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**CITY OF SARTELL  
DEZURIK HAZARDOUS WASTE LAGOON #3  
SARTELL, MINNESOTA**

**2001 ANNUAL REPORT & STATISTICAL ANALYSIS  
GROUND-WATER MONITORING DATA**

Prepared for

City of Sartell/DeZurik Hazardous Waste Lagoon #3

January 25, 2002

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**CITY OF SARTELL  
DEZURIK HAZARDOUS WASTE LAGOON #3  
SARTELL, MINNESOTA**

**2001 ANNUAL REPORT & STATISTICAL ANALYSIS  
GROUND-WATER MONITORING DATA**

**INTRODUCTION**

Leggette, Brashears and Graham (LBG) has completed the ground-water monitoring and statistical analysis for the DeZurik Hazardous Waste Landfill Lagoon No.3 located in Sartell, Minnesota. This report was prepared in accordance with the terms of the landfill permit. Ground-water monitoring was performed during two sampling events in 2001. Sampling consisted of collecting ground water samples from four monitoring wells. The samples were analyzed for total metals, dissolved metals and inorganic parameters.

The goal of the ground-water monitoring was to provide information regarding depth and quality of the ground water. The goal of the statistical analysis was to show with statistical assurance that the hazardous waste lagoon is not adversely impacting the ground water and, if the ground water is impacted, to provide information regarding the nature and location of the impacts.

**BACKGROUND**

Background information was obtained from the reissued Part B Permit Application approved by the MPCA in September of 1994. The DeZurik Hazardous Lagoon No.3 (site) is located in the SW1/4 of Section 16, Township 125 North, Range 28 West within the city limits of the City of Sartell, Minnesota and is approximately 0.2 acres in size (Figure 1 ). Sludges were disposed of from various DeZurik operations in the city. The site was closed in 1987 with a multi-layer 6-foot cover system.

### **Scope of Work**

This report presents the sampling results from the April and October 2001 monitoring events. The 2001 ground-water monitoring results were compared to historical data for the site and to state and federal water quality standards.

This annual report incorporates information that was included in the semiannual report presented to the MPCA in July 2001, and also includes the following information:

- A narrative describing the effects that the site is exerting on surrounding ground-water quality and any changes made to or maintenance needed in the monitoring network;
- A description of sampling dates and procedures;
- Results of appropriate statistical procedures;
- Water level monitoring data and potentiometric maps for each sampling event;
- Calculation of ground-water flow velocities;
- Laboratory analytical reports;
- Graphs showing concentration versus time for target parameters historically detected above background levels in ground water; and
- Summary tables showing laboratory analysis and water elevation data for each well sampled to date.

### **Hydrogeologic Setting**

A detailed description of the geology and hydrogeology of the site is provided in the Part B Permit Application. The information below has been summarized from the application.

The general geology of the area in which the site is located consists of unconsolidated glacial deposits (approximately 80 to 100 feet) that overlie Precambrian granitic bedrock. Previous studies indicated there are three geologic/hydrogeologic units underneath the site that affect ground-water movement and flow. The surficial unit consists of silty fine-grained sands that soil borings indicate are approximately 15 feet thick. Outwash deposits are located below the fine sands and consist of silty sands and gravel. The outwash is considered the upper-most aquifer and is present to 70 to 80 feet below ground surface (bgs). The third layer consists of clayey weathered bedrock occurring at approximately 70 to 80 feet bgs which acts as an aquitard restricting the downward flow of ground water into the bedrock.

## GROUND-WATER MONITORING

### Ground-Water Monitoring Network

The wells that comprise the monitoring network for the site are shown on Figures 2 and 3. Upgradient well P-13 and downgradient wells P-5R, P-9R, and P-12R were sampled in 2001. Ground-water samples were collected by LBG field personnel according to the methods presented in Appendix II and sent to Energy Laboratories in Rapid City, South Dakota for the analysis of inorganics, nutrients, and trace metals. The spring sampling round was completed on April 18, 2001; however, due to the higher detection limits that were used for analysis of the dissolved metals, resampling was performed on July 26, 2001. The fall sampling round was completed on October 23, 2001.

Prior to sampling, the general condition of each well was noted and presented in Appendix II. All of the wells were in good condition during both sampling events in 2001.

### Ground-Water Elevation and Flow Monitoring

Ground-water elevations were measured in wells P-13, P-5R, P-5A, P-7, P-9R, and P-12R on April 18 and October 23, 2001 according to the methods presented in Appendix II. Water level data which includes historical information is summarized in Table 1. Ground-water flow is primarily to the southeast, which is consistent with historical results. Ground-water potentiometric maps are presented as Figures 2 and 3.

The hydraulic gradient remains consistent for the area. In 1994, for the Part B Permit Application, the average gradient was 0.006 ft/ft. In 1998, the average hydraulic gradient was 0.006 ft/ft. The hydraulic gradients in 2000 were 0.011 ft/ft and 0.013 ft/ft for spring and fall sampling events, respectively. In 2001, the hydraulic gradients were 0.013 ft/ft in the spring and 0.009 ft/ft in the fall. These gradients were calculated with elevations and distances from wells P-13 to P-9R.

The average linear ground-water flow rates can be calculated using the following equation and assumptions:

$$V = K \cdot I / n_e$$

Where:

V = ground-water velocity

$K$  = hydraulic conductivity (assumed 0.39 ft/min)

$I$  = hydraulic gradient (ft/ft)

$n_e$  = effective porosity (assumed 25%)

The calculated linear flow rates based on the above equation and assumptions are 29.20 ft/day for the spring sampling event and 20.22 ft/day for the fall sampling event. The spring velocity is higher than the previous spring velocity of 24.26 ft/day; however, the fall velocity is lower than the 2000 fall velocity of 30.10 ft/day.

### **Ground-Water Quality Monitoring**

Field sampling data sheets for the fall sampling event are presented in Appendix I and the laboratory analytical report is presented in Appendix II. Ground-water quality data for the site was statistically analyzed and compared to various and state water quality standards. The pertinent standards are described below.

- Maximum Contaminant Level (MCL) -The MCLs are enforceable standards that apply to public water systems, as established in the National Interim Primary Drinking Water Standards for the United States.
- Secondary Maximum Containment Level (SMCL) -The SMCL applies to public water systems. The standards are established primarily for taste, odor, and aesthetic reasons, not due to adverse health affects.
- Intervention Limits (IL) - The ILs are established for landfills in the State of Minnesota. The ILs apply to ground-water quality at the compliance boundary, generally located 200 feet from the waste boundaries.
- Health Risk Limits (HRLs) -The HRLs are risk-based levels for constituents in ground water. The HRLs are determined by the Minnesota Department of Health and are enforceable under Minnesota Rules 4717.7100 to 4717.7800.

Background concentrations for target contaminants (arsenic, barium, cadmium, lead, and selenium) are established at the upgradient well, P-13. The background data during the spring and fall sampling rounds of 2001 remained consistent with past data (Table 2) except for barium.

Background concentration results for barium increased over historical levels during the 1998 and 1999 sampling events; however, have decreased significantly in the 2000 and 2001 sampling events.

Dissolved boron, manganese, nitrate, and total dissolved solids (TDS) levels exceeded federal or state water quality standards in the spring and/or fall in at least one monitoring well, as detailed below. A summary of the exceeded contaminants is presented in Table 4.

- Concentrations of dissolved boron have remained above the HRL in well P-5R. Concentrations have been detected in wells P-9R, P-12R, and P-13 since 2000; however they have remained below the HRL.
- Concentrations of dissolved manganese have remained below the SMCL in wells P-5R, P-9R, and P-13. In the spring resampling of well P-12R, the concentration increased above the SMCL; however, the concentration decreased to below the SMCL in the fall.
- Concentrations of nitrates have remained above the IL in the spring and fall of 2001; however, the concentrations remain below the MCL and HRL.
- Concentration of TDS have remained above the SMCL in wells P-5R, P-9R, and P-12R; however, in well P-13, the concentrations are below the SMCL.

## STATISTICAL ANALYSIS

Statistical analysis was performed on the results of the sampling events to determine if detections in downgradient wells (P-5R, P-9R, P-12R) are above background concentrations in the upgradient well (P-13). The statistical analysis was completed in accordance with the Part B Permit reissued in September 1994. The analysis is performed on dissolved concentrations of arsenic, barium, cadmium, lead and selenium.

The tolerance interval was calculated for each of the above analytes based on historical levels in upgradient well P-13. The Poisson Distribution was used to estimate the population mean and variance for arsenic, cadmium, lead and selenium. Since more than two detects occurred for barium, the arithmetic mean and standard deviation were used to calculate the tolerance interval for barium.



The decreased background concentrations in 2000 and 2001 for barium lowered the tolerance interval from 320  $\mu\text{g/L}$  to 220  $\mu\text{g/L}$ . The assumed tolerance factor of 2.523 is based on a confidence factor of 95 percent with a typical set of background data ( $n= 16$ ). The following equation was used to calculate the tolerance:

$$T = U + (k * s) . \text{ Where:}$$

T = Tolerance interval

U = Population mean

k = Tolerance factor

s = Standard deviation

As stated in the correspondence dated September 29, 1998 from DeZurik to the MPCA, even though laboratory detection limits are lower, tolerance levels continue to be calculated assuming the means are equal to the reporting limits identified in the November 1994 Quality Assurance Project Plan (QAPP), as long as the detects are less than the QAPP reporting limits.

The contaminants of concern were all below background concentrations for the 2001 sampling events. No contaminants of concern have exceeded background concentrations since 1990. Graphs of concentration versus time for barium and cadmium are presented on Graphs 2 and 3. These parameters are the only contaminants of concern to have exceeded background concentrations in the past.

## CONCLUSIONS AND RECOMMENDATIONS

Review of the laboratory analytical results and the results of the statistical analysis indicate that concentrations of contaminants of concern (arsenic, barium, cadmium, lead, and selenium) were below background concentrations in wells P-5R, P-9R and P-12R at the DeZurik Lagoon No.3 in 2001. Overall, the monitoring well network is in good condition and correctly placed to monitor potential releases from the site.

In at least one well, a MCL, SMCL and/or HRL were exceeded during both the spring and fall sampling events. The SMCL standard of 500 mg/L for TDS was exceeded in P-5R, P-9R and P-

12R; however, the concentrations remained relatively steady from 2000 sampling events. In Well P-13, concentrations of TDS remained below the SMCL.

The HRL for boron was only exceeded in P-5R and remained comparable with concentrations from the 2000 sampling events. Concentrations of boron were also detected in wells P-9R, P-12R and P-13; however they remain below the HRL.

Concentrations in well P-12R exceeded the SMCL for manganese, but did not exceed the HRL. Manganese was also detected in wells P-9R and P-13; however, the concentrations were below the SMCL.

The IL for nitrate was exceeded in P-5R, P-9R, P-12R, and P-13 during the spring and fall sampling events; however they remain comparable to concentrations detected in the spring of 2000.

The calculated ground-water flow velocities for the spring and fall 2001 sampling events are 29.20 ft/day and 20.22 ft/day, respectively.

Based on the data summarized above, continued monitoring at the site is recommended. No changes in the monitoring plan are warranted at this time.

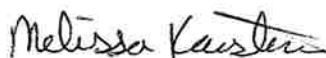
### STANDARD OF CARE

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

If you have any questions about this report, or need additional information, please contact me at (605) 334-6000.

Very truly yours,

LEGGETTE, BRASHEARS & GRAHAM, INC.



Melissa Karstens  
Environmental Scientist

Reviewed by:

#### PROFESSIONAL GEOLOGIST

I hereby certify that this plan, document, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Geologist under the laws of the State of Minnesota

Print Name: Timothy L. Kenyon

Signature: 

Date: 1-25-02 License # 30512

Tim Kenyon  
Senior Associate

TK:kak

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**TABLE 1**  
**Water Elevations**  
**DeZurik Hazardous Waste Lagoon #3**

DATE	P-5A	P-5R	P-9R	P-12	P-12R	P-13
04/04/1990	1020.83					
06/26/1990	1021.79		1020.74	1021.81		1025.77
10/02/1990	1023.15		1023.05	1023.31		1026.18
12/18/1990	1023.13		1023.25	1023.41		1026.23
04/04/1991	1022.69		1022.79	1022.95		1026.14
07/31/1991	1024.29		1024.43	1024.5		1026.45
10/31/1991	1025.11		1024.97	1025.07		1026.48
04/23/1992	1024.22		1024.36	1024.34		1026.46
10/21/1992	1024.25		1024.28			
04/20/1993	1023.05		1022.94	1023.11		1026
10/27/1993	1025.29	1026.14	1025.2		1025.37	1026.98
04/20/1994	1024.56	1024.73	1024.56		1024.75	1026.59
07/11/1994			1025.52			
10/17/1994	1025.38	1025.47	1025.34		1025.44	1027.04
04/11/1995	1024.50	1024.79	1025.01		1024.80	1026.75
10/09/1995	1025.39	1025.63	1025.52		1025.53	1026.98
04/17/1996	1024.70	1024.94	1024.83		1024.97	1026.59
10/15/1996	1024.26	1024.4	1024.25		1024.37	1026.47
04/15/1997	1024.11	1024.35	1024.22		1024.23	1026.45
10/14/1997	1025.8	1026.04	1025.81		1025.91	1027.27
04/13/1998	1024.67	1024.84	1024.69		1024.84	1026.44
10/06/1998	1024.48	1024.62	1024.47		1024.63	1026.37
04/27/1999		1023.63	1023.48		1023.64	1026.1
10/27/1999		1023.93	1023.81		1023.93	1026.24
04/25/2000		1023	1022.96		1023	1026.22
10/23/2000		1022.17	1022.01		1022.18	1026.08
04/18/2001		1022.12	1021.97		1022.1	1025.94
10/23/2001		1023.75	1023.63		1023.79	1026.18

blank = not sampled

TABLE 2

**DEZURIK HAZARDOUS WASTE LAGOON #3  
SARTELL, MINNESOTA**

Water Quality Data Summary - Detected Parameters

Analyte	Units	P-9R	P-9R Resample	P-9R	P-13	Duplicate (P-13)	P-13 Resample	P-13	Duplicate (P-13)	P-5R	P-5R Resample	Duplicate Resample (P-5R)	P-5R	P-12R	P-12R Resample	P-12R
		18-Apr-01	25-Jul-01	23-Oct-01	18-Apr-01	18-Apr-01	26-Jul-01	23-Oct-01	23-Oct-01	18-Apr-01	26-Jul-01	26-Jul-01	23-Oct-01	18-Apr-01	26-Jul-01	23-Oct-01
Total Organic Carbon	mg/L	1.7		3.8	1.3	1.2		2.3	0.9	2.5			1.8	2.3		1.8
Chloride	mg/L	29		36	21	22		27	29	33			37	38		37
Conductivity	umhos/cm	977		1010	742	744		777	764	1290			1160	927		902
Chemical Oxygen Demand	mg/L	19		18	32	18		104	32	15			80	29		23
pH	su	7.57		7.21	7.58	7.56		7.14	7.36	7.4			7.09	7.64		7.29
Total Phenols	mg/L			0.02				0.02	<0.01				<0.01			0.02
Sodium	mg/L	13		10	5	5		5	5	41			28	12		23
Total Dissolved Solids	mg/L	560		600	430	400		430	410	820			710	520		510
Sulfate	mg/L	91		107	58	51		36	35	254			160	102		82
Nitrate as N	mg/L	5.82		5.74	5.46	5.53		5.21	5.18	4.52			5.78	5.05		5.04
Dissolved Arsenic	mg/L	<0.01	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
Dissolved Barium	mg/L	0.08	0.079	0.07	0.043	0.043	0.042	0.038	0.037	0.079	0.066	0.071	0.049	0.06	0.064	0.037
Dissolved Boron	mg/L	0.15	0.1	0.05	0.03	0.07	0.036	0.05	0.03	2.18	1.26	1.27	1.01	0.07	0.086	0.07
Dissolved Cadmium	mg/L	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005
Dissolved Calcium	mg/L	154		144	123	121		114	114	186			159	150		128
Dissolved Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Iron	mg/L	<0.01	<0.01	0.096	<0.01	<0.01	0.04	0.08	0.07	0.02	0.03	0.02	0.08	0.01	<0.01	0.16
Dissolved Lead	mg/L	<0.01	<0.002	<0.002	<0.01	<0.001	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002
Dissolved Magnesium	mg/L	46		41	28	29		28	28	56			47	37		32
Dissolved Manganese	mg/L	0.03	0.03	0.03	0.006	0.005	<0.005	0.01	<0.005	0.024	<0.005	<0.005	<0.005	0.025	0.057	0.02
Dissolved Selenium	mg/L	0.01	<0.005	<0.005	<0.01	0.01	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005
Dissolved Zinc	mg/L	0.007	0.028	0.01	<0.005	<0.005	<0.005	0.01	0.01	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	0.01

**TABLE 3**  
**Summary of Analytical and Statistical Analysis Results**  
**DeZurik Hazardous Waste Lagoon No. 3**  
**(units = µg/L, dissolved)**

WELL NUMBER	DATE	ARSENIC	BARIUM	CADMIUM	LEAD	SELENIUM
P-5A	12/27/1989	ND	50	ND	ND	ND
P-5A	06/28/1990	ND	ND	0.5	5	ND
P-5A	10/04/1990	ND	110	ND	ND	ND
P-5A	12/18/1990	ND	80	ND	ND	ND
P-5A	04/04/1991	ND	60	0.4	ND	ND
P-5A	08/01/1991	ND	67	ND	ND	ND
P-5A-1	10/31/1991	ND	63	0.32	ND	ND
P-5A-2	10/31/1991	ND	60	0.43	ND	ND
P-5A-3	10/31/1991	ND	62	0.38	ND	ND
P-5A-4	10/31/1991	ND	62	0.55	ND	ND
P-5A	04/23/1992	ND	56	ND	ND	ND
P-5A	09/30/1992	ND	ND	ND	ND	ND
P-5A	04/20/1993	ND	ND	ND	ND	ND
P-5R	10/27/1993	ND	78	1.4	ND	ND
P-5R	01/10/1994	--	ND	--	--	--
P-5R	04/20/1994	ND	ND	ND	ND	<6.02
P-5R	10/17/1994	ND	ND	ND	ND	ND
P-5R	04/11/1995	ND	ND	ND	ND	ND
P-5R	10/11/1995	ND	52	ND	ND	ND
P-5R	04/17/1996	ND	ND	ND	ND	ND
P-5R	10/16/1996	< 3.0	ND	0.36	< 3.0	< 3.0
P-5R	04/17/1997	< 3.0	50	< 0.30	< 3.0	< 3.0
P-5R	10/16/1997	<3.0	ND	<0.30	<3.0	<3.0
P-5R	04/13/1998	<2	16	<0.2	<1	<3
P-5R	10/06/1998	<2	33	<0.2	<1	<3
P-5R	04/27/1999	<2	131	<0.2	<1	<1
P-5R	10/27/1999	<2	210*	<0.2	<1	<1
P-5R	04/24/2000	<2	204	<0.2	<1	<1
P-5R	10/23/2000	<2	183	<0.2	<1	<1
P-5R	04/18/2001	<10	79	<1	<10	10
P-5R Resample	07/26/2001	<5	66	<0.5	<2	<5
P-5R Resample Dup	07/26/2001	<5	71	<0.5	<2	<5
P-5R	10/23/2001	<5	49	<0.5	<2	<5
P-9R	04/04/1991	ND	ND	ND	ND	ND
P-9R	08/01/1991	ND	ND	ND	ND	ND
P-9R-1	10/31/1991	ND	ND	ND	ND	ND
P-9A-2	10/31/1991	ND	ND	ND	ND	ND
P-9R-3	10/31/1991	ND	ND	0.3	ND	ND
P-9R-4	10/31/1991	ND	ND	ND	ND	ND
P-9R	04/23/1992	ND	ND	0.19	ND	ND
P-9R	09/30/1992	ND	ND	ND	ND	ND
P-9R	04/20/1993	ND	ND	ND	ND	ND
P-9R	10/27/1993	ND	ND	0.7	ND	ND
P-9R	04/20/1994	ND	ND	ND	ND	<6.02
P-9R	10/17/1994	ND	ND	ND	ND	ND
P-9R	04/11/1995	ND	ND	ND	ND	ND
P-9R	10/10/1995	ND	ND	ND	ND	ND
P-9R	04/17/1996	ND	ND	ND	ND	ND
P-9R	10/16/1996	< 3.0	ND	< 0.30	< 3.0	< 3.0
P-9R	04/16/1997	< 3.0	53	< 0.30	< 3.0	< 3.0
P-9R	10/15/1997	<3.0	61	1.4	<3.0	<3.0
P-9R	04/10/1998	<2	17	0.7	2	<3
P-9R	10/06/1998	<2	46	<0.2	<1	<3



**TABLE 3**  
**Summary of Analytical and Statistical Analysis Results**  
**DeZurik Hazardous Waste Lagoon No. 3**  
**(units = µg/L, dissolved)**

WELL NUMBER	DATE	ARSENIC	BARIUM	CADMIUM	LEAD	SELENIUM
P-9R	04/27/1999	<2	191	<0.2	1.4	<1
P-9R	10/27/1999	<2	126*	0.35	<1	<1
P-9R	04/25/2000	<2	99	0.26	<1	<1
P-9R	10/23/2000	<2	115	<0.2	<1	<1
P-9R	04/18/2001	<10	80	<1	<10	10
P-9R Resample	07/25/2001	<5	79	<0.5	<2	<5
P-9R	10/23/2001	<5	70	<0.5	<2	<5
P-12	04/04/1991	ND	ND	ND	ND	ND
P-12	08/01/1991	ND	ND	0.32	ND	ND
P-12-1	10/31/1991	ND	ND	0.31	ND	ND
P-12-2	10/31/1991	ND	ND	0.33	ND	ND
P-12-3	10/31/1991	ND	ND	ND	ND	ND
P-12-4	10/31/1991	ND	ND	ND	ND	ND
P-12	04/23/1992	ND	ND	ND	ND	ND
P-12	09/30/1992	ND	ND	ND	ND	ND
P-12	04/20/1993	ND	ND	ND	ND	ND
P-12R	10/27/1993	ND	ND	13	ND	ND
P-12R	01/10/1994	--	--	ND	--	--
P-12R	04/20/1994	ND	ND	ND	ND	<6.02
P-12R	10/17/1994	ND	ND	ND	ND	ND
P-12R	04/11/1995	ND	ND	ND	ND	ND
P-12R	10/10/1995	ND	ND	ND	5.2	ND
P-12R	04/17/1996	ND	ND	ND	ND	ND
P-12R	10/16/1996	< 3.0	ND	0.63	< 3.0	< 3.0
P-12R	04/17/1997	< 3.0	ND	< 0.30	< 3.0	< 3.0
P-12R	10/16/1997	<3.0	ND	<0.30	<3.0	<3.0
P-12R	04/13/1998	<2	9	<0.2	<1	<3
P-12R	10/06/1998	<2	30	<0.2	<1	<3
P-12R	04/27/1999	<2	54	<0.2	<1	<1
P-12R	10/27/1999	<2	159*	<0.2	<1	<1
P-12R	04/25/2000	<2	135	<0.2	1.1	<1
P-12R	10/24/2000	<2	185	<0.2	<1	<1
P-12R	04/18/2001	<10	60	<1	<10	<10
P-12R Resample	07/26/2001	<5	64	<0.5	<2	<5
P-12R	10/23/2001	<5	37	<0.5	<2	<5
P-13	06/28/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	06/28/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	06/28/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	06/28/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	10/04/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	10/04/1990	< 3.0	60	< 0.3	< 3.0	< 3.0
P-13B	10/04/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	10/04/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	12/18/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	12/18/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	12/18/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13D	12/18/1990	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	04/04/1991	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	08/01/1991	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-1	10/31/1991	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-2	10/31/1991	< 3.0	< 50	0.88	< 3.0	< 3.0
P-13-3	10/31/1991	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-4	10/31/1991	< 3.0	< 50	< 0.3	< 3.0	< 3.0

**TABLE 3**  
**Summary of Analytical and Statistical Analysis Results**  
**DeZurik Hazardous Waste Lagoon No. 3**  
**(units = µg/L, dissolved)**

WELL NUMBER	DATE	ARSENIC	BARIUM	CADMIUM	LEAD	SELENIUM
P-13-1	04/23/1992	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-2	04/23/1992	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-3	04/23/1992	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-4	04/23/1992	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	09/30/1992	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-1	10/8-9/92	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-2	10/8-9/92	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13-3	10/8-9/92	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	04/20/1993	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	04/20/1993	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	04/20/1993	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13D	04/20/1993	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	10/29/1993	< 3.0	< 50	3.3*	< 3.0	< 3.0
P-13B	10/29/1993	< 3.0	< 50	5.5*	< 3.0	< 3.0
P-13C	10/29/1993	< 3.0	< 50	3.9*	< 3.0	< 3.0
P-13D	10/29/1993	< 3.0	< 50	17*	< 3.0	< 3.0
P-13	04/20/1994	< 3.0	< 50	< 0.3	< 3.0	< 6.02
P-13A	04/20/1994	< 3.0	< 50	< 0.3	< 3.0	< 6.02
P-13B	04/20/1994	< 3.0	< 50	0.31	< 3.0	< 6.02
P-13C	04/20/1994	< 3.0	< 50	< 0.3	< 3.0	< 6.02
P-13	10/17/1994	< 3.0	54	< 0.3	< 3.0	< 3.0
P-13A	10/18/1994	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	10/18/1994	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	10/18/1994	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	04/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	04/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	04/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	04/12/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	10/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	10/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	10/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	10/11/1995	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	04/17/1996	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13A	04/17/1996	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13B	04/17/1996	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13C	04/17/1996	< 3.0	< 50	< 0.3	< 3.0	< 3.0
P-13	10/16/1996	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13A	10/16/1996	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13B	10/17/1996	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13C	10/17/1996	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13	04/16/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13A	04/17/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13B	04/17/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13C	04/17/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13	10/15/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13A	10/16/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13B	10/16/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13C	10/16/1997	< 3.0	< 50	< 0.30	< 3.0	< 3.0
P-13A	04/09/1998	< 2	< 6	< 0.2	< 1	< 3
P-13B	04/10/1998	< 2	< 6	< 0.2	< 1	< 3
P-13C	04/10/1998	2.2	< 6	< 0.2	< 1	< 3



**TABLE 3**  
**Summary of Analytical and Statistical Analysis Results**  
**DeZurik Hazardous Waste Lagoon No. 3**  
**(units = µg/L, dissolved)**

WELL NUMBER	DATE	ARSENIC	BARIUM	CADMIUM	LEAD	SELENIUM
P-13D	04/13/1998	<2	<6	<0.2	<1	<3
P-13A	10/05/1998	<2	27	<0.2	<1	<3
P-13B	10/05/1998	<2	101	<0.2	<1	<3
P-13C	10/06/1998	<2	180	<0.2	<1	<3
P-13D	10/06/1998	<2	135	<0.2	<1	<3
P-13A	04/26/1999	<2	66	<0.2	<1	<1
P-13B	04/26/1999	<2	178	<0.2	<1	<1
P-13C	04/27/1999	<2	114	<0.2	<1	<1
P-13D	04/27/1999	<2	151	<0.2	<1	<1
P-13A	10/26/1999	<2	95*	<0.2	<1	<1
P-13B	10/27/1999	<2	300*	<0.2	<1	<1
P-13C	10/27/1999	<2	196*	<0.2	<1	<1
P-13D	10/27/1999	<2	229*	<0.2	<1	<1
P-13A	04/24/2000	<2	156	<0.2	<1	<1
P-13A	10/23/2000	<2	115	<0.2	<1	<1
P-13	04/18/2001	<10	43	<1	<10	<10
P-13Dup	04/18/2001	<10	43	<1	<10	<10
P-13 Resample	07/26/2001	<5	42	<0.5	<2	<5
P-13	10/23/2001	<5	38	<0.5	<2	<5
P-13Dup	10/23/2001	<5	37	<0.5	<2	<5

Regulatory Limits:

MCL:	50	2000	5	15	50
SMCL:	N/A	N/A	N/A	N/A	N/A
HRL:	N/A	2000	4	N/A	30
IL:	12.5	375	1.25	5	11

Background Detection limit\*\*

Background Mean#

Background Standard deviation#

K<sub>0.95</sub>

Tolerance level#\*\*

3	50	0.3	3	3
3	94	0.3	3	3
1.732	53.579	0.548	1.732	1.732
2.523	2.523	2.523	2.523	2.523
7.4	230	1.7	7.4	7.4

ND Not detected.

-- Not measured.

# The Poisson Distribution method was used for calculating the Tolerance Level for background constituents with two or less reported results above the detection limit. For background constituents with three or more results above the detection limit, the arithmetic mean and standard deviation is calculated.

\* Data collected are considered suspect and are excluded from the tolerance limit and background mean calculations. As required in the August 1994 Part B Permit Application, the most recent and valid 16 samples were included in the tolerance limit calculation.

\*\* In 1998, new analytical equipment allowed the laboratory to obtain lower detection limits than that obtained in previous sampling years. These detection limits are lower than those required in the August 1994 Part B Permit Application for evaluating compliance of wells. Where the reported detection limit is lower than the required detection limit, the required detection limit is used for calculating the tolerance level to maintain continuity in evaluating compliance. Please note that the detection limits for the parameters are higher for the April 2001 event due to matrix interferences with the samples. Please refer to the analytical report for a complete explanation of the elevated detection limits.

Note: Sample results in bold type exceed MCL and/or HRL.

TABLE 4

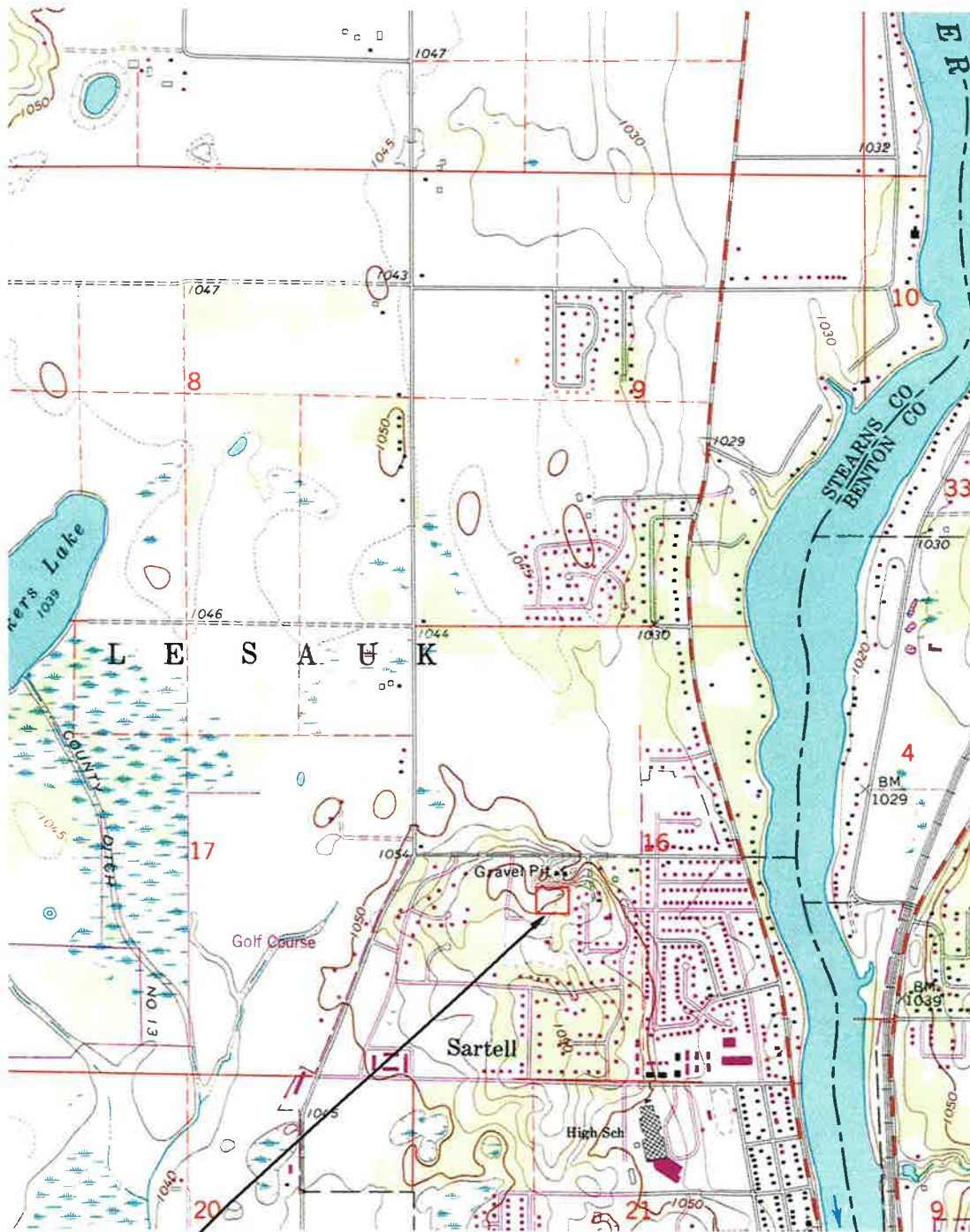
DEZURIK HAZARDOUS WASTE LAGOON #3  
SARTELL, MINNESOTA

2000 and 2001 Water Quality Data - Exceeded Parameters (in mg/L)

Analyte	Well	Spring 2000	Fall 2000	Spring 2001	Fall 2001	MCL	SMCL	IL	HRL
Boron	P-5R	<b>1.18</b>	<b>1.62</b>	<b>2.18</b>	<b>1.01</b>				<b>0.6</b>
	P-9R	<0.1	<0.1	0.15	0.05				
	P-12R	<0.1	<0.1	0.086	0.07				
	P-13	<0.1	<0.1	0.07	0.05				
Manganese	P-5R	0.092	0.063	0.024	<0.005		<b>0.05</b>		0.1
	P-9R	0.024	0.036	0.03	0.03				
	P-12R	0.022	0.006	<b>0.057</b>	0.02				
	P-13	0.013	0.014	0.006	0.01				
Nitrate	P-5R	<b>5.57</b>	NS	<b>4.52</b>	<b>5.78</b>	10		<b>2.5</b>	10
	P-9R	<b>4.59</b>	NS	<b>5.82</b>	<b>5.74</b>				
	P-12R	<b>4.72</b>	NS	<b>5.05</b>	<b>5.04</b>				
	P-13	<b>5.8</b>	NS	<b>5.46</b>	<b>5.21</b>				
TDS	P-5R	<b>717</b>	<b>852</b>	<b>820</b>	<b>710</b>		<b>500</b>		
	P-9R	<b>509</b>	<b>625</b>	<b>560</b>	<b>600</b>				
	P-12R	<b>582</b>	<b>585</b>	<b>520</b>	<b>510</b>				
	P-13	413	456	400	430				

**Light Green** - Lowest Standard  
**BOLD** - Exceeded Lowest Standard  
 NS - Not Sampled

**FIGURES**

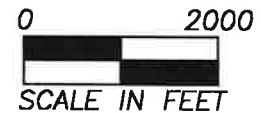


APPROXIMATE LOCATION  
OF SUBJECT PROPERTY



QUADRANGLE LOCATION

Revisions shown in purple and woodland compiled in cooperation with State of Minnesota agencies from aerial photographs taken 1991 and other sources. Contours not revised. This information not field checked. Map edited 1993.



DATE	REVISED

**LEGGETTE, BRASHEARS & GRAHAM, INC.**  
 Professional Ground-Water  
 and Environmental Services  
 1113 East 14th Street  
 Sioux Falls, South Dakota 57104  
 (605) 334-8000



**DEZURIK HAZARDOUS WASTE LAGOON #3**  
 SARTELL, MINNESOTA

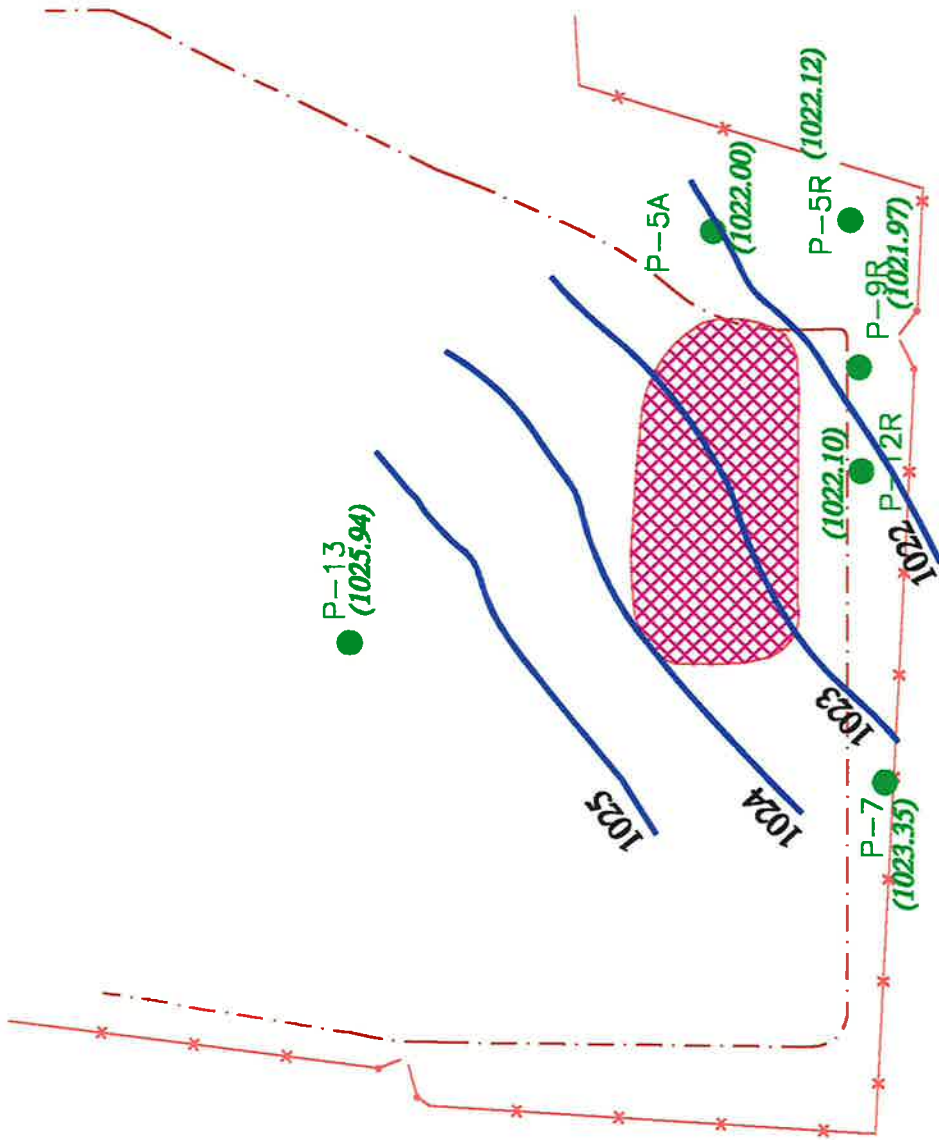
Site Location Map  
 Source: USGS 7.5 Minute Series; Little Rock Lake Quad

FILE: Dez-topo.dwg DATE: January, 2002 FIGURE: 1



**LEGEND**

- P-13  
(1025.94)
- \*— FENCE
- · - · - APPROXIMATE LIMIT OF LANDFILL WASTE
- ▨ APPROXIMATE LIMIT OF LAGOON
- 1025 WATER TABLE CONTOUR (DASHED WHERE INFERRED)



**LEGGETTE, BRASHEARS & GRAHAM, INC.**  
 Professional Ground-Water  
 and Environmental Services  
 1118 East 14th Street  
 Sioux Falls, South Dakota 57104  
 (605) 534-8000

DATE	REVISED

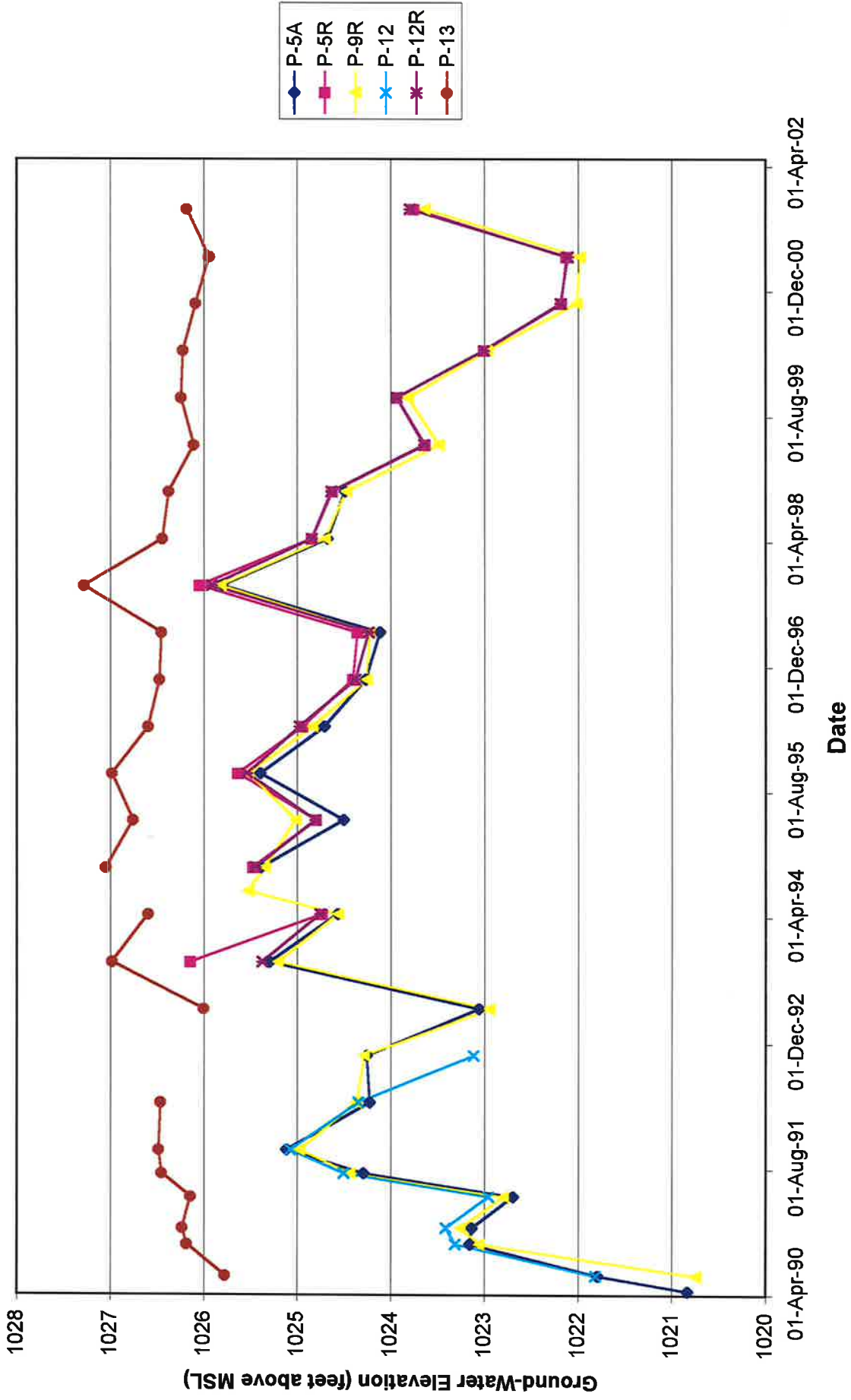
**DEZURIK HAZARDOUS WASTE LAGOON #3**  
 SARTELL, MINNESOTA

GROUND-WATER ELEVATIONS AND INFERRED FLOW DIRECTION (18 APR 01)

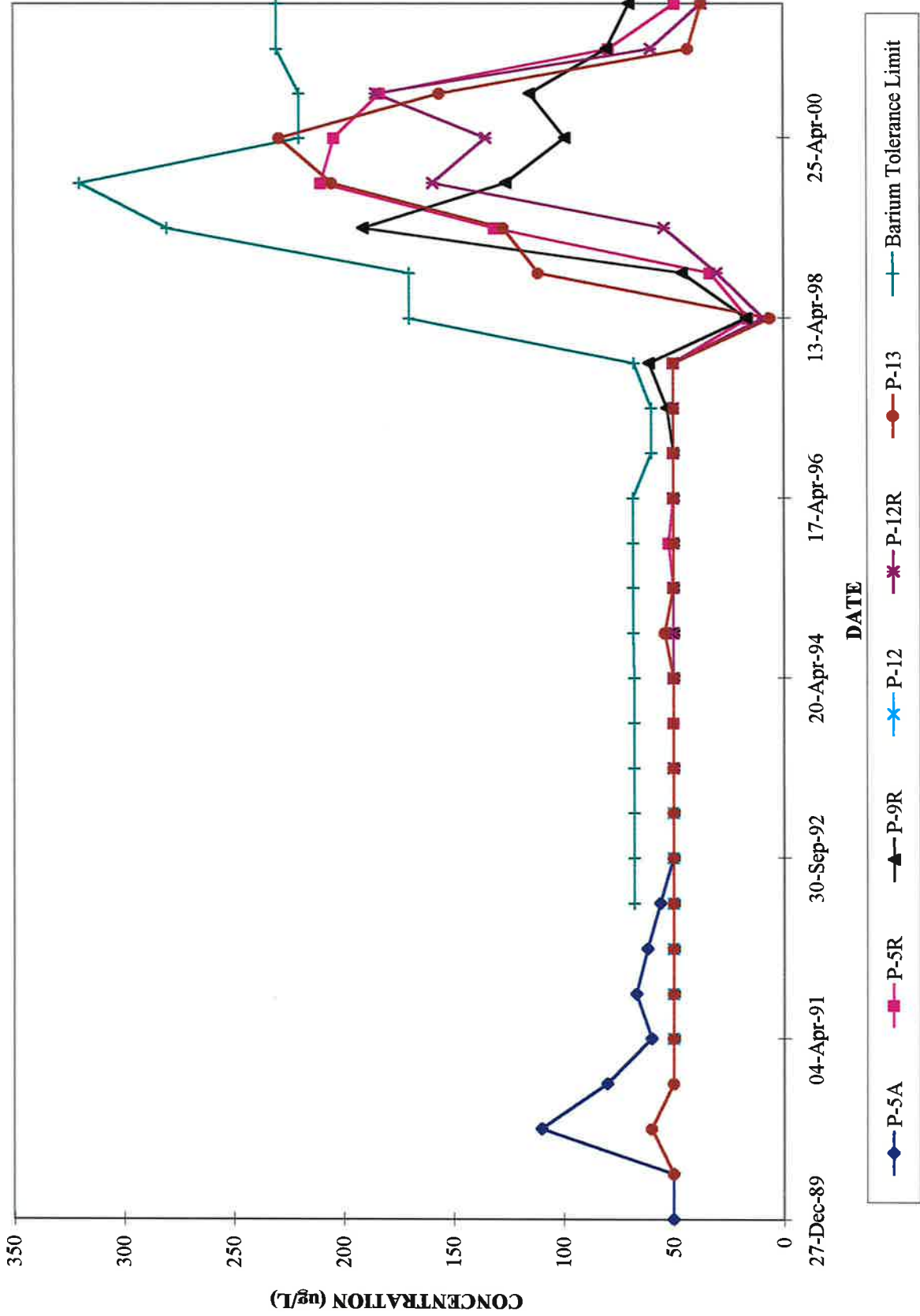
FILE: dezurik gw-2000      DATE: July 2001      FIGURES: 2



**Graph 1**  
**DeZurik Ground-Water Elevation Data**

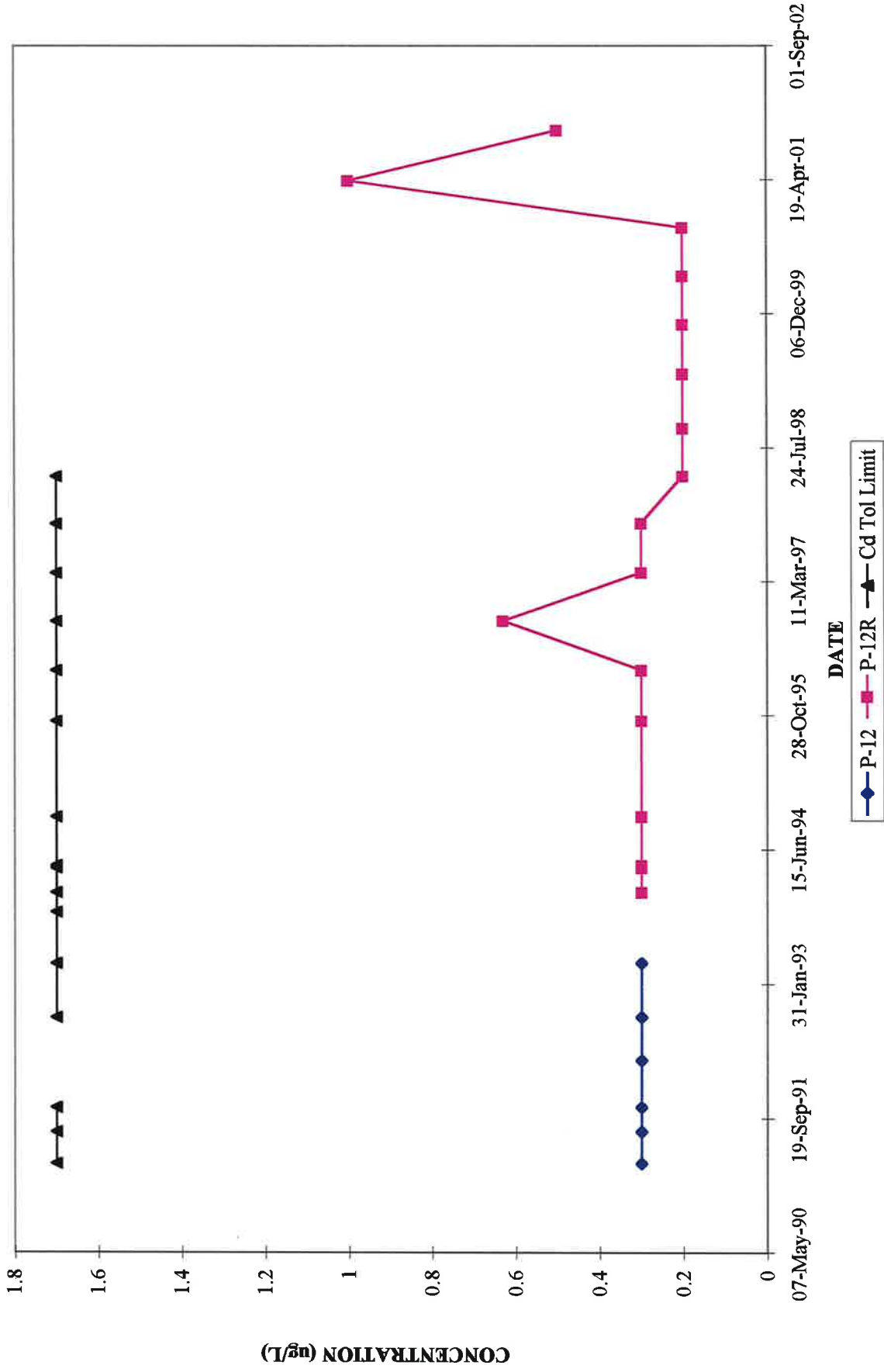


**Graph 2**  
**Historical Concentrations of Dissolved Barium**





**Graph 3**  
**Historical Concentrations of Dissolved Cadmium**



**APPENDIX I**

**Field Sampling Data Sheets**

FLUID-LEVEL DATA SHEET

DATE: 10-23-01

CLIENT NAME: DEZURIK LANDFILL LAGOON #3

CLIENT CODE: 6SARBT

LOCATION: 12 TH ST N, SARTELL, MN

JOB CODE: DESHWL

WEATHER CONDITIONS: CLEAR, 60°

RECORDED BY: CMH

MEASURING DEVICE: SOLINST

WELL	DEPTH TO HYDROCARBON	DEPTH TO WATER	ELEVATION TOC	ELEVATION WATER	PRODUCT THICKNESS	COMMENTS
P-5R		75.29	1099.04	1023.75		
P-9R		78.46	1102.09	1023.63		
P-12R		77.54	1101.33	1023.79		
P-13		78.94	1106.12	1026.18		

DAILY ACTIVITY LOG

7:00 DEPARTURE

8:24 ARRIVAL ON SITE

8:30 SAMPLING - P-13

9:32 JASON CHANG(?) FROM MPCA ARRIVES. HE NEEDS TO OBSERVE SAMPLING FOR A REPORT DUE TO THE EPA.

9:33 SAMPLING P-5R, P-9R, P-12R, DUPLICATE.  
 JASON REVIEWS AN OLD REPORT AND MENTIONS P-13 WAS SAMPLED 4 TIMES EVERY 4 HRS AFTER THE INITIAL SAMPLING FOR BACKGROUND ON LAST YEARS EVENT. I GRABBED A DUPLICATE SAMPLE FROM P-13 @ 12:40.

13:00 COMPLETE SAMPLING

12:30 JASON DEPARTS

13:01 SAMPLING SARTELL LANDFILL.

## GROUND-WATER SAMPLING DATA SHEET

Client Code: 6SARBT

Project Title: DEZURIK LANDFILL LAGOON #3

Job Code: DESHWL

Address: 12TH ST N

Date: 10.23.01

City, State, Zip: SARTELL, MN.

### General Data

### Stabilization Data

Location ID:	Volume (gallons)	Well Volume	Temp (C)	ORP (mV)	SC (uS)	pH
P-5R						
Key Number: MASTER 106013	4.00	1.0	10.8	65	1047	6.84
Casing Diameter (in): 4"	8.00	2.0	10.9	72	1050	6.88
Well Depth (ft): 81.35 TO TOC	12.00	3.0	10.9	63	1050	6.89
Depth to water (ft): 75.29	16.00	4.0	10.9	72	1052	6.90
Column length (ft): 6.06						
Column volume (gal) 3.96						
Total volume purged (gal): 16.00						

### Miscellaneous

Purge Method: PVC BAILER

Sampling Method: DISP. BAILER

Analysis Requested: Dissolved metals, CL, FL, NO3, SO4, COD, Cyanide, Phenols, TOC, TDS, pH, Conductivity

Weather Conditions: HAZY, 59°

Sample Description: SLIGHTLY SILTY, TANNING, NO ODOR

Remarks:

Sampler: CMH

Time Sample Collected: 10:05

Leggette, Brashears & Graham, Inc.  
1210 West County Road E  
St. Paul, Minnesota 55112

## GROUND-WATER SAMPLING DATA SHEET

Client Code: 6SARBT

Project Title: DEZURIK LANDFILL LAGOON #3

Job Code: DESHWL

Address: 12TH ST N

Date: 10-23-01

City, State, Zip: SARTELL, MN.

**General Data**

**Stabilization Data**

General Data	Volume (gallons)	Well Volume	Temp (C)	ORP (mV)	SC (uS)	pH
Location ID: P-9R	6.00	1.0	10.6	35	866	7.34
Key Number: <sup>MASTER</sup> 106013	11.00	2.0	10.5	84	885	7.33
Casing Diameter (in): 4"	16.00	3.0	10.5	72	893	7.35
Well Depth (ft): 86.20 TOTOC						
Depth to water (ft): 78.46						
Column length (ft): 7.74						
Column volume (gal): 5.05						
Total volume purged (gal): 16.00						

**Miscellaneous**

Purge Method: fvc BAILER

Sampling Method: DISP. BAILER

Analysis Requested: Dissolved metals, CL, FL, NO3, SO4, COD, Cyanide, Phenols, TOC, TDS, pH, Conductivity

Weather Conditions: CLEAR. 62°

Sample Description: CLEAR. NO ODOR

Remarks:

Sampler: CMH

Time Sample Collected: 10:59

**Leggette, Brashears & Graham, Inc.**  
 1210 West County Road E  
 St. Paul, Minnesota 55112

## GROUND-WATER SAMPLING DATA SHEET

Client Code: <b>6SARBT</b>	Project Title: <b>DEZURIK LANDFILL LAGOON #3</b>
Job Code: <b>DESHWL</b>	Address: <b>12TH ST N</b>
Date: <b>10-23-01</b>	City, State, Zip: <b>SARTELL, MN.</b>

General Data	Stabilization Data					
Location ID:	Volume (gallons)	Well Volume	Temp (C)	ORP (mV)	SC (uS)	pH
<b>P-12R</b>						
Key Number: <b>MASTER 106013</b>	<b>7.00</b>	<b>1.0</b>	<b>10.4</b>	<b>22</b>	<b>818</b>	<b>7.26</b>
Casing Diameter (in): <b>4"</b>	<b>13.00</b>	<b>2.0</b>	<b>10.4</b>	<b>34</b>	<b>811</b>	<b>7.30</b>
Well Depth (ft): <b>86.80 TO TOC</b>	<b>19.00</b>	<b>3.0</b>	<b>10.4</b>	<b>111</b>	<b>812</b>	<b>7.30</b>
Depth to water (ft): <b>77.54</b>						
Column length (ft): <b>9.26</b>						
Column volume (gal): <b>6.05</b>						
Total volume purged (gal): <b>19.00</b>						

### Miscellaneous

Purge Method: <b>PVC BAILER</b>
Sampling Method: <b>DISP. BAILER</b>
Analysis Requested: <b>Dissolved metals, CL, FL, NO3, SO4, COD, Cyanide, Phenols, TOC, TDS, pH, Conductivity</b>
Weather Conditions: <b>CLEAR 63°</b>
Sample Description: <b>SUBMITLY SUMP, TAN TINT, NO ODOM</b>
Remarks:
Sampler: <b>CMH</b>
Time Sample Collected: <b>12:12</b>

**Leggette, Brashears & Graham, Inc.**  
 1210 West County Road E  
 St. Paul, Minnesota 55112

## GROUND-WATER SAMPLING DATA SHEET

Client Code: 6SARBT	Project Title: DEZURIK LANDFILL LAGOON #3
Job Code: DESHWL	Address: 12TH ST N
Date: 10-23-01	City, State, Zip: SARTELL, MN.

General Data	Stabilization Data					
Location ID:	Volume (gallons)	Well Volume	Temp (C)	ORP (mV)	SC (uS)	pH
P-13	6.00	1.0	10.4	55	744	6.81
Key Number: <sup>MMSITE</sup> 106013	11.00	2.0	10.4	33	718	6.81
Casing Diameter (in): 4"	16.00	3.0	10.4	46	716	6.78
Well Depth (ft): 86.90 TO TOP						
Depth to water (ft): 78.94						
Column length (ft): 7.96						
Column volume (gal): 5.20						
Total volume purged (gal): 16.00						

### Miscellaneous

Purge Method: PUC BAILER
Sampling Method: DISP. BAILER
Analysis Requested: Dissolved metals, CL, FL, NO3, SO4, COD, Cyanide, Phenols, TOC, TDS, pH, Conductivity
Weather Conditions: HAZY, 53°
Sample Description: SLIGHTLY SILTY TAN TINT NO ODOUR
Remarks: DUPLICATE SAMPLE COLLECTED @ 12:40

Sampler: CMH	Time Sample Collected: 9:03
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**Leggette, Brashears & Graham, Inc.**  
 1210 West County Road E  
 St. Paul, Minnesota 55112



# CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: \_\_\_\_\_ Cust. No.: \_\_\_\_\_  
 Login Date: \_\_\_\_\_ Custody Seal: Yes/No  
 Shipped by: \_\_\_\_\_ Intact: Yes/No  
 Shipping Bill #: \_\_\_\_\_ Signature Match?: Yes/No  
 Sample temp: \_\_\_\_\_ °C If no - Reason: \_\_\_\_\_

**For Lab Use Only**  
 HELENA, MT  
 P.O. Box 5688 (59604)    Voice: 877-472-0711    Wats: 877-472-0711    888-672-1225  
 2704 Billings Ave. (59601)    Voice/Fax: 406-442-0711    Fax: 605-342-1225

BILLINGS, MT    800-735-4489    wats: 800-735-4489    P.O. Box 30916 (59107)    voice: 406-252-6325    1120 South 27th (59101)    Fax: 406-252-6069

CASPER, WY    888-235-0515    wats: 888-235-0515    P.O. Box 3258 (82602)    voice: 307-235-0515    2393 Salt Creek Highway (82601)    Fax: 307-234-1639

GILLETTE, WY    307-686-7175    voice: 307-686-7175    1105 West First Street (82716)    Fax: 307-682-4625

RAPID CITY, SD    P.O. Box 2470 (57709)    wats: 888-672-1225    610 Farmwood (57701)    voice: 605-342-1225    Fax: 605-342-1397

Project Name / Address	Analysis Requested	Sample Type: A W S U O	number of containers	Air Water Soils/Solids Vegetation Urine Other	Comments, Special Instructions, etc.
DEZURIK LANDFILL   SARTZEL, MN	DISOLVED METALS				
	CHANGE METALS				
	COD/PHENOLS				
	TOC				
	ELF, NOL, SO4				
	TPS, PH, CONDUCTIVITY				

Lab No.	DATE	TIME	Invoice to:	Report to:	Received by: (signature)	Date	Relinquished (signature)	Time	Received for Laboratory by: (signature)
	10/23/01	9:03		TIM KEULON L36 1113 EAST 14th ST. SILVER FALLS, SD 57104 SAMPLE ID.					
		10:05		P-13					
		10:59		P-5R					
		12:12		P-9R					
		12:40		P-12R					
				DUPLICATE					

1. Relinquished (signature) \_\_\_\_\_ Date 10/27/01 1730  
 Received by: (signature) \_\_\_\_\_  
 Relinquished (signature) \_\_\_\_\_ Date \_\_\_\_\_  
 Received for Laboratory by: (signature) \_\_\_\_\_



**APPENDIX II**

**Methods**

## METHODOLOGIES

### Monitor-Well Development

The monitor wells are developed by surging with dedicated stainless-steel bailers or by hand pumping until the discharge is relatively sediment free.

### Ground-Water Monitoring

Fluid-level elevations are measured to the nearest 0.01 foot using the top of well casing as a reference point with a steel tape, an electronic water-level indicator or an interphase probe. Prior to insertion into each monitor well, the measuring device is cleaned with alcohol and rinsed with distilled water. The steel tapes are accurate to approximately  $\pm 0.01$  foot. The electronic water-level indicator manufacturer's reported accuracy is  $\pm 0.04$  foot. The interphase probe has a manufacturer's reported accuracy of approximately  $\pm 0.01$  foot.

### Ground-Water Sampling

The monitor wells are sampled in order from the suspected cleanest to the suspected most contaminated. Wells containing measurable accumulations of free-phase product are not sampled. The sampling procedure is as follows.

- The fluid level in the well is measured to the nearest 0.01 foot as described in the ground-water monitoring section above.
- The well volume is calculated.
- A minimum of three standing well volumes are purged from the well. During purging, the temperature, pH and conductivity of each successive well volume removed is recorded. After 3 successive similar readings are obtained for these parameters, indicating stabilization, the ground-water sample is collected.
- The water is purged with and the sample is collected with either a dedicated stainless steel bailer or a dedicated disposable polyethylene bailer. Samples for volatile analyses are collected first, followed by any other required parameters. A minimum of one field blank is collected per sampling day by pouring distilled water or deionized water into the bailer prior to use in a well as a quality control procedure.

- All data are recorded on field sampling sheets and chain of custody forms. Samples are transported to a laboratory following appropriate documentation, preservation and chain of custody procedures.

### Laboratory Analyses

The soil and/or ground-water samples are placed in clean jars supplied by the laboratory, preserved in an ice-filled cooler and shipped along with a chain of custody form via overnight courier to the laboratory. The samples are analyzed for total petroleum hydrocarbons and benzene, toluene, ethylbenzene, xylenes and methyl tertiary butyl ether by the USGS/California (modified 8015 method) or an equivalent method acceptable to the DENR.

**APPENDIX III**

**Laboratory Analytical Report**

JAN - 7 2002

REVISED LABORATORY ANALYSIS REPORT

Leggette, Brashears & Graham  
 Tim Kenyon  
 1113 East 14th Street  
 Sioux Falls, SD 57104

Project ID: DEZURIK LANDFILL  
 Sample ID: P-13  
 Laboratory ID: 01-23807-1  
 Sample Matrix: Water  
 Sample Date: 23-Oct-01 0903  
 Received at Lab: 24-Oct-01 1055

Reported: 12-Dec-01

P-13 / 01-23807-1

Constituent	Results	Units	Qual	Reporting		Regulatory		Method	Analyzed
				Limit	Limit	Limit	Limit		

INORGANIC ANALYSIS

Carbon, Total Organic (TOC)	2.3 mg/L		C	2		EPA 415.2		30-Oct-01 1006	JL
Chloride	27 mg/L			1		SM 4500CL		05-Nov-01 0900	BB
Conductivity @ 25 C	777 umhos/cm			1		EPA 160.1		24-Oct-01 1600	JEM
Cyanide, Total	<0.005 mg/L			0.005		EPA 335.4		26-Oct-01 1100	JEM
Fluoride	<0.1 mg/L			0.1		SM 4500-F- C		02-Nov-01 1400	BB
Oxygen Demand, Chemical (COD)	104 mg/L		C	5		EPA 410.4		30-Oct-01 1418	LR
pH	7.14 su			0.01		EPA 150.1		24-Oct-01 1300	JEM
Phenols, Total	0.02 mg/L		C	0.01		EPA 420.2		01-Nov-01 1411	JL
Sodium	5 mg/L			1		EPA 200.7		03-Dec-01 1145	E.D.
Solids, Total Dissolved (TDS)	430 mg/L			5		SM 2540 C		29-Oct-01 0915	LMT
Sulfate	36 mg/L		D2	1		SM 4500E		02-Nov-01 0830	DK

NUTRIENT ANALYSIS

Nitrate as N	5.21 mg/L		D10	0.05		EPA 353.2		01-Nov-01 1106	BB
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TRACE METALS ANALYSIS

Dissolved Metals Analyses

Arsenic, Dissolved	<0.005 mg/L			0.005		EPA 206.2		12-Nov-01 1505	ED
Barium, Dissolved	0.038 mg/L			0.005		EPA 200.7		01-Nov-01 1724	ED
Boron, Dissolved	0.05 mg/L			0.005		EPA 200.7		01-Nov-01 1724	ED
Cadmium, Dissolved	<0.0005 mg/L			0.0005		EPA 213.2		10-Dec-01 1430	ED
Calcium, Dissolved	114 mg/L			1		EPA 200.7		03-Dec-01 1145	ED
Chromium, Dissolved	<0.01 mg/L			0.01		EPA 200.7		01-Nov-01 1724	ED
Iron, Dissolved	0.08 mg/L			0.01		EPA 200.7		01-Nov-01 1724	ED
Lead, Dissolved	<0.002 mg/L			0.002		EPA 239.2		10-Dec-01 1400	ED
Magnesium, Dissolved	28 mg/L			1		EPA 200.7		03-Dec-01 1145	ED
Manganese, Dissolved	0.01 mg/L			0.005		EPA 200.7		01-Nov-01 1724	ED
Selenium, Dissolved	<0.005 mg/L			0.005		EPA 270.2		12-Nov-01 1400	ED
Zinc, Dissolved	0.010 mg/L			0.005		EPA 200.7		01-Nov-01 1724	ED

D2: Reported result reflects a dilution of 2x to quantitate within calibration range or to eliminate matrix interferences.

D10: Reported result reflects a dilution of 10x to quantitate within calibration range or to eliminate matrix interferences.

(C) Analysis performed at Energy Laboratories, Inc., Casper, Wyoming.



**REVISED LABORATORY ANALYSIS REPORT**

Leggette, Brashears & Graham  
 Tim Kenyon  
 1113 East 14th Street  
 Sioux Falls, SD 57104

Project ID: DEZURIK LANDFILL  
 Sample ID: P-5R  
 Laboratory ID: 01-23807-2  
 Sample Matrix: Water  
 Sample Date: 23-Oct-01 1005  
 Received at Lab: 24-Oct-01 1055

Reported: 12-Dec-01

P-5R / 01-23807-2

Constituent	Results	Units	Qual	Reporting		Regulatory		Analyzed
				Limit	Limit	Method	Method	

**INORGANIC ANALYSIS**

Carbon, Total Organic (TOC)	1.8 mg/L		C	2		EPA 415.2	30-Oct-01 1006	JL
Chloride	37 mg/L			1		SM 4500CL	05-Nov-01 0900	BB
Conductivity @ 25 C	1,160 umhos/cm			1		EPA 160.1	24-Oct-01 1600	JEM
Cyanide, Total	<0.005 mg/L			0.005		EPA 335.4	26-Oct-01 1100	JEM
Fluoride	<0.1 mg/L			0.1		SM 4500-F- C	02-Nov-01 1400	BB
Oxygen Demand, Chemical (COD)	80 mg/L		C	5		EPA 410.4	30-Oct-01 1418	LR
pH	7.09 su			0.01		EPA 150.1	24-Oct-01 1300	JEM
Phenols, Total	<0.01 mg/L		C	0.01		EPA 420.2	01-Nov-01 1411	JL
Sodium	28 mg/L			1		EPA 200.7	03-Dec-01 1148	E.D.
Solids, Total Dissolved (TDS)	710 mg/L			5		SM 2540 C	29-Oct-01 0915	LMT
Sulfate	160 mg/L		D6	1		SM 4500E	02-Nov-01 0830	DK

**NUTRIENT ANALYSIS**

Nitrate as N	5.78 mg/L		D10	0.05		EPA 353.2	01-Nov-01 1106	BB
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**TRACE METALS ANALYSIS**

**Dissolved Metals Analyses**

Arsenic, Dissolved	<0.005 mg/L			0.005		EPA 206.2	12-Nov-01 1511	ED
Barium, Dissolved	0.049 mg/L			0.005		EPA 200.7	01-Nov-01 1727	ED
Boron, Dissolved	1.01 mg/L			0.005		EPA 200.7	01-Nov-01 1727	ED
Cadmium, Dissolved	<0.0005 mg/L			0.0005		EPA 213.2	10-Dec-01 1435	ED
Calcium, Dissolved	159 mg/L			1		EPA 200.7	03-Dec-01 1148	ED
Chromium, Dissolved	<0.01 mg/L			0.01		EPA 200.7	01-Nov-01 1727	ED
Iron, Dissolved	0.08 mg/L			0.01		EPA 200.7	01-Nov-01 1727	ED
Lead, Dissolved	<0.002 mg/L			0.002		EPA 239.2	10-Dec-01 1407	ED
Magnesium, Dissolved	47 mg/L			1		EPA 200.7	03-Dec-01 1148	ED
Manganese, Dissolved	<0.005 mg/L			0.005		EPA 200.7	01-Nov-01 1727	ED
Selenium, Dissolved	<0.005 mg/L			0.005		EPA 270.2	12-Nov-01 1410	ED
Zinc, Dissolved	0.010 mg/L			0.005		EPA 200.7	01-Nov-01 1727	ED

D6: Reported result reflects a dilution of 6x to quantitate within calibration range or to eliminate matrix interferences.

D10: Reported result reflects a dilution of 10x to quantitate within calibration range or to eliminate matrix interferences.

(C) Analysis performed at Energy Laboratories, Inc., Casper, Wyoming.



**REVISED LABORATORY ANALYSIS REPORT**

Leggette, Brashears & Graham  
 Tim Kenyon  
 1113 East 14th Street  
 Sioux Falls, SD 57104

**Project ID:** DEZURIK LANDFILL  
**Sample ID:** P-9R  
**Laboratory ID:** 01-23807-3  
**Sample Matrix:** Water  
**Sample Date:** 23-Oct-01 1059  
**Received at Lab:** 24-Oct-01 1055

**Reported:** 12-Dec-01

P-9R / 01-23807-3

Constituent	Results	Units	Qual	Reporting	Regulatory	Method	Analyzed
				Limit	Limit		

**INORGANIC ANALYSIS**

Carbon, Total Organic (TOC)	3.8 mg/L		C	2		EPA 415.2	30-Oct-01 1006 JL
Chloride	36 mg/L			1		SM 4500CL	05-Nov-01 0900 BB
Conductivity @ 25 C	1,010 umhos/cm			1		EPA 160.1	24-Oct-01 1600 JEM
Cyanide, Total	<0.005 mg/L			0.005		EPA 335.4	26-Oct-01 1100 JEM
Fluoride	<0.1 mg/L			0.1		SM 4500-F- C	02-Nov-01 1400 BB
Oxygen Demand, Chemical (COD)	18 mg/L		C	5		EPA 410.4	30-Oct-01 1418 LR
pH	7.21 su			0.01		EPA 150.1	24-Oct-01 1300 JEM
Phenols, Total	0.02 mg/L		C	0.01		EPA 420.2	01-Nov-01 1411 JL
Sodium	10 mg/L			1		EPA 200.7	03-Dec-01 1151 E.D.
Solids, Total Dissolved (TDS)	600 mg/L			5		SM 2540 C	29-Oct-01 0915 LMT
Sulfate	107 mg/L		D4	1		SM 4500E	02-Nov-01 0830 DK

**NUTRIENT ANALYSIS**

Nitrate as N	5.74 mg/L		D10	0.05		EPA 353.2	01-Nov-01 1106 BB
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**TRACE METALS ANALYSIS**

**Dissolved Metals Analyses**

Arsenic, Dissolved	<0.005 mg/L			0.005		EPA 206.2	12-Nov-01 1517 ED
Barium, Dissolved	0.07 mg/L			0.005		EPA 200.7	01-Nov-01 1731 ED
Boron, Dissolved	0.05 mg/L			0.005		EPA 200.7	01-Nov-01 1731 ED
Cadmium, Dissolved	<0.0005 mg/L			0.0005		EPA 213.2	10-Dec-01 1440 ED
Calcium, Dissolved	144 mg/L			1		EPA 200.7	03-Dec-01 1151 ED
Chromium, Dissolved	<0.01 mg/L			0.01		EPA 200.7	01-Nov-01 1731 ED
Iron, Dissolved	0.096 mg/L			0.01		EPA 200.7	01-Nov-01 1731 ED
Lead, Dissolved	<0.002 mg/L			0.002		EPA 239.2	10-Dec-01 1415 ED
Magnesium, Dissolved	41 mg/L			1		EPA 200.7	03-Dec-01 1151 ED
Manganese, Dissolved	0.03 mg/L			0.005		EPA 200.7	01-Nov-01 1731 ED
Selenium, Dissolved	<0.005 mg/L			0.005		EPA 270.2	12-Nov-01 1420 ED
Zinc, Dissolved	0.010 mg/L			0.005		EPA 200.7	01-Nov-01 1731 ED

D4: Reported result reflects a dilution of 4x to quantitate within calibration range or to eliminate matrix interferences.

D10: Reported result reflects a dilution of 10x to quantitate within calibration range or to eliminate matrix interferences.

(C) Analysis performed at Energy Laboratories, Inc., Casper, Wyoming.



**REVISED LABORATORY ANALYSIS REPORT**

**Leggette, Brashears & Graham**  
**Tim Kenyon**  
 1113 East 14th Street  
 Sioux Falls, SD 57104

**Project ID: DEZURIK LANDFILL**  
**Sample ID: P-12R**  
**Laboratory ID: 01-23807-4**  
**Sample Matrix: Water**  
**Sample Date: 23-Oct-01 1212**  
**Received at Lab: 24-Oct-01 1055**

**Reported: 12-Dec-01**

**P-12R / 01-23807-4**

Constituent	Results	Units	Qual	Reporting		Regulatory		Method	Analyzed
				Limit	Limit	Limit	Limit		
<b>INORGANIC ANALYSIS</b>									
Carbon, Total Organic (TOC)	1.8 mg/L		C	2		EPA 415.2		30-Oct-01 1006	JL
Chloride	24 mg/L			1		SM 4500CL		05-Nov-01 1055	BB
Conductivity @ 25 C	902 umhos/cm			1		EPA 160.1		24-Oct-01 1600	JEM
Cyanide, Total	<0.005 mg/L			0.005		EPA 335.4		26-Oct-01 1100	JEM
Fluoride	<0.1 mg/L			0.1		SM 4500-F- C		02-Nov-01 1400	BB
Oxygen Demand, Chemical (COD)	23 mg/L		C	5		EPA 410.4		30-Oct-01 1418	LR
pH	7.29 su			0.01		EPA 150.1		24-Oct-01 1300	JEM
Phenols, Total	0.02 mg/L		C	0.01		EPA 420.2		01-Nov-01 1411	JL
Sodium	23 mg/L			1		EPA 200.7		03-Dec-01 1154	E.D.
Solids, Total Dissolved (TDS)	510 mg/L			5		SM 2540 C		29-Oct-01 0915	LMT
Sulfate	82 mg/L		D3	1		SM 4500E		02-Nov-01 0830	DK
<b>NUTRIENT ANALYSIS</b>									
Nitrate as N	5.04 mg/L		D10	0.05		EPA 353.2		01-Nov-01 1106	BB
<b>TRACE METALS ANALYSIS</b>									
<b>Dissolved Metals Analyses</b>									
Arsenic, Dissolved	<0.005 mg/L			0.005		EPA 206.2		12-Nov-01 1523	ED
Barium, Dissolved	0.037 mg/L			0.005		EPA 200.7		01-Nov-01 1734	ED
Boron, Dissolved	0.07 mg/L			0.005		EPA 200.7		01-Nov-01 1734	ED
Cadmium, Dissolved	<0.0005 mg/L			0.0005		EPA 213.2		10-Dec-01 1445	ED
Calcium, Dissolved	128 mg/L			1		EPA 200.7		03-Dec-01 1154	ED
Chromium, Dissolved	<0.01 mg/L			0.01		EPA 200.7		01-Nov-01 1734	ED
Iron, Dissolved	0.16 mg/L			0.01		EPA 200.7		01-Nov-01 1734	ED
Lead, Dissolved	<0.002 mg/L			0.002		EPA 239.2		10-Dec-01 1422	ED
Magnesium, Dissolved	32 mg/L			1		EPA 200.7		03-Dec-01 1154	ED
Manganese, Dissolved	0.02 mg/L			0.005		EPA 200.7		01-Nov-01 1734	ED
Selenium, Dissolved	<0.005 mg/L			0.005		EPA 270.2		12-Nov-01 1424	ED
Zinc, Dissolved	0.010 mg/L			0.005		EPA 200.7		01-Nov-01 1734	ED

D3: Reported result reflects a dilution of 3x to quantitate within calibration range or to eliminate matrix interferences.

D10: Reported result reflects a dilution of 10x to quantitate within calibration range or to eliminate matrix interferences.

(C) Analysis performed at Energy Laboratories, Inc., Casper, Wyoming.

**REVISED LABORATORY ANALYSIS REPORT**

Leggette, Brashears & Graham  
 Tim Kenyon  
 1113 East 14th Street  
 Sioux Falls, SD 57104

Project ID: DEZURIK LANDFILL  
 Sample ID: DUPLICATE  
 Laboratory ID: 01-23807-5  
 Sample Matrix: Water  
 Sample Date: 23-Oct-01 1240  
 Received at Lab: 24-Oct-01 1055

Reported: 12-Dec-01

DUPLICATE / 01-23807-5

Constituent	Results	Units	Qual	Reporting	Regulatory	Method	Analyzed
				Limit	Limit		

**INORGANIC ANALYSIS**

Carbon, Total Organic (TOC)	0.9 mg/L		C	2		EPA 415.2	30-Oct-01 1006 JL
Chloride	29 mg/L			1		SM 4500CL	05-Nov-01 1055 BB
Conductivity @ 25 C	764 umhos/cm			1		EPA 160.1	24-Oct-01 1600 JEM
Cyanide, Total	<0.005 mg/L			0.005		EPA 335.4	26-Oct-01 1100 JEM
Fluoride	<0.1 mg/L			0.1		SM 4500-F- C	02-Nov-01 1400 BB
Oxygen Demand, Chemical (COD)	32 mg/L		C	5		EPA 410.4	30-Oct-01 1418 LR
pH	7.36 su			0.01		EPA 150.1	24-Oct-01 1300 JEM
Phenols, Total	<0.01 mg/L		C	0.01		EPA 420.2	01-Nov-01 1411 JL
Sodium	5 mg/L			1		EPA 200.7	03-Dec-01 1340 E.D.
Solids, Total Dissolved (TDS)	410 mg/L			5		SM 2540 C	29-Oct-01 0915 LMT
Sulfate	35 mg/L		D2	1		SM 4500E	02-Nov-01 0830 DK

**NUTRIENT ANALYSIS**

Nitrate as N	5.18 mg/L		D10	0.05		EPA 353.2	01-Nov-01 1106 BB
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**TRACE METALS ANALYSIS**

**Dissolved Metals Analyses**

Arsenic, Dissolved	<0.005 mg/L			0.005		EPA 206.2	12-Nov-01 1530 ED
Barium, Dissolved	0.037 mg/L			0.005		EPA 200.7	01-Nov-01 1737 ED
Boron, Dissolved	0.03 mg/L			0.005		EPA 200.7	01-Nov-01 1737 ED
Cadmium, Dissolved	<0.0005 mg/L			0.0005		EPA 213.2	10-Dec-01 1450 ED
Calcium, Dissolved	114 mg/L			1		EPA 200.7	03-Dec-01 1340 ED
Chromium, Dissolved	<0.01 mg/L			0.01		EPA 200.7	01-Nov-01 1737 ED
Iron, Dissolved	0.07 mg/L			0.01		EPA 200.7	01-Nov-01 1737 ED
Lead, Dissolved	<0.002 mg/L			0.002		EPA 239.2	10-Dec-01 1430 ED
Magnesium, Dissolved	28 mg/L			1		EPA 200.7	03-Dec-01 1340 ED
Manganese, Dissolved	<0.005 mg/L			0.005		EPA 200.7	01-Nov-01 1737 ED
Selenium, Dissolved	<0.005 mg/L			0.005		EPA 270.2	12-Nov-01 1430 ED
Zinc, Dissolved	0.010 mg/L			0.005		EPA 200.7	01-Nov-01 1737 ED

D2: Reported result reflects a dilution of 2x to quantitate within calibration range or to eliminate matrix interferences.

D10: Reported result reflects a dilution of 10x to quantitate within calibration range or to eliminate matrix interferences.

(C) Analysis performed at Energy Laboratories, Inc., Casper, Wyoming.

L.J. Hansen   
 Laboratory Director



### Quality Assurance Data

Parameter	Original	Duplicate	Spike Result (%Rec)	Blank Result	Calibration Verification	Acceptance Range	Date Analyzed	Analysts Initials
Ca,TR	144	144	10600%	<1	57	46.8 - 62.0	1-Nov-2001	ED
K,TR	3.45	3.48	9500%	<1	16.4	13.8 - 19.4	1-Nov-2001	ED
Mg,TR	41	41	93	<1	9.69	8.32 - 11.0	1-Nov-2001	ED
Na,TR	10.0	10.1	101	<1	41.5	36.3 - 47.5	1-Nov-2001	ED
As,D	<0.005	<0.005	101	<0.005	0.0105	0.009 - 0.011	12-Nov-2001	ED
B,D	0	0.0181	99.1	<0.01	0.973	0.90 - 1.10	1-Nov-2001	ED
Ba,D	0.0576	0.0563	105.7	<0.01	1.003	0.90 - 1.10	1-Nov-2001	ED
Cd,D	<0.0005	<0.0005	92	<0.0005	0.0012	0.0011 - 0.0014	10-Dec-2001	ED
Cr,D	<0.01	<0.01	9832%	<0.01	0.9682	0.90 - 1.10	1-Nov-2001	ED
Fe,D	0.4941	0.4683	10300%	<0.03	1.026	0.90 - 1.10	1-Nov-2001	ED
Mn,D	<0.01	<0.01	95.44	<0.01	0.9721	0.90 - 1.10	1-Nov-2001	ED
Pb,D	<0.002	<0.002	101	<0.002	0.0103	0.009 - 0.011	10-Dec-2001	ED
Se,D	<0.005	<0.005	102	<0.005	0.015	0.013 - 0.017	12-Nov-2001	ED
Zn,D	<0.005	<0.005	104.74	<0.005	0.9517	0.90 - 1.10	1-Nov-2001	ED
SC	777	778	NA	<1	254	232 - 280	24-Oct-2001	JEM
pH	7.14	7.15	NA	NA	8.99	8.79 - 9.19	24-Oct-2001	JEM
TDS	432	434	na	<5	190	153-217	29-Oct-2001	LMT
F	1.0	1.1	99	<0.1	1.55	1.31 - 1.95	2-Nov-2001	BB
NO3	0.26	0.26	107	<0.05	15.9	14.7 - 18.4	1-Nov-2001	BB
SO4	32	32	96	<1	17	13.1 - 19.5	2-Nov-2001	DK
CL	13	13	108	<1	39	34.0 - 42.8	5-Nov-2001	BB
CN-T	<0.005	<0.005	99	<0.005	0.365	0.248 - .432	30-Oct-2001	JEM