REPORT

Post-Closure Operating License Renewal Application

Granger MID 082 771 700 Landfill

Submitted to:

Granger Land Development

Lansing, MI

Submitted by:

Golder Associates Inc.

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Distribution List

Michigan Department of Environment, Great Lakes, and Energy - Materials Management Division

Granger Land Development Company

Golder Associates USA Inc.

Michigan Department of Environment, Great Lakes, and Energy
Materials Management Division

OPERATING LICENSE APPLICATION FORM FOR HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

Required under authority of Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Failure to submit this information may result in civil or criminal penalties.

Note: Copies of the current EGLE Site Identification Form, EQP 5150, and the EPA Part A Permit Application Form, 8700-23, must be submitted with this application.

I. FACILITY SITE ID NUMBER	MID 082771700							
II. FACILITY'S LEGAL OWNER								
A. Name	Watertown Development Corporation							
B. Street or P.O. Box	16980 Wood Road, P.O. Box 27185							
C. City/State/ZIP	Lansing, MI 48909							
D. Telephone Number (area code included)	517-372-2800							
E. Owner Type	P	F. Ownership Change?	Y		N	X	N/A	Date
III. FACILITY OPERATOR								
A. Name	Granger Land Development Company							
B. Street or P.O. Box	8550 West Grand River Avenue							
C. City/State/ZIP	Grand Ledge, MI 48837							
D. Telephone Number (area code included)	517-372-2800							
E. Operator Type	P	F. Operator Change?	Y		N	X	N/A	Date
IV. TITLEHOLDER OF LAND								
A. Name	Watertown Development Corporation							
B. Street or P.O. Box	16980 Wood Road, P.O. Box 27185							
C. City/State/ZIP	Lansing, MI 48909							
D. Telephone Number (area coded included)	517-372-2800							

V. OPERATING LICENSE APPLICATION		
Place an "X" in the appropriate box under either A or B (select only one box)		
A. Operating License Application		
☐	First Application for *Existing Facility	Place an "X" here if application is for a facility that has not been previously licensed in Michigan to treat, store, or dispose of hazardous waste and has interim status pursuant to 40 CFR §270.70.
☒	Renewal Application for *Existing Facility	Place an "X" here if renewal application for a facility that was previously licensed in Michigan to treat, store, or dispose hazardous waste and whose hazardous waste operations have not had any new construction or been altered, enlarged, or expanded.
☐	Application for Modification of License	Place an "X" here if application is for a license modification.
☐	First Application for Research, Development, and Demonstration (RDD) License	Place an "X" here if application for a temporary license for RDD.
☐	Renewal Application for RDD License	Place an "X" here if application for the renewal of a temporary license for RDD.
B. Operating License Application for New, Altered, Enlarged, or Expanded Facility		
☐	First Application	Place an "X" here if application is for a new facility or a facility that wishes to alter, enlarge, or expand its hazardous waste operations.

For existing facilities, provide date operation began.	Date	1970
For RDD activities, provide the date RDD began or expected to begin.	Date	
For new, altered, enlarged, or expanded facilities, provide date expected construction to begin.	Date	

***Existing Facility** means a hazardous waste treatment, storage, or disposal facility (TSDF) that either received all necessary state-issued environmental permits or licenses before January 1, 1980, or for which approval of construction was received from the Air Pollution Control Commission before November 19, 1980, or before promulgation of new federal rules that caused the facility to become subject to regulation as a TSDF. Existing facilities also include TSDFs that were operating before January 1, 1980, under existing authority, or before promulgation of new federal rules that caused the facility to become subject to regulation as a TSDF and that did not require state-issued environmental permits or licenses.

VI.	OPERATING LICENSE APPLICATION FEES		
☒	A. Operating License Application Fixed Fee		$ 500
☐	B. Additional License Application Fees for New, Altered, Enlarged, or Expanded Facility		$ 25,000
	Check Type of Facility		
☐	Land Disposal ($9,000)		$
☐	Incineration or Other Treatment ($7,200)		$
☐	Storage ($500)		$
Total Operating License Fee			$ 500

Note: Checks shall be made payable to the "State of Michigan" and the state accounting code "HWOL" written in the memo portion. Checks shall be mailed to EGLE, Cashier's Office, P.O. Box 30657, Lansing, Michigan 48909-8157, with a copy of payment included with application that is mailed to the EGLE, MMD, P.O. Box 30241, Lansing, Michigan 48909-7741.

VII.	EXISTING ENVIRONMENTAL PERMITS (attach copies of each as proof of issuance)	
☒	A. NPDES (Discharges to Surface Water) Permit Number	Stormwater General Permit Certificate of Coverage No. MIS410095
☐	B. UIC (Underground Injection of Fluids) Permit Number	
☐	C. RCRA (Hazardous Waste) Permit Number	
☐	D. PSD (Air Emissions From Proposed Sources) Permit Number	
☐	E. Other (Specify below) Permit Number	

VIII. NATURE OF BUSINESS (Provide a brief description)

Closed landfill that accepted hazardous waste from 1980 to 1983. Post-closure period began April 13, 1990.

IX. MAP

Attach to this application a topographic map of the area extending at least one mile beyond the property boundaries. The map must show the legal boundaries of the facility; the location of each of its existing and proposed intake and discharge structures; each of its hazardous waste treatment, storage, or disposal facilities, including the location of all processes listed in Items XII and XIII identified by process code; and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area, plus all drinking water wells within a quarter mile of the facility that are identified in the public record or otherwise known to you. (see instructions for specific requirements)

X. FACILITY DRAWING

All existing facilities must include a scale drawing of the facility showing the property boundaries of the facility; the areas occupied by treatment, storage, or disposal operations that will be used during interim status; the name of each operation (drum storage area, etc.); areas of past TSD operations; areas of future TSD; and the approximate dimensions of the property boundaries and all TSD areas. Where applicable, use the process codes listed in Items XII and XIII to indicate the location of all TSD. This drawing should fit on an 8.5 by 11 inch sheet of paper.

XI. PHOTOGRAPHS

All existing facilities must include photographs that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas. Use the process codes and descriptions in Items XII and XIII to indicate the location of all TSD areas. Indicate the date of the photograph on the back of each photograph. Photographs may be in color or black and white, aerial or ground-level.

XII. PROCESS CODES AND DESIGN CAPACITIES (see instructions)

Line Number	A. Process Code (from list)	B. Process Design Capacity		For Official Use Only	Line Number	A. Process Code (from list)	B. Process Design Capacity		For Official Use Only
		B.1. Quantity	B.2. Unit of Measure				B.1. Quantity	B.2. Unit of Measure	
1.	D80	4000	AC-FT		6.				
2.					7.				
3.					8.				
4.					9.				
5.					10.				

C. Additional Process Codes or Description of Nonlisted Processes (Codes "S99" and "T04").

XIII. DESCRIPTION OF HAZARDOUS WASTES

Line Number	A. Hazardous Waste Number (enter code)	B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Processes				
				D.1 Process Codes (enter code)				D.2 Process Description (if no code entered in D.1)

XIV. OTHER REQUIRED ATTACHMENTS

A. General Information (each item should be a separate attachment to the application)

1. General facility description
2. Chemical and physical analyses*
3. Waste Analysis Plan*
4. Security procedures and equipment
5. Inspection schedules*
6. Preparedness/prevention or waiver*
7. Contingency Plan*
8. Traffic information
9. Location information
10. Personnel training program*
11. Closure and Postclosure (C/PC) Plan*
12. C/PC cost estimates*
13. Topographic map
14. Liability mechanism
15. Financial assurance instrument

* Use template provided to complete application

B. Supplemental Information (each item, if needed, should be a separate attachment to the application)

1. Status of compliance with other federal laws
2. Corrective action information*
3. Hydrogeological Report*
4. Environmental Assessment*
5. Environmental monitoring Programs*
6. Engineering plans
7. Proof of issuance of other permits or licenses
8. Capability certification/compliance schedule
9. Restrictive covenant (landfills only)
10. Construction certification (new, altered, enlarged, or expanded)

* Use template provided to complete application

C. Facility Specific Information (each item, if needed, should be a separate attachment to the application)

1. Containers*
2. Tanks*
3. Incineration or thermal treatment
4. Treatment
5. Surface impoundments
6. Waste piles
7. Landfills
8. Land treatment
9. Miscellaneous units
10. Underground mines or caves
11. Drip pads
12. Boilers and industrial furnaces
13. Air emissions from process vents, equipment leaks, tanks, containers, and surface impoundments**

* Use template provided to complete application

** Use templates C.11-AA, C.11-BB, and C.11-CC provided to complete application

XV. CERTIFICATION		
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		
TIMOTHY KRAUSE	[signature]	12/28/2021
OWNER NAME (type or print)	SIGNATURE	DATE SIGNED
TIMOTHY KRAUSE	[signature]	12/28/2021
OPERATOR NAME (type or print)	SIGNATURE	DATE SIGNED
TIMOTHY KRAUSE	[signature]	12/28/2021
TITLEHOLDEROF LAND NAME (type or print)	SIGNATURE	DATE SIGNED

GRANGER WASTE SERVICES, INC.

DATE	INVOICE NO	DESCRIPTION	INVOICE AMOUNT	DEDUCTION	BALANCE
12-27-21	LICENSE APP		500.00	.00	500.00
CHECK DATE 12-28-21	CHECK NUMBER 178925	TOTAL >	500.00	.00	500.00

PLEASE DETACH AND RETAIN FOR YOUR RECORDS

156094 & 156095.ai

THIS CHECK HAS VARIOUS SECURITY FEATURES INCLUDING COLORED BACKGROUND & WATERMARK

GRANGER

GRANGER WASTE SERVICES, INC.
P O BOX 27185
LANSING MI 48909
517-372-2800

FIFTH THIRD BANK
2501 COOLIDGE ROAD
EAST LANSING, MI 48823

74-005/724

178925

DATE 12/28/2021

Pay:**Five hundred dollars and no cents

$ ****500.00

TO THE ORDER OF

STATE OF MICHIGAN
EGLE
PO BOX 30657
LANSING, MI 48909

CHECK IS VOID AFTER 90 DAYS

⑈000178925⑈ ⑆072400052⑆7161671149⑈

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	508(1)(a)				FORM	Application form.		**Appplication**
324.11123(2)	504(1)(c)	511(1)	270.14(b)(22)		PRE-APPLICATION PUBLIC PARTICIPATION	Summary of pre-application public meeting.		**NA - post-closure operation**
324.11123(2), 324.11118(4)					DISCLOSURE	Disclosure statement revisions for first operating license after construction permit.		**NA - post-closure operation**
324.11123(2)	508(1)(h)				FEE	Operating license application fee of $500.00.		**Application**
Re	508(3)		270.11(d)		CERTIFICATION	Certification wording.		**Application**
324.11123(2)	508(3)		270.11(d)		CERTIFICATION	Certification signed by owner.		**Application**
324.11123(2)	508(3)		270.11(d)		CERTIFICATION	Certification signed by operator.		**Application**
324.11123(2)	508(3)		270.11(d)		CERTIFICATION	Certification signed by titleholder of land.		**Application**
324.11123(3)	508(1)(d)				CERTIFICATION OF CAPABILITY	PE certification that the facility was constructed according to approved plans in the construction permit, or that an existing facility is capable of managing hazardous waste in compliance with Part 111 of Act 451.		**NA - post-closure operation**
324.11123(2)	504(1)(d), 508(1)(b)	506			HYDROGEO	HYDROGEOLOGICAL REPORT		**Section 3**
324.11123(2)	504(1)(d), 506(1)(a), 508(1)(b)				HYDROGEO	Summary of GW monitoring data.		**Section 3.1 and Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(1)(b), 508(1)(b)				HYDROGEO	Identification of uppermost aquifer and aquifers hydraulically interconnected, flow direction and rate, and basis.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(1)(c), 508(1)(b)				HYDROGEO	Identification of aquifer used by public or private wells within 2,000 feet of site.		**Past Hydrogeological Investigations, Figure 1**
324.11123(2)	504(1)(d), 506(1)(d), 508(1)(b)				HYDROGEO	Identification of all other aquifers evidenced by available well or boring logs.		**Section 3**
324.11123(2)	504(1)(d), 506(1)(e)(i), 508(1)(b)		270.14(b)(19)		HYDROGEO	Delineation of waste management areas on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(e)(ii), 508(1)(b)				HYDROGEO	Delineation of property boundary on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(e)(iii), 508(1)(b)				HYDROGEO	Delineation of point of compliance on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(e)(iv), 508(1)(b)				HYDROGEO	Delineation of groundwater monitoring wells on Part B topographic map.		**Figure 3**
324.11123(2)	504(1)(d), 506(1)(e)(v), 508(1)(b)				HYDROGEO	Delineation of aquifers on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(f), 508(1)(b)				HYDROGEO	Identify all domestic, municipal, industrial, oil, and gas wells and soil borings within 1 mile of site on Part A topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(g)(i), 508(1)(b)				HYDROGEO	Delineation of any contaminant plume from unit on site on Part B topographic map.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(1)(g)(ii), 508(1)(b)				HYDROGEO	For land-based units, identification of the concentration of Appendix VIII constituents in contaminant plume.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(2), 508(1)(b)				HYDROGEO	GWM program or justification for waiver.		**Appendix F, Section 1.0**
324.11123(2)	504(1)(d), 506(2)(a)(i), 508(1)(b)				GWM ENG REPORT	At least 5 soil borings per first 5 acres and at least 3 per each additional 5 acres.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	Soil samples from each soil layer or change in lithology for each soil boring.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	2 of initial 5 (and 1 of each additional 3) borings evaluated and logged using continuous sampling methods.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	Soil test for particle size by both sieve and hydrometer.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(ii),508(1)(b)				GWM ENG REPORT	Soil test for Atterburg limits.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	Soil test for classification , USCS.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iii)(A), 508(1)(b)				GWM ENG REPORT	Evaluate each soil layer for moisture content.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iii)(B), 508(1)(b)				GWM ENG REPORT	Evaluate each soil layer for permeability.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(A), 508(1)(b)				GWM ENG REPORT	Soil boring logs include soil and rock descriptions.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(B), 508(1)(b)				GWM ENG REPORT	Soil boring logs include method of sampling.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(C), 508(1)(b)				GWM ENG REPORT	Soil boring logs include sample depth.		**Past Hydrogeological Investigations**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(d), 506(2)(a)(iv)(D), 508(1)(b)				GWM ENG REPORT	Soil boring logs include date of boring.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(E), 508(1)(b)				GWM ENG REPORT	Soil boring logs include water level measurements.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(F), 508(1)(b)				GWM ENG REPORT	Soil boring logs include soil test data.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(G), 508(1)(b)				GWM ENG REPORT	Soil boring logs include boring location.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(H), 508(1)(b)				GWM ENG REPORT	Soil boring logs include standard penetration number.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(v), 508(1)(b)				GWM ENG REPORT	Borings not converted to observation wells are properly abandoned and recorded.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(a)(vi), 508(1)(b)				GWM ENG REPORT	Elevations corrected to USGS datum.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(b), 508(1)(b)				GWM ENG REPORT	Static water level measurements from at least 3 observation wells and 1 cluster (land-based units with at least 3 clusters and at least 1 cluster well for each 20 acres)		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(c), 508(1)(b)				GWM ENG REPORT	Include water level contour map, interval not more than 1 foot.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(d), 508(1)(b)				GWM ENG REPORT	GW flow and net diagrams for more than 2 well clusters.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(e), 508(1)(b)				GWM ENG REPORT	Location and depth of all observation wells and evidence that they are effectively located.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(2)(f), 508(1)(b)				GWM ENG REPORT	Continuously sample, log, and classify lithology of each boring that is to be completed as an observation well.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(3)(a), 508(1)(b)	612		264.98(a)	DETECTION MONITORING	List of primary and secondary parameters and monitoring frequencies.		**Appendix F, Section 1**
324.11123(2)	504(1)(d), 506(3)(b), 508(1)(b)	612		264.98	DETECTION MONITORING	Proposed GW monitoring system.		**Appendix F, Section 1**
324.11123(2)	504(1)(d), 506(3)(c), 508(1)(b)	612, 611(2)(a)(xi)		264.97(g)	DETECTION MONITORING	Background or procedures to calculate background for primary and secondary parameters.		**Appendix F-3**
324.11123(2)	504(1)(d), 506(3)(d), 508(1)(b)	612		264.98	DETECTION MONITORING	Description of GW sampling, analysis, and statistical comparisons to evaluate data.		**Appendix F-2 and F-3**
324.11123(2)	504(1)(d), 506(3)(e), 508(1)(b)	612		264.98	DETECTION MONITORING	Procedures for preventing cross-contamination in wells.		**Appendix F-2**
324.11123(2)	504(1)(d), 506(3)(f), 508(1)(b)	612		264.98	DETECTION MONITORING	Evidence that sampling procedures and well construction materials are compatible with monitoring parameters.		**Appendix F-2**
324.11123(2)	504(1)(d), 506(4)(a), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Description of wastes previously managed at the site.		**Section 2.10**
324.11123(2)	504(1)(d), 506(4)(b), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Characterization of contaminated GW.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(4)(c), 508(1)(b)	612		264.97, 264.99	COMPLIANCE MONITORING	List of hazardous constituents for monitoring.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(4)(d), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Proposed concentration limits for each constituent.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(4)(e), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Detailed plans and engineering report describing GWM system.		**Purge System, Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(4)(f), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Description of sampling, analysis, and statistical comparison to evaluate GWM data.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(5)(a), 508(1)(b)				GW CORRECTIVE ACTION	Characterization of contaminated GW.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(5)(b), 508(1)(b)				GW CORRECTIVE ACTION	Concentration limits.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(5)(c), 508(1)(b)				GW CORRECTIVE ACTION	Detailed plans and engineering report of corrective action to be taken.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(5)(d), 508(1)(b)				GW CORRECTIVE ACTION	Description of how GWM program will demonstrate adequacy of CA.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(6), 508(1)(b)				HYDROGEO	Additional hydrogeological information for land-based units.		**Past Hydrogeological Investigations**
324.11123(2)	504(1)(f), 508(1)(b)	611			ENVIRONMENTAL MONITORING	ENVIRONMENTAL MONITORING PROGRAM		**Appendix F**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)			ENVIRONMENTAL MONITORING	SAP. Sampling and Analysis Plan for each environmental monitoring program		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(i)			ENVIRONMENTAL MONITORING	SAP. Sampling location map.		**Appendix F, Figure 1**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(ii)			ENVIRONMENTAL MONITORING	SAP. Sampling schedule.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(iii)			ENVIRONMENTAL MONITORING	SAP. Parameters to be analyzed.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(iv)			ENVIRONMENTAL MONITORING	SAP. Sampling equipment, well purging, and sample collection procedures.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(v)			ENVIRONMENTAL MONITORING	SAP. Field measured parameters.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(vi)			ENVIRONMENTAL MONITORING	SAP. Sample preservation and handling techniques.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(vii)			ENVIRONMENTAL MONITORING	SAP. Sampling analytical protocols.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(viii)			ENVIRONMENTAL MONITORING	SAP. Field and laboratory QA/QC.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(ix)			ENVIRONMENTAL MONITORING	SAP. Chain of custody procedures.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(x)			ENVIRONMENTAL MONITORING	SAP. Decontamination procedures.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(xi)			ENVIRONMENTAL MONITORING	SAP. Data analysis, including statistical method used.		**Appendix F-2 and F-3**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(b)			ENVIRONMENTAL MONITORING	Groundwater monitoring program per R 299.9612.		**Appendix F, Section 1**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(c)			ENVIRONMENTAL MONITORING	Ambient air monitoring program per Part 55 of Act 451.		**NA**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(d)			ENVIRONMENTAL MONITORING	Soil monitoring program.		**NA**
324.11123(2)	504(1)(e), 508(1)(b)				ENVIRONMENTAL ASSESSMENT	Environmental Assessment.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(a)		PART A	Description of activities that require a RCRA permit.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(b)		PART A	Address, location (including latitude and longitude).		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(c)		PART A	SIC codes.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(d)		PART A	Operator name, address, telephone, ownership status,...		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(e)		PART A	Owner name, address, telephone.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(f)		PART A	Is facility located in Indian lands?		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(g)		PART A	Indicate whether new or existing facility, first or revised application.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(h)		PART A	For existing facilities, scale drawing and photographs.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(i)		PART A	Process description and design capacity.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(j)		PART A	Specify hazardous wastes to be managed, and estimated annual quantities.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(k)		PART A	Identify all other environmental permits, applications, or approvals.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(l)		PART A	Topographic map extending one mile beyond property boundaries...		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(m)		PART A	Description of business.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(n)		PART A	For hazardous debris, description of debris and contaminant categories.		**NA - post-closure operation**
324.11123(2)	508(1)(f)				OTHER PERMITS	Proof of issuance of all other state environmental permits		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(1)		GENERAL	General facility description.		**Section 2.1**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(2)	264.13(a)(1)	C&P ANALYSIS	Chemical and physical analyses of hazardous waste and hazardous debris. Must have all information needed to treat, store, or dispose of the waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b) and (c)	WASTE ANALYSIS	WASTE ANALYSIS PLAN		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(1)	WASTE ANALYSIS	Specify the parameters for which each waste will be analyzed and the rationale for selection of these parameters.	Must be sufficient to comply with chemical and physical analysis requirements of 264.13(a).	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(2)	WASTE ANALYSIS	The test methods for each parameter analyzed.	Must be specified in R 299.9216.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(3)	WASTE ANALYSIS	The sampling method to obtain a representative sample of waste.	Must be described in Appendix I of Part 261 or be equivalent.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(4)	WASTE ANALYSIS	The frequency of review and reanalysis of wastes to ensure that the characterizations are accurate.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(5)	WASTE ANALYSIS	The waste analyses supplied by generators.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods to comply with 264.17.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods to ensure that no free liquids are disposed in a landfill per 264.314.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for incinerator waste feed analysis per 264.341.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for organic content measurement to comply with Subpart AA, 264.1034(d).		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for organic content measurement to comply with Subpart BB, 264.1063(d).		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for average VO measurement to comply with Subpart CC, 264.1083.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods to comply with LDRs, 268.7.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(8)(i)	WASTE ANALYSIS	Procedures and schedules for waste analysis to justify exemption from Subpart CC.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(8)(ii)	WASTE ANALYSIS	Notice and VO analysis from each off-site generator to justify exemption from Subpart CC.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(7)	WASTE ANALYSIS	Special requirements for surface impoundments exempt from LDRs.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(c)(1)	WASTE ANALYSIS	Procedures to determine the identity of each movement of off-site waste managed.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(c)(2)	WASTE ANALYSIS	Sampling method to obtain a representative sample of off-site waste when necessary to determine the identity of off-site waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(c)(3)	WASTE ANALYSIS	For landfills, the procedures to determine whether the off-site generator added sorbent to containerized waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(4)	264.14	SECURITY	Description of security procedures and equipment under 264.14.		**Section 2.2**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)	INSPECTION	General inspection schedule under 264.15(b).		**Section 2.3**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(3)	INSPECTION	Identify the types of problems which are to be looked for during the inspection.		**Section 2.3**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(4)	INSPECTION	Identify the frequency of inspection to comply with container management requirements in 264.174.		**NA - no containers, post-closure**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(d)	INSPECTION	Provisions for an inspection log and the information that will be recorded for each inspection and maintaining the records.		**Section 2.3**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(4)	INSPECTION	Identify the frequency of inspection to comply with tank management requirements in 264.193 and 264.195.		**NA - no tanks, post-closure**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(4), 264.1088	INSPECTION	Identify the frequency of inspection to comply with Subparts AA, BB, and CC air emission standards.		**NA - Section 2.3.2**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.51	CONTINGENCY PLAN	CONTINGENCY PLAN		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(a)	CONTINGENCY PLAN	Describe the actions of personnel to comply with 264.51 and 264.56.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(2)	270.14(b)(7)	264.52(a) 264.56(a)(2)	CONTINGENCY PLAN	Describe the actions of personnel to comply with 264.51 and 264.56.	Notify PEAS at 800-292-4706 if a release could threaten human health or the environment, or if it has reached surface water or groundwater.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(b)	CONTINGENCY PLAN	Incorporate SPCC plan if applicable.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(c)	CONTINGENCY PLAN	Describe arrangements with local authorities and emergency response teams per 264.37.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(d)	CONTINGENCY PLAN	List name, address, and phone of all emergency coordinators, or state that it will be provided in OL application.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	606(1), 607(1)	270.14(b)(7)	264.32, 264.52(e)	CONTINGENCY PLAN	List of all emergency and decon equipment, description, location, and capabilities.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(f)	CONTINGENCY PLAN	Evacuation plan for personnel, evacuation signals, routes.		**NA - post-closure operation**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(6)		PREPAREDNESS & PREVENTION	Justification of waiver of Subpart C preparedness and prevention requirements.		**Section 2.4**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(i)		PREPAREDNESS & PREVENTION	Description of measures to prevent hazards in unloading operations.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(ii)		PREPAREDNESS & PREVENTION	Description of measures to prevent runoff and flooding.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	604(1)(b)	270.14(b)(8)(ii)		PREPAREDNESS & PREVENTION	Description of measures to prevent runoff and flooding.	Runoff control for 24-hour, 100-year rainfall.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(iii)		PREPAREDNESS & PREVENTION	Description of measures to prevent contamination of water supplies.		**NA - post-closure operation**
324.11123(2)	504(2), 504(3), 508(1)(b)	604(1)(a), 614(1)(a), 615(1)	270.15(a), 270.16(g)	264.175(b)(4), 264.193(e)	PREPAREDNESS & PREVENTION		Run-on control for 24-hour, 25-year rainfall.	**NA - post-closure operation**
324.11123(2)	504(2), 504(3), 508(1)(b)	604(1)(c), 614(1)(a), 615(1)	270.15(a), 270.16(g)	264.31, 264.175(b), 264.193	PREPAREDNESS & PREVENTION		Prevent releases to soil, groundwater, surface water, drains, and sewers.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	606(1)	270.14(b)(8)(iv)	264.31	PREPAREDNESS & PREVENTION	Description of measures to mitigate effects of equipment failures and power outages.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(v)		PREPAREDNESS & PREVENTION	Description of measures to prevent undue exposure of personnel to hazardous waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	606(1)	270.14(b)(8)(vi)	264.31	PREPAREDNESS & PREVENTION	Description of measures to prevent releases to the atmosphere.	Minimize possibility of any unplanned sudden or nonsudden release to air.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(9)		PREPAREDNESS & PREVENTION	Description of measures to prevent accidental ignition or reaction of ignitable or incompatible wastes per 264.17, and documentation of compliance with 264.17(c).		**NA - post-closure operation**
324.11123(2)		606		264.35	PREPAREDNESS & PREVENTION		Adequate aisle space to allow unobstructed movement of personnel, emergency equipment, etc.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(10)		TRAFFIC	Traffic pattern, volume, control, access road description, traffic signals.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(11)(i)-(ii)		LOCATION	Compliance with seismic standard.		**Section 2.5**
324.11123(2)	504(1)(c), 508(1)(b)	603(4)	270.14(b)(11)(iii)-(iv)		LOCATION	Compliance with 100-year floodplain provisions.	Not located within a floodplain unless proper demonstrations are made.	**Section 2.5**
324.11123(2)		603(1)(1)			LOCATION		Not within 61 meters of a fault with displacement in Holocene time.	**NA - post-closure operation**
324.11123(2)		603(1)(b)			LOCATION		Not in a floodway designated under Part 31.	**NA - post-closure operation**
324.11123(2)		603(1)(c)			LOCATION		Not in a coastal high-risk area designated under the Shorelands Act.	**NA - post-closure operation**
324.11123(2)		603(1)(d)			LOCATION		Not over a sole-source aquifer or its recharge zone.	**NA - post-closure operation**
324.11123(2)		603(1)(e)			LOCATION		Not within the isolation distance from public water supplies specified in Act 399.	**NA - post-closure operation**
324.11123(2)		603(1)(f)		Vol. 8, Appendix 1.70-1	LOCATION		Not in a wetland.	**NA - post-closure operation**
324.11123(2)		603(2)			LOCATION		60 (150 for landfills) meters from adjacent commercial, residential, and recreational property.	**NA - post-closure operation**
324.11123(2)		603(5)			LOCATION		Land-based units must be in area with not less than 6 meters of 1x10E-6 cm/sec permeability	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(20)	270.3	LOCATION	Considerations under federal law	The Wild and Scenic Rivers Act, The National Historic Preservation Act, The Endangered Species Act, The Coastal Zone Management Act, The Fish and Wildlife Coordination Act	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(12)		TRAINING	Training Program outline per 264.16.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(14)		CLOSURE	Documentation of closed units.		**Section 2.6, 2.7**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(1)	CLOSURE	A description of how each unit will be closed in accordance with 264.111.		**Section 2.6, Appendix C**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(2)	CLOSURE	A description of how final closure will be conducted in accordance with 264.111, and identify the maximum extent of operations.		**Section 2.6, Appendix C**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(3)	CLOSURE	An estimate of the maximum inventory of hazardous wastes.		**Section 2.10**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(3)	CLOSURE	A description of the methods to remove, transport, treat or dispose of all hazardous wastes.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	A detailed description of the steps to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	A detailed description of the procedures to sample and analyze contaminated soils.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	The parameters that will be analyzed to verify extent of contamination.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	Criteria for determining the extent of decontamination required.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(5)	CLOSURE	A detailed description of other activities (run-on and run-off control, GWM, etc.) necessary to ensure that the closure performance standard is satisfied.		**Appendix C**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(6), 264.113	CLOSURE	A schedule for closure of each unit and for final closure.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(2)	270.14(b)(13)		CLOSURE		Notification of closure within 60 days prior to initiating closure.	**Section 2.7 - Appendix D**
324.11123(2)	504(1)(c), 508(1)(b)	613(3)	270.14(b)(13)		CLOSURE	Provisions for certification of closure and a list of items to document that closure was completed in accordance with the closure plan.		**Section 2.7 - Appendix D**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(13)		POST-CLOSURE	POST-CLOSURE PLAN		**Appndix C**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142	FINANCIAL	CLOSURE COST ESTIMATE		**NA - post-closure operation**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)	FINANCIAL	Closure cost estimate.	Detailed written estimate in current dollars for the cost of closing the facility.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(1)	FINANCIAL	Closure cost estimate.	Cost to close the maximum extent of operation.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(2)	FINANCIAL	Closure cost estimate.	Third-party costs.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(3)	FINANCIAL	Closure cost estimate.	No salvage value.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(4)	FINANCIAL	Closure cost estimate.	Cannot incorporate zero cost for wastes that may have economic value.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(16)		FINANCIAL	Post-Closure cost estimate.		**Section 4.0, Appendix G**
324.11123(2)	508(1)(e)	703	270.14(b)(15)		FINANCIAL	Financial assurance for closure.		**NA - post-closure operation**
324.11123(2)	508(1)(e)	703	270.14(b)(16)		FINANCIAL	Financial assurance for post-closure.		**Section 4.0, Appendix G**
324.111123(2)	508(1)(e)	710	270.14(b)(17)		FINANCIAL	Third-party liability coverage.		
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(19)		GENERAL	Topographic Map.		**Figure 1**
324.11123(2)	504(1)(g), 508(1)(b)				ENGINEERING	Engineering plans prepared and sealed by registered PE.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(i), 508(1)(b)				ENGINEERING	Engineering plans include plan views, elevations, sections, and supplementary views necessary for review.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(ii), 508(1)(b)				ENGINEERING	Specifications of all construction materials and installation methods.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(iii), 508(1)(b)				ENGINEERING	Basis of design for all process equipment and containment structures.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(iv), 508(1)(b)				ENGINEERING	Process flow diagram.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(v), 508(1)(b)				ENGINEERING	Process design capacity.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(a)	264.192(a)	TANKS	Tank System Assessment by independent, registered PE.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)		270.16(b)		TANKS	Dimensions and capacity of each tank.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(c)		TANKS	Description of feed systems, safety cutoff, bypass, and pressure control.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(d)		TANKS	Diagram of piping, instrumentation, and process flow for each tank system.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(3)	270.16(e)	264.192(a)(3)	TANKS	Description of materials and equipment to provide external corrosion protection.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(f)	264.192(b) - (e)	TANKS	Description of installation in compliance with 264.192(b), (c), (d), and (e).	Qualified inspection prior to covering and use, proper backfill, tested for tightness, support for ancillary equipment.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193	TANKS	Plans and description of how secondary containment satisfies 264.193		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(i)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must contain 100% of the capacity of the largest tank.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(ii)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must be designed to prevent run-on and infiltration unless it has additional capacity for a 24- hour, 25-year rainfall.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(iii)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must be constructed with chemical-resistant water stops in joints.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(iv)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must have impermeable interior coating that is compatible with materials stored.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(v)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must have means to protect against formation of and ignition of vapors if waste is ignitable or reactive.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(vi)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must have external moisture barrier if subject to hydraulic pressure.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(3)	TANKS	Plans and description of how secondary containment satisfies 264.193	Double-walled tank requirements.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(f)	TANKS	Plans and description of how secondary containment satisfies 264.193	Ancillary equipment must have secondary containment except for aboveground piping, welded connections, sealless equipment, and pressurized system with auto shut-offs that are inspected daily.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(1)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must have strength and thickness to prevent failure.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(2)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must have adequate foundation.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(3)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must have leak detection within 24 hours.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(4)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must be sloped or designed and operated to remove liquids within 24 hours.	**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(h)		TANKS	Variance provisions from secondary containment....		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(i)	264.194(b)	TANKS	Description of controls and practices to prevent spills and overflows per 264.194(b).		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(j)		TANKS	If ignitables, reactive, or incompatibles are managed, a description of how operating procedures and design will satisfy 264.198 and 264.199.		**NA - post-closure operation**
324.11123(2)		615(4)			TANKS		Compliance with Act 207	**NA - post-closure operation**
			270.16(k)		TANKS	Subpart CC information per 270.27.		**NA - post-closure operation**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(1)		CONTAINERS	Design parameters, dimensions, materials of construction of containment system.		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(2)		CONTAINERS	How the containment system design promotes drainage and/or how containers are kept out of standing liquids.		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(3)		CONTAINERS	The capacity of the containment system relative to the number and volume of containers.		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(4)		CONTAINERS	Provisions for preventing or managing run-on.		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(5)		CONTAINERS	Provisions for analyzing and removing accumulated liquids in containment system and preventing overflow.		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(b)		CONTAINERS	For containers of wastes that do not contain free liquids....		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(c)	264.176	CONTAINERS	Sketches or drawings demonstrating compliance with buffer zone requirement for ignitable and reactive wastes.	50 feet from property boundary.	**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(c)	264.177(c)	CONTAINERS	Sketches or drawings demonstrating compliance with segregation requirements for incompatible wastes.		**NA - post-closure operation**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(d)		CONTAINERS	For incompatible wastes, a description of the procedures to comply with 264.177(a) and (b) and 264.17(b) and (c).		**NA - post-closure operation**
324.11123(2)		614(1)(b)			CONTAINERS		Mark each container with "Hazardous Waste"	**NA - post-closure operation**
324.11123(2)		606(1)		264.35	CONTAINERS		Maintain adequate aisle space to allow unobstructed movement of personnel and equipment.	**NA - post-closure operation**
			270.15(e)		CONTAINERS	Subpart CC information per 270.27.		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(a)		LANDFILLS	List of hazardous wastes placed or to be placed in landfill.		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(b)		LANDFILLS	Detailed plans and engineering report describing how the landfill is designed and is or will be constructed, operated and maintained to meet the requirements of 264.19 (CQA), 264.301, 264.302 and 264.303, addressing the following items …		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(b)(1)(i)	264.301(a) or 264.301(b)	LINER	Liner system must meet the minimum technology requirements of 264.301(a) or an exemption under 264.301(b) must be requested.		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(b)(1)(i)	264.301(a)(1)	LINER	Liner system designed, constructed, and installed to prevent migration of wastes out of the landfill to the adjacent subsurface soil or surface water at any time during the active life (including closure period).		**NA - post-closure operation**
324.11123(2)	504(5)(a), 508(1)(b)				TREATMENT	Demonstration of how the treatment will change the physical, chemical, or biological character or composition of the waste; neutralize the waste; recover energy or material resources from the waste; render the waste nonhazardous, safer, etc.		**NA - post-closure operation**
324.11123(2)	504(5)(b), 508(1)(b)				TREATMENT	The proper treatment technique, feed rates, operating conditions, and accuracy of devices intended to measure treatment parameters.		**NA - post-closure operation**
324.11123(2)	504(5)(c), 508(1)(b)				TREATMENT	Whether the wastes or treatment chemicals will have any detrimental effect on the facility, and measures to control these effects.		**NA - post-closure operation**
324.11123(2)	504(5)(d), 508(1)(b)				TREATMENT	Whether the wastes contain contaminants that may interfere with the treatment process and how the interference will be controlled.		**NA - post-closure operation**
324.11123(2)	504(5)(e), 508(1)(b)				TREATMENT	Whether the wastes contain contaminants that might cause the release of toxic gases or fumes and how they will be controlled.		**NA - post-closure operation**
324.11123(2)	504(5)(f), 508(1)(b)				TREATMENT	Whether the wastes contain contaminants that might form toxic constituents with treatment chemicals and how they will be controlled.		**NA - post-closure operation**
324.11123(2)	504(5)(g), 508(1)(b)				TREATMENT	Trial tests.		**NA - post-closure operation**
324.11123(2)	504(12), 508(1)(b)		270.24		AIR	Subpart AA.		**NA - Section 5.1**
324.11123(2)	504(13), 508(1)(b)		270.25		AIR	Subpart BB.		**NA - Section 5.2**
324.11123(2)	504(16), 508(1)(b)		270.27		AIR	Subpart CC.		**NA - Section 5.3**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(i)		CORRECTIVE ACTION	Location of each waste management unit.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(ii)		CORRECTIVE ACTION	Designation of type of waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(iii)		CORRECTIVE ACTION	Dimensions and structural description of waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(iv)		CORRECTIVE ACTION	Dates of operation for waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(v)		CORRECTIVE ACTION	Description of wastes managed in waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(2)		CORRECTIVE ACTION	Release information for waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(3)		CORRECTIVE ACTION	Results of investigations required to determine if a more complete investigation of waste management units is necessary.		**Section 2.10, Appendix E**

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APPENDICES

1.0 INTRODUCTION

The Granger Grand River MID 082 771 700 Landfill is owned and operated by Granger Land Development Company (Granger). Granger began operations of the Grand River facility for others in 1974 and purchased the landfill in 1980. Original operations of the facility by others began in 1970.

The post-closure period began on April 13, 1990 with certification from the Michigan Department of Natural Resources (MDNR) [currently the Michigan Department of Environment, Great Lakes, and Energy (EGLE)] that all the requirements of closure had been fulfilled.

Pursuant to R 299.9508(3), this operating license application for the post-closure period includes the following information:

a.) Information specified in 40 CFR §270.14(b)(1), (4) to (6), (11), (13), (14), (18), and (19) and (d);

b.) Information specified in R 299.9506 (Hydrogeological reports);

c.) Most recent post-closure cost estimate prepared in accordance with R 299.9702; and

d.) Copy of the documentation required to demonstrate compliance with R 299.9703.

The review checklist is provided with the application form.

2.0 GENERAL INFORMATION REQUIRED - 40 CFR §270.14(B) AND (D)

2.1 General Description [40 CFR §270.14(b)(1)]

The Granger MID Landfill is located at 8550 W. Grander River Highway, Grand Ledge, Michigan. In November 1980, to comply with RCRA, GLDC submitted a Part A application for Interim Status. During October 1981, after submitting detailed engineering plans to upgrade a portion of the site to Michigan Act 641 standards (predecessor to the current Part 115 standards), GLDC negotiated a Consent Agreement with Michigan Department of Natural Resources (MDNR) which limited the type and quantities of hazardous wastes which could be accepted at the site under constraints imposed by the Michigan Act 64. The limitations in the agreement were based upon the types and quantities of waste that had been received at the facility in the past. Between the years 1980 and 1983 the facility received 35,000 cubic yards of hazardous waste.

Topographic maps of the site are provided on **Figure 1** and **Figure 1A**. The facility drawing for the site is provided on **Figure 2**. An aerial photograph of the site is provided on **Figure 3**.

2.1.1 Isolation of Waste

Several actions have been taken to effectively isolate the waste material at the landfill from other disposal areas. These have included the following activities:

- Construction of clay walls at the perimeter of the landfill;
- Installation of leachate collection lines along the perimeter of the landfill;
- The construction of a slurry wall along the south border of the landfill;
- The construction of a slurry wall along portions of the east and west boundaries of the landfill, and their tie-in to the existing clay walls;
- Construction of a clay cap over the entire landfill.

Historical engineering drawings are included in **Appendix E**.

The first two actions were an integral part of normal construction activities at the landfill. The installation of the slurry wall and the capping of the landfill were performed in conjunction with both the MDNR and the Circuit Court. Following an April 22, 1983 Court order, Granger submitted plans and specifications for construction activities which were intended to fulfil the objectives identified in paragraph 3 of the April 22, 1983 document. Paragraph 3 required the submission of documents designed to provide for "permanently and completely encapsulating the portion of its landfill site where hazardous wastes have been disposed of in the past on or before May 2, 1983". Detailed plans were approved by the Circuit Court and the MDNR in an April 23, 1984 correspondence.

The encapsulation plan was designed to provide isolation of the waste material by including the construction of a slurry wall and a landfill cap in addition to the existing clay walls. On the west side the slurry wall to the south was keyed into the existing clay wall to the north. On the east side, the slurry wall was keyed to the south and keyed to the clay wall to the north. On the east clay wall, the internal leachate collection lines were placed at a significantly lower elevation relative to both the leachate collection and dewatering lines were installed in the adjacent 641 (Part 115) area to the east. Such positioning of the lines provides additional assurance that leachate could not migrate from the site.

The consummation of the encapsulation activities, accompanied with documentation provided to the MDNR and the Court, has resulted in recognition that these actions have accomplished the goal of effective encapsulation. In a November 19, 1994 correspondence from the Court, it was stated that "Based upon review of the certification documentation and field investigations (copies attached), the Hazardous Waste Division, Department of Natural Resources, has determined that the construction meets the design plan and specifications set forth in this Court's Order of April 23, 1984 and adequately addresses paragraph 3 of this Court's Order of April 22, 1983".

2.1.2 Leachate Collection System

From 1981-1983 a series of leachate collection lines were installed at the site. An initial 6" line was installed inside the south wall along the 128+50 line, then continuing north at variable distances inside the eastern wall to the north end. Construction of this line occurred in 1981-82. An additional 8" diameter line was added on the east side in conjunction with the construction of the clay wall along the eastern boundary in 1982. These lines are joined at coordinate 14500N:7280E. The 8" diameter combined leachate collection line continues over to the leachate manhole on the north side of the landfill. Leachate collection piping from the adjacent landfill also enters the same pump station manhole from which the leachate is pumped through the forcemain to the POTW.

Two additional leachate collection lines are present on the west side of the landfill. The inner line is a 12" diameter pipe while the leachate line closer to the clay wall has a 4" diameter. These lines are joined at coordinate 14737N:6110E, then continue east to the leachate collection manhole. Numerous lines of unidentified length extend south from this line. Although no drawings are available for documentation, an 18-24" diameter leachate collection line runs generally north-south through the center of the cell.

Several piezometers were installed across the site. These piezometers were converted to leachate collection wells. Static elevations are measured in each of the leachate wells on a quarterly basis. These measurements are taken to determine if a significant amount of leachate is present both in the central area and along the eastern edge of the site. The subsequent data have indicated that the pumping systems are effective and that there is no significant "head" of leachate present throughout the site.

2.1.3 Post-Closure

The post-closure time frame began on April 13, 1990 with certification from the Michigan Department of Natural Resources (currently EGLE) that all the requirements of closure had been fulfilled. The post-closure care period will be conducted for at least a 30 year period, and will include the following programs:

- Maintaining the integrity and effectiveness of the final cover;
- Maintaining, operating and monitoring the effectiveness of the leachate collection system;
- Monitoring and maintaining groundwater quality;
- Maintaining and operating the gas monitoring and gas collection systems.

2.2 Security Procedures [40 CFR §270.14(b)(4)]

The Granger Grand River MID 082 771 700 Landfill is equipped with perimeter fencing and a locking entrance gate that is shared with the adjacent Part 115 landfill. Perimeter fences ranging in height from 4 to 8 feet are arranged around the facility. A warning sign is posed on the entrance gate to the facility.

During operating hours, gates are staffed with employees who monitor vehicles and persons entering the facility. Gates are locked to prevent unauthorized access when staff are not present.

2.3 Inspection Schedule [40 CFR §270.14(b)(5)]

2.3.1 Final Cover Inspection and Maintenance

Visual inspections of the final cover are performed each year.

Visual inspections are performed during a walk-over of the site. All problem areas are recorded on the observation form which is enclosed (**Appendix A**). The inspection will include observations relative to the following:

- areas of settlement and/or ponding;
- the possible presence of erosion, rifts or cracks;
- areas of stressed or dead vegetation;
- areas of sparse vegetation;
- evidence of burrowing animals:
- areas of slope failure;
- areas of exposed liner;
- areas characterized by gas emissions;
- leachate outbreaks;
- damage to any risers or pipes which extend through the cap;
- undesirable plant species capable of damaging the cap;
- damage to spillways or berms;

Maintenance activities will be directed by observations recorded on the inspection form. The activities will be performed as necessary such that the observations identified during the inspection are addressed and the integrity of the final cover is maintained. Survey benchmarks are no longer observed since Granger has incorporated GPS survey equipment and methods. Following completion of the inspection, the information will be given to the site manager for subsequent maintenance. Routine maintenance of the final cover will be performed during the summer/fall construction season.

2.3.2 Gas Collection System Inspection and Maintenance

During the inspections of final cover, the area will also be inspected for the possible presence of odors or gas emissions through the cap. In addition, the gas vents will be inspected for their structural integrity and the data obtained during the quarterly monitoring for possible gas migration will be reviewed. The site manager will be informed of any matters which require maintenance to facilitate their inclusion in the summer/fall construction season.

The landfill does not operate process vents (not subject to Subpart AA). The landfill gas is not classified as hazardous waste (not subject to Subpart BB). No hazardous waste was accepted after December 6, 1996 (not subject to Subpart CC).

2.3.3 Leachate Collection System Inspection and Maintenance

The volume of leachate/condensate is reported on a monthly basis to Southern Clinton County Municipal Utilities Authority (SCCMUA), or other comparable facility. The records of discharge volumes are be retained at the Granger Wood Street facility. These records are reviewed regularly.

The leachate manhole, the leachate pump house, and the leachate collection system along the east side are inspected on a monthly basis using the enclosed inspection form (**Appendix A**). The manhole is inspected for security and structural integrity. The pump house is inspected for any evidence of loose plumbing or electrical fittings and any evidence of leakage. Static elevations are measured in the leachate collection wells to verify the effective operation of the pumps. Data obtained during the monthly inspections is maintained at the Granger Wood Street Office. Any problems requiring repair or maintenance are reported to the manager.

The quarterly monitoring of static leachate elevations will be reported to EGLE annually and maintained in the Operating Record. The data will be examined during each inspection event to assess if any significant change in elevation has occurred.

2.3.4 Purge System Inspection and Maintenance

The purge system will be inspected on a weekly basis. The purge wells will be inspected for any visible damage. The pump station will then be inspected for any leaks or loose fittings in the plumbing or electrical connections. The valves and gauges at the pump station will be inspected both for leaks and for general working condition. The data from the flow meter will be inspected to determine if the pump operation (cycles/day and discharge volume) are consistent. These discharge data will provide an overview of the effectiveness of the entire system (wells, piping, pumps, valves, meters, etc.) since they provide the composite effectiveness of all the separate components. Any problems encountered will be reported to the landfill manager for correction.

2.3.5 Site Security Inspection and Maintenance

The annual inspection of the landfill will include an examination of site security using the enclosed inspection form. The inspection will include a survey of the fences, gates, locks, and lockboxes. Any problems with any aspect of the security system will be reported to the site manager for repair.

2.4 Preparedness and Prevention Requirement Waiver [40 CFR 270.14(b)(6)]

Hazardous waste disposal areas have been encapsulated as discussed in Section 2.1. The entire fill area has been covered with a cap that will prevent runoff waters from this area contaminating other areas of the landfill. The presence of the sidewalls, in conjunction with the leachate collection system, will provide for leachate collection and disposal at the wastewater treatment facility. The cap will also prevent landfill personnel and equipment from coming in contact with hazardous wastes and tracking them to other areas of the landfill. Furthermore, the cap will prevent wastes from volatilizing to the atmosphere or blowing off site.

Site security measures will result in very limited access to the site. As a result, activities in this vicinity should be limited to those actions directly involving post-closure responsibilities. These activities should involve only Granger personnel and/or subcontractors who are qualified and authorized to work in the area.

2.5 Facility Location Information [40 CFR §270.14(b)(11)]

The facility is in Clinton County, Michigan and is therefore not located in a jurisdiction with seismic standard applicability (§264.18(a)).

The facility is located in an area of minimal flood hazard and not within the 100-year floodplain. The most recent flood insurance rate map for the area surrounding the facility is provided in **Appendix B**.

2.6 Closure and Post-Closure Plans [40 CFR §270.14(b)(13)]

The Closure and Post-Closure Plan dated October 1984 and Addendum I to the Closure and Post-Closure Plan dated October 1985 for the Granger MID landfill are included in **Appendix C**.

2.7 Closure Notice Documentation [40 CFR §270.14(b)(14)]

Closure certification for the MID landfill was submitted to MDNR on November 3, 1988 (with addenda dated November 21, 1989 and February 16, 1990). Correspondence dated April 13, 1990 from MDNR certified the closure requirements had been fulfilled and Granger was released from closure financial assurance requirements. The Restrictive Covenant which pertains to the MID landfill was filed by MDEQ with the Clinton County office of the Register of Deeds is provided in **Appendix D**.

Information regarding the location, type and quantity of waste was submitted to the Watertown Charter Township Planning Commission Zoning Board by Granger on September 14, 1994 (also provided in **Appendix D**).

2.8 State Financial Mechanism Coverage [40 CFR §270(b)(18)]

Financial assurance requirements are discussed in **Section 4.0** of this report.

2.9 Topographic Map [40 CFR §270(b)(19)]

Pursuant to 40 CFR §270(b)(19), a topographic map is provided on **Figure 1** and **Figure 1A**.

2.10 Solid Waste Management Unit Information [40 CFR §270.14(d)]

A description of the waste management units is provided in **Appendix E**. Additionally, the following information is provided:

Topographic Map

The topographic map is provided on **Figure 1**.

Designation of Type of Unit

The solid waste management unit is a closed landfill.

General dimensions and structural description

A site plan showing the extent of the hazardous waste is provided on **Figure 1**. The legal property description for the facility is as follows:

> The following legal property description pertains to the 59.72 acre parcel of land located in Watertown·Township, Clinton County, with a property address of 8550 West Grand River Avenue, Grand Ledge, Michigan. The property is owned by the Granger Land Development Company, a corporation located at 3535 Wood Road in Lansing, Michigan. The legal description is as follows:
>
> Commencing at a point on the E-W 1/4 line distant S 89 ° 58'41" E 1316.40 feet from the W 1/4 Corner Section 29, T5N, R3W, Watertown Township, Clinton County, Michigan, thence N 00° 19'38" E along the W 1/8 line 186.75' to the point of beginning, thence continuing on the said 1/8 line N 00° 19'38" E 2091.60 feet to a point on the south right-of-way line of I-96, as now located, thence along said south limited access right-of-way on the arc of a curve to the right, said curve having a delta angle = 13°45'17", radius of 5626.58 feet, long chord bearing and distance S 77°38'15" E 1347.52 feet, a distance of 1350.76 feet, thence S 00°22' 16" W along the N-S 1/4 line 1803.09 feet, thence S 90°00'00 W 1316.54 feet to the point of beginning. The above described lands contain 59.72 acres and are subject to all easements and restrictions of record, if any.

Unit operation timeframe

The Grand River facility began operations in 1970 and closure was certified by the State on April 13, 1990.

Specification of wastes managed

The quantity and types of hazardous wastes received at the MID landfill are summarized in Tables 1 and 2 below. After 1983 only non-hazardous waste was placed in the facility.

Table 1: 1980 Hazardous Waste Received

Waste Identification Number	Quantity (Cubic Yards)
EP Toxic for Heavy Metals (OLD #F017) (Paint Sludges)	5,600
EP Toxic for D005, D006, 00ID, D007, 002D, D008, 003D (Industrial Sludges)	12,300
Solids containing flammable material (paint, solvents, thinners) generated hazardous materials spill cleanups	17,200
Total	35,000

Table 2: Summary of Types and Quantities of Hazardous Waste in Granger (Quantity Reported as Tons)

RCRA Hazardous Waste Type	1981 (12/80 - 11/81)	1982 (12/81 - 11/82)	1983 (12/82 - 4/83)
D006 (Cd)	0	41	14
D007 (Cr)	0	401	819
D008 (Pb)	0	1966	172
Soils Contaminated with; U154 Methanol U120 Tetrachloroethylene U220 Toluene U226 1,1,1-Trichloroethane U228 Trichloroethylene	0	2165	1070
Subtotal:	0	4573	2075
Act 64 Hazardous Waste			
001D (Cu)	0	0	4
003D (Zu)	0	3841	2248
Subtotal:	0	3841	2252
Total:	**0**	**8414**	**4327**

Note: Assumes 1 cubic yard of waste to equal 1 ton.

3.0 HYDROGEOLOGY

In lieu of the hydrogeological investigation report specified in R 299.9056. Granger is referencing the past hydrogeologic investigations that have been conducted at the site, including:

Ostrander, A.G. 1977. "Hydrogeological Investigation of the Grand River Landfill in Watertown Township, Clinton County."

Keck Consulting Services, Inc. 1981. "Hydrogeological Investigation Granger Landfill Expansion, Section 29, T.5N, R.3W, Watertown Township, Clinton County, Michigan."

Keck Consulting Services, Inc. 1981. "Hydrogeological Investigation, Modification of Existing Facility, Granger Landfill, Section 29, T.5N, R.3W, Watertown Township, Clinton, County, Michigan."

These hydrogeologic investigations have resulted in the current groundwater monitoring well network and groundwater monitoring program. The site geology is summarized as follows (source: Post-Closure Groundwater Statistical Evaluation Program, RMT, Inc., January 2006):

- *A surficial granular deposit, which varies in thickness from several feet up to 30 feet. Portions of this deposit have been excavated in some of the areas of the landfill and have been hydraulically separated through the construction of a low permeable clay barrier system and a slurry wall.*
- *A silty clay deposit characterized as a till which acts as a hydraulic barrier to varying degrees across the site. The deposit is considered a confining layer in the southern portion of the site and a leaky confining layer in northern portions.*
- *A lower granular deposit which varies in thickness between several feet up to 30 feet.*
- *A lower silty clay characterized as a till.*
- *Sandstone bedrock consisting of the Saginaw Formation.*

The hydrogeology and three water bearing zones are summarized as follows (source: Post-Closure Groundwater Statistical Evaluation Program, RMT, Inc., January 2006):

- *A shallow drift aquifer, which is present in the near surface granular deposit. A groundwater recovery system is also modifying groundwater flow in these deposits.*
- *A deep drift aquifer, which is present in the lower granular deposit between the two till sequences. The groundwater flow in this unit appears to vary but generally flows from the southwest to northeast.*
- *A sandstone bedrock aquifer.*

3.1 Summary of Recent Monitoring Data

The following sections summarize the monitoring data from the last five (5) annual groundwater monitoring reports (2016 through 2020).

3.1.1 Groundwater

The groundwater monitoring plan is presented in Section 1 of the attached Monitoring Plan (**Attachment F**). Groundwater contour maps from the 2020 annual groundwater report are provided in **Attachment F-1**. In the past three years (2018, 2019 and 2020), no statistical exceedances have been confirmed.

3.1.1.1 Bedrock Aquifer

Bedrock aquifer groundwater samples are collected semi-annually from monitoring wells MW-16 (upgradient), MW-17 and MW-18. In the past 5-years, the groundwater samples from the bedrock aquifer have not had any detections for VOCs above the laboratory limits and no inorganic parameter has exceeded its prediction limit. The groundwater data indicate the site has not impacted the groundwater in the bedrock aquifer.

3.1.1.2 Deep Glacial Drift Aquifer

Deep glacial drift aquifer samples are collected semi-annually from monitoring wells MW-44 (upgradient), MW-14dr, MW-20r, MW-22dr, MW-24dr, MW-25r, MW-42r[2], MW-43d, and MW-45. In the past 5 years, the groundwater samples from the deep glacial drift aquifer have not had any detection of VOCs above the laboratory limits. Sodium and chloride impacts from roadway salt impacted runoff are present at MW-14dr, MW-22dr, MW-24dr and MW-25r, as discussed in further detail in recent annual groundwater monitoring reports. As summarized in the 2020 annual groundwater report, the data indicate that the site activities have not impacted the groundwater in the deep glacial drift aquifer.

3.1.1.3 Shallow Glacial Drift Aquifer

Shallow glacial drift aquifer samples are collected semi-annually from MW-9, MW-14sr, MW-21sr, MW-23sr, MW-40, and MW-43s. The sampling data indicated normal variability of naturally occulting inorganic parameters and no VOCs have been detected above the laboratory detection limit in the past 5-years. Sodium, chloride, and to a lesser extent potassium impacts from roadway salt impacted runoff are present at MW-14sr, MW-21sr and MW-23sr, as discussed in further detail in recent annual groundwater monitoring reports. Boron was detected above prediction limits at MW-23sr in 2016 and 2017 but less than prediction limits in 2018-2020. There was a slight exceedance of lead in MW-40 during Q1 of 2019. The well was resampled and the concentration was non-detect. MW-40 is an upgradient well so this exceedance was attributed to natural variability in geochemistry.

3.1.2 Surface Water

The surface water monitoring plan is presented in Section 2 of the attached Monitoring Plan (**Attachment F**). Surface water samples are collected semi-annually from the ditch leading to the Openlander Drain.

Recent surface sampling results show no water quality exceedances (2016-2020 annual groundwater reports). No VOCs have been detected. Elevated sodium, chloride, and potassium are present as a result of runoff from the adjacent highway and nitrate is associated with upgradient agricultural sources as discussed in recent annual groundwater reports.

3.1.3 Leachate

The leachate monitoring plan is presented in Section 3 of the attached Monitoring Plan (**Attachment F**). Leachate samples are collected from 7 extraction points: LMW-1 through LMW-7 (which was added in 2020). Based on recent detections, t-butanol and THF were added in 20xx, and 1,2,4-trimethylbenzene has been added for future leachate analysis.

3.1.4 Purge System

The purge system monitoring plan is presented in Section 4 of the attached Monitoring Plan (**Attachment F**). Two purge systems are operated at the site, one in the southwest corner (PW-46 and PW-48) to address VOC concentrations and along the west and northside (PW-49 and PW-50) to address boron concentrations.

For the VOC purge system, static groundwater elevations (MW-6r, MW-19, P-28, P-29, P-30, P-31, P-32, P-33, MW-35, P-36, P-37, MW-40, MW-43s, MW-43d and MW-44d) and groundwater samples (MW-19, P-28, P-29 PW-46 and PW-48) are obtained during quarterly monitoring events. As discussed in the recent annual groundwater monitoring reports, the groundwater sampling results and groundwater elevations indicate that VOC purge system is maintaining a cone of depression and VOC concentrations are reducing within the purge area and non-detect outside the immediate purge area.

For the Boron purge system, static groundwater elevations (MW-9r, MW-45, MW-20r, MW-23sr, MW-24dr, and MW-21sr) and ground water samples (MW-21sr, MW-23sr, MW-24sr, PW-49 and PW-50) are obtained during quarterly monitoring events. As discussed in the recent annual groundwater monitoring repots, boron concentrations have decreased in purge wells and surrounding monitoring wells. The data indicate purge system is effectively remediating impacted groundwater on the west and north side.

3.1.5 Final Cover

Inspections of the final cover system are performed annually. Inspection reports are provided in annual groundwater monitoring reports. Recent inspections indicate that the final cover is good condition with routine maintenance actions typical for a closed landfill. General maintenance included routine mowing and monitoring of low area/ruts, areas of sparse vegetation, standing water at gas control structures (removed during quarterly maintenance), animal burrows (none noted recently) and undesirable plant species.

4.0 FINANCIAL ASSURACE

4.1 Post-Closure Care Cost Estimate

The post-closure care cost estimate including corrective action (operation and monitoring of the purge systems) is included in **Attachment G**. The annual post-closure care cost estimate is summarized in **Table 3** below. This latest revision of the post closure cost estimate is from 2017 and will be updated within 60 days of the anniversary date of the establishment of the financial instrument as per 40 CFR 264.114(b).

Table 3: Annual Post-Closure Care Cost Estimate

Activity		Estimated Cost
1	Groundwater Monitoring	$24,211
2	Leachate Management	$5,219
3	Final Cover Maintenance	$17,822
4	Stormwater Controls	$1025
5	Miscellaneous Management	$509
6	Groundwater Remediation – Purge System	$68,134
	Subtotal	$116,919
	Administrative Expenses (15%)	$17,538
	Third Party Contractor Escalator (10%)	$11,692
Total Annual Cost of Post-Closure Care and Corrective Action		**$146,148.76**

4.2 Financial Assurance

Letters of Credit for financial assurance of the cost for post-closure care during this permit period are provided in **Attachment G**.

5.0 AIR EMISSIONS REQUIREMENTS

5.1 40 CFR 264 Subpart AA

The landfill gas extraction wells are not considered process vents because they are not associated with hazardous waste distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations. Because the LFG extraction wells are not considered process vents, 40 CFR 264 Subpart AA does not apply.

5.2 40 CFR 264 Subpart BB

Subpart BB applies, in general, to an operator of a facility that disposes of hazardous waste; however, it only applies to equipment that contains or contacts hazardous wastes with organic concentrations of at least 10% by weight in a unit that is subject to the permitting requirements of Part 270. This landfill requires a permit under Part 270; however, the LFG generated is not classified as a “hazardous waste” so none of the equipment contains or contacts hazardous waste. On this basis, Subpart BB does not apply.

5.3 40 CFR 264 Subpart CC

Subpart CC does not apply to waste management units that hold hazardous waste placed in the unit before December 6, 1996, and in which no hazardous waste is added to the unit on or after December 6, 1996. Materials which are now classified as hazardous waste were last accepted in this landfill prior to December 6, 1996 and no hazardous materials were accepted on or after December 6, 1996 so Subpart CC does not apply.

Signature Page

Golder Associates Inc.

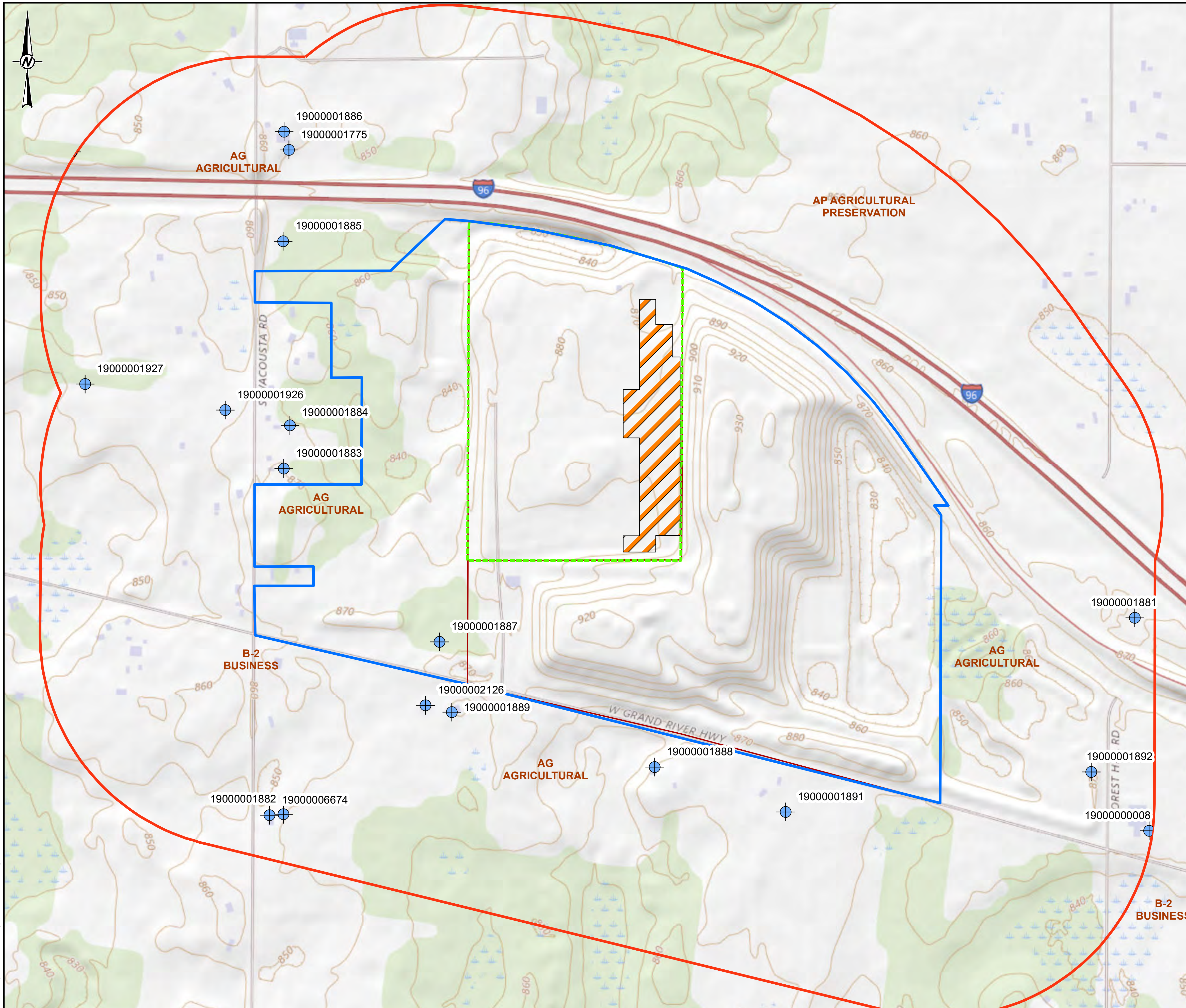
Samuel F. Stafford, PE
Senior Engineer

David M. List, PE
Principal and Practice Leader

SFS/DML

https://golderassociates.sharepoint.com/sites/152409/project files/5 technical work/mid post-closure op app/final/granger mid lf post-closure app doc_12282021.docx

Figures



LEGEND

- WATER WELLS
- PROPERTY BOUNDARY
- 1/4 MILE RADIUS
- APPROXIMATE HAZARDOUS WASTE PLACEMENT
- CLOSED MID LANDFILL BOUNDARY
- PARCELS

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed August, 2021.

Water wells from Wellogic, the EGLE statewide ground water database.

Zoning information taken from Clinton County GIS, Watertown Township Zoning Map, Clinton County, Michigan.

600 300 0 600 Feet

CLIENT
GRANGER WASTE MANAGEMENT
GRAND RIVER LANDFILL
LANSING, MICHIGAN

PROJECT
OPERATING PERMIT LICENSE APPLICATION

TITLE
TOPOGRAPHIC MAP

CONSULTANT
GOLDER MEMBER OF WSP

YYYY-MM-DD	2021-11-16
PREPARED	DJC
DESIGN	SFS
REVIEW	SFS
APPROVED	DML

PROJECT No.	CONTROL	Rev.	FIGURE
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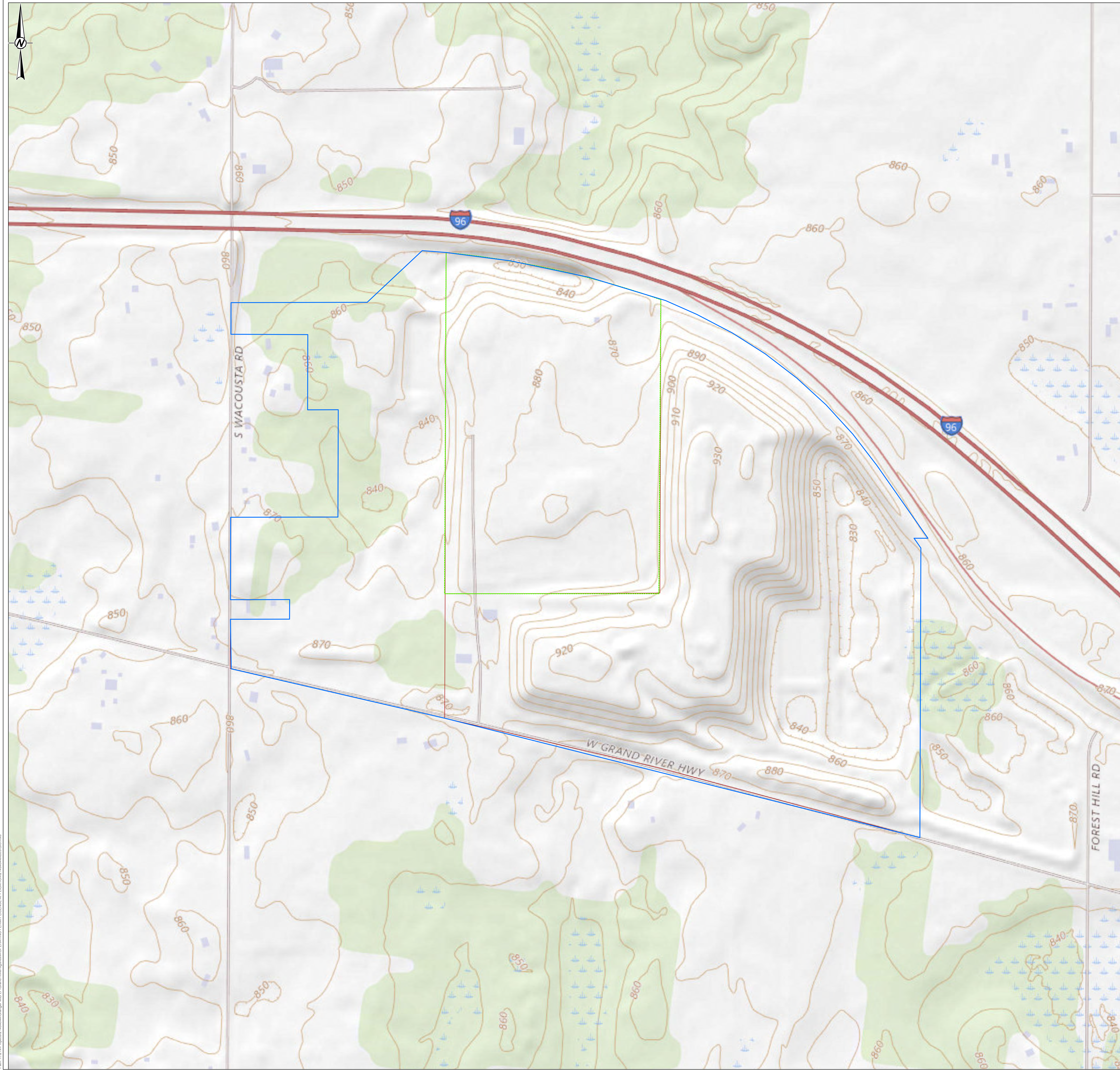

LEGEND

PROPERTY BOUNDARY

CLOSED MID LANDFILL BOUNDARY

PARCELS

REFERENCE

SERVICE LAYER CREDITS: USGS THE NATIONAL MAP: NATIONAL BOUNDARIES DATASET, 3DEP ELEVATION PROGRAM, GEOGRAPHIC NAMES INFORMATION SYSTEM, NATIONAL HYDROGRAPHY DATASET, NATIONAL LAND COVER DATABASE, NATIONAL STRUCTURES DATASET, AND NATIONAL TRANSPORTATION DATASET; USGS GLOBAL ECOSYSTEMS; U.S. CENSUS BUREAU TIGER/LINE DATA; USFS ROAD DATA; NATURAL EARTH DATA; U.S. DEPARTMENT OF STATE HUMANITARIAN INFORMATION UNIT; AND NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION, U.S. COASTAL RELIEF MODEL. DATA REFRESHED AUGUST, 2021.

WATER WELLS FROM WELLOGIC, THE EGLE STATEWIDE GROUND WATER DATABASE.

ZONING INFORMATION TAKEN FROM CLINTON COUNTY GIS, WATERTOWN TOWNSHIP ZONING

CLIENT
GRANGER WASTE MANAGEMENT
GRAND RIVER LANDFILL
LANSING, MICHIGAN

PROJECT
OPERATING PERMIT LICENSE APPLICATION

TITLE
TOPOGRAPHIC MAP

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-18
PREPARED	DJC
DESIGN	SFS
REVIEW	SFS
APPROVED	DML

PROJECT No.	CONTROL	Rev.	FIGURE
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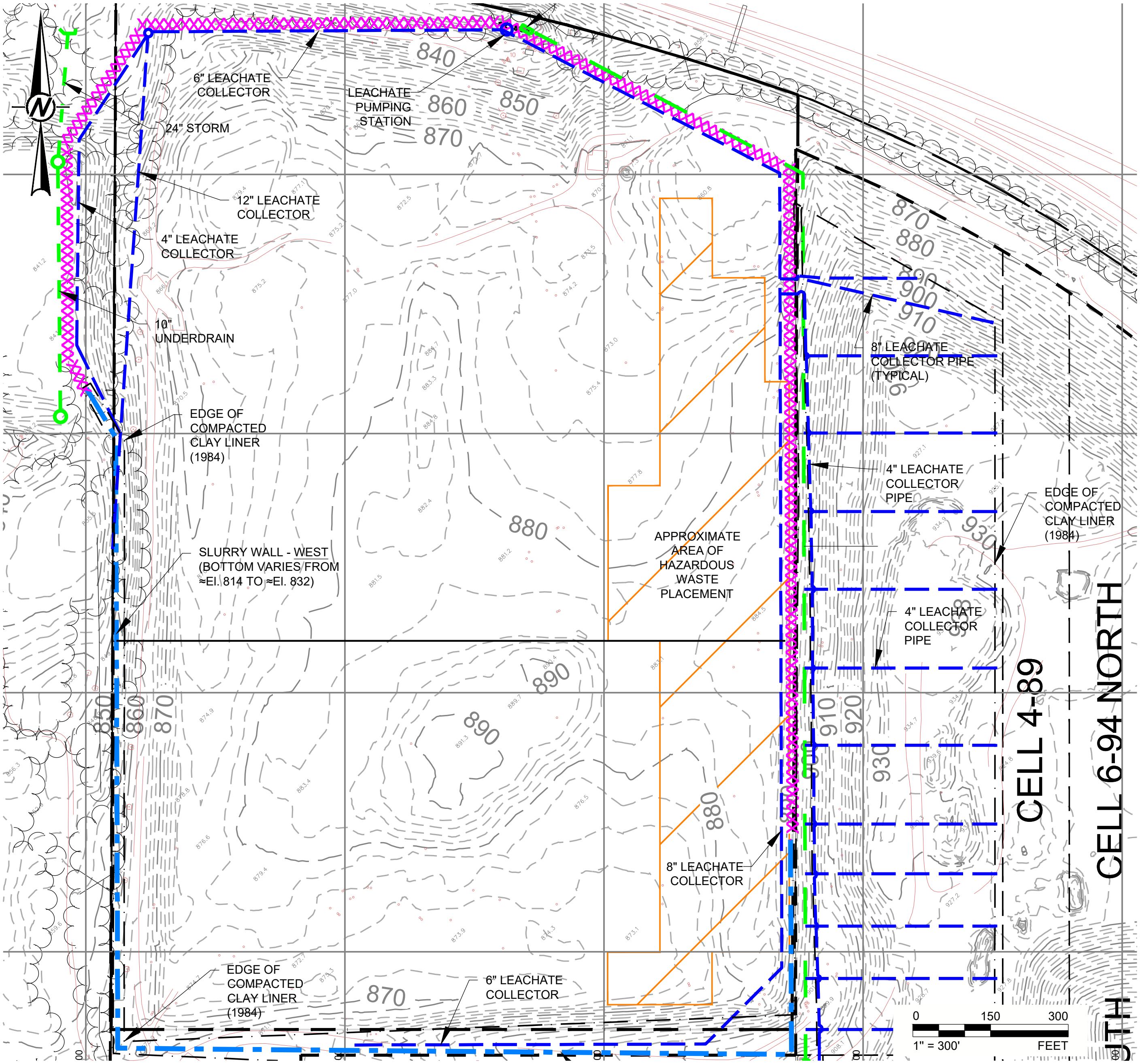

LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE GRANGER MID LANDFILL BOUNDARY
- APPROXIMATE AREA OF HAZARDOUS WASTE PLACEMENT (REFERENCE 2) (NOTE 1)
- UNDERDRAIN PIPING (REFERENCE 3)
- CLAY WALL DIKE (REFERENCE 3)
- LEACHATE COLLECTOR PIPE (REFERENCES 3 & 4)
- EDGE OF COMPACTED CLAY LINER - 1984 (REFERENCE 4)

REFERENCES

1. EXISTING TOPOGRAPHY BASED ON NOVEMBER 24, 2019 AERIAL FLYOVER, PROVIDED BY GRANGER, DATED 1/21/2020.
2. APPROXIMATE AREA OF HAZARDOUS WASTE PLACEMENT TAKEN FROM "FINAL CONTOURS ON EXISTING FILLED SITE," DATED 9-28-84, PROVIDED BY GRANGER WASTE MANAGEMENT.
3. APPROXIMATE UNDERDRAIN AND CLAY WALL DIKE LOCATIONS TAKEN FROM "MONITORING WELL AND GROUNDWATER DATA SURVEY," DATED 5-9-86, PROVIDED BY GRANGER WASTE MANAGEMENT.
4. APPROXIMATE LEACHATE PIPING LOCATIONS TAKEN FROM "SITE PLAN AS-BIULT - 1984," BY STS CONSULTANTS LTD., PROVIDED BY GRANGER WASTE MANAGEMENT.

CLIENT
GRANGER WASTE MANAGEMENT
GRAND RIVER LANDFILL
LANSING, MICHIGAN

PROJECT
OPERATING PERMIT LICENSE APPLICATION

TITLE
FACILITY LAYOUT

CONSULTANT
GOLDER MEMBER OF WSP

YYYY-MM-DD	2021-11-17
DESIGNED	SFS
PREPARED	DJC
REVIEWED	SFS
APPROVED	DML

PROJECT NO.	CONTROL	REV.	FIGURE
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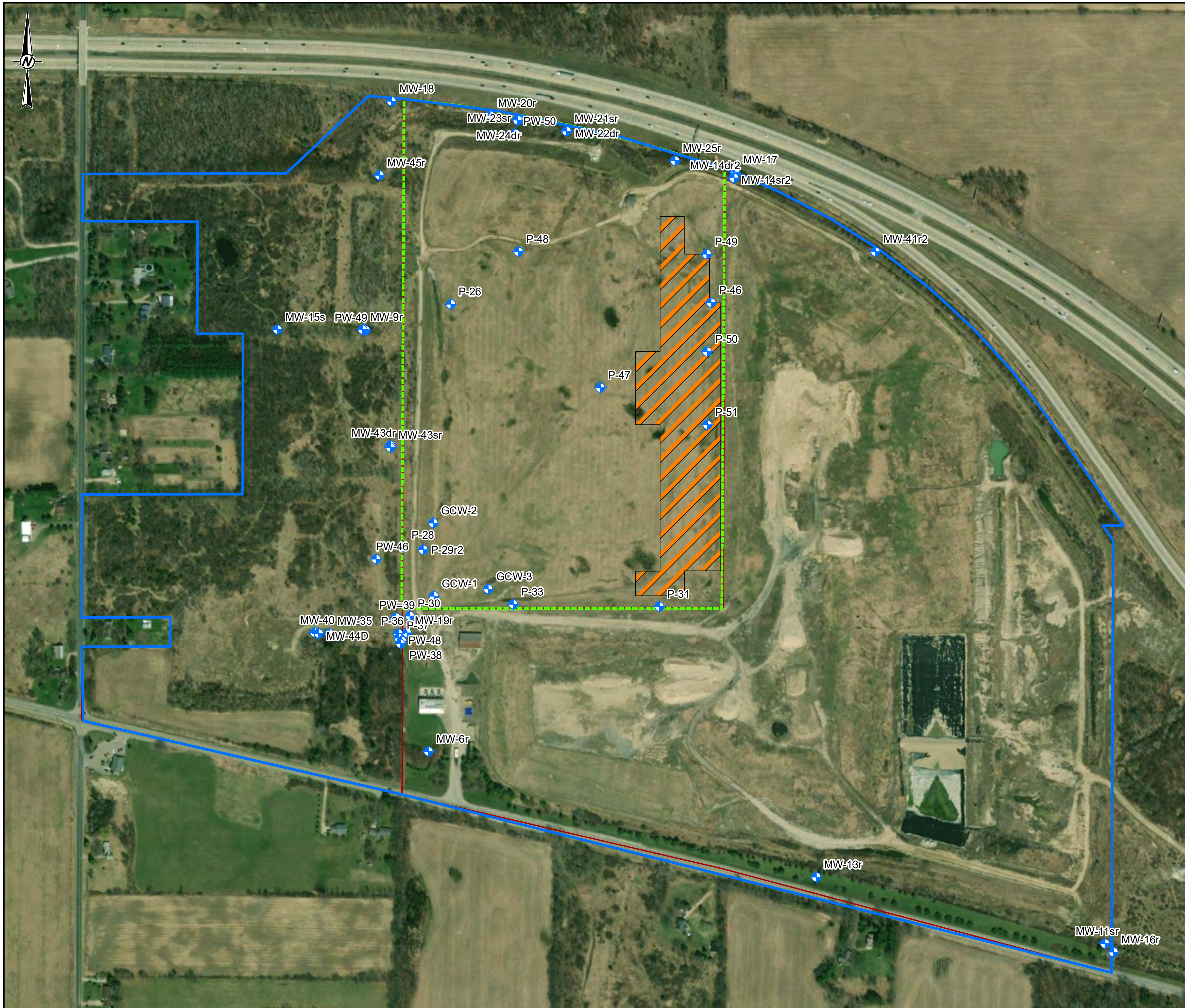

LEGEND

- WELL LOCATIONS
- PROPERTY BOUNDARY
- APPROXIMATE HAZARDOUS WASTE PLACEMENT
- CLOSED MID LANDFILL BOUNDARY
- PARCELS

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

400 200 0 400
Feet

CLIENT
GRANGER WASTE MANAGEMENT
GRAND RIVER LANDFILL
LANSING, MICHIGAN

PROJECT
OPERATING PERMIT LICENSE APPLICATION

TITLE
AERIAL PHOTOGRAPH

CONSULTANT

GOLDER MEMBER OF WSP

YYYY-MM-DD	2021-11-16
PREPARED	DJC
DESIGN	SFS
REVIEW	SFS
APPROVED	DML

PROJECT No.	CONTROL	Rev.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

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APPENDIX A

Inspection Forms

LANDFILL CAP INSPECTION AND MAINTENANCE LOG

Date________________________________ Facility____

Inspector______________________________ Weather Conditions________________________________

A. Final Cover Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
A-1	Check integrity of benchmarks		
A-2	What is the general condition of the cap?		
A-3	Are there areas of settlement or ponding?		
A-4	Is there evidence of erosion?		
A-5	Is there evidence of stressed vegetation?		
A-6	Is there evidence of burrowing animals?		
A-7	Is there evidence of slope failure?		
A-8	Is there any exposed liner?		
A-9	Is there evidence of leachate outbreaks?		
A-10	Is there damage to risers or pipes extending thru the cap?		
A-11	Are there undesirable plants capable of damaging the cap?		
A-12	Is there damage to spillways or berms?		
A-13	What was the date of the last post-closure inspection?		

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date_______________________________ Facility_______________________________

Inspector_______________________________ Weather Conditions_______________________________

B. Gas Collection System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
B-1	Is there evidence of odors or gas emissions through the final cover?		
B-2	What is the condition of the gas vents?		
B-3	What was the date of the last inspection?		

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date____________________________ Facility____________________________________

Inspector__________________________ Weather Conditions____________________________

C. Leachate Collection System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS		LOCATION
C-1	Leachate manhole: • Is the manhole secure?			
	• Are there visible leaks or structural cracks present?			
C-2	Leachate Pump Station: • Is there evidence of leaks, loose plumbing or electrical connections?			
C-3	Flow Gauges: • Are flow gauges functional?			
	• Does the data indicate consistent operation?			
C-4	Leachate Elevations: • Change in static elevations over past six months	Prior Elevation	Current Elevation	Change
	-P29			
	-P30			
	-P31			
	-P33			
	-LW-1			
	-LW-2			
	-LW-3			
	-LW-4			
	-LW-5			
	-LW-6			

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date________________________________ Facility____

Inspector_____________________________ Weather Conditions_______________________________

D. Purge System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
D-1	Any evidence of loose fittings or leaks at the purge well manhole plumbing?		
D-2	Are pressure gauges in good working condition? (non-zeroed & cracked cover plate?)		
D-3	Is there any evidence of physical damage to the purge wells?		
D-4	Do the flow data (Cycles/day & cumulative volume) indicate consistent operation?		
D-5	Indicate flow meter reading.		

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date________________________________ Facility____

Inspector____________________________ Weather Conditions__________________________________

E Site Security Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
E-1	Is the fence secure and in proper condition?		
E-2	Are gates in place and in working order?		
E-3	Are locks in place and in working order?		
E-4	Are lockboxes installed and in working order?		

APPENDIX B

FIRM Map

84°43'7.95"W 42°48'51.62"N

84°41'14.59"W 42°46'45.94"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **11/10/2021 2:30 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: No elevation features on this FIRM
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **287** OF **375**

Panel Contains:

COMMUNITY	NUMBER	PANEL
CHARTER TOWNSHIP OF WATERTOWN	260291	0287

MAP NUMBER
26037C0287D
EFFECTIVE DATE
May 03, 2011

APPENDIX C

Closure and Post-Closure Plan

CLOSURE AND POST-CLOSURE PLAN
for
GRANGER LANDFILL
MID 082771700
WATERTOWN TOWNSHIP
CLINTON COUNTY, MICHIGAN

Prepared By
Granger Land Development Company

October, 1984

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

NOTE: Only Pertinent Parts of these Appendices Have Been Included.

I INTRODUCTION

Granger Land Development Company (GLDC) began operating the Granger Landfill in 1974 for other owners who had started the landfill in 1970. GLDC purchased the landfill in 1980.

During the late 1970's, the Michigan Department of Natural Resources (MDNR) began controlling wastes other than conventional municipal and industrial waste by issuing approval letters for various "special wastes" which permitted generators to dispose of these wastes at selected landfills. Under RCRA and Michigan Act 64 (Michigan Hazardous Waste Act) some of these wastes were subsequently considered to be hazardous wastes.

In November 1980, to comply with RCRA, GLDC submitted a Part A application for Interim Status. During October of 1981, after submitting detailed engineering plans to upgrade a portion of the site to Michigan Act 64 standards, GLDC negotiated an agreement with MDNR which severely limited the type and quantities of hazardous wastes which could be accepted at the site under constraints imposed by Michigan Act 64. The limitations in the agreement were based upon the types and quantities of wastes that had been received at the facility in the past. A copy of this agreement is included as Appendix I.

At the GLDC (Watertown Township) Landfill, the original landfill is part of a larger overall expanded facility. In May 1981, detailed engineering plans were submitted to MDNR to upgrade and expand the facility to the newly developed Act 641 (Michigan Solid Waste Management Act) standards. These plans included details on overall site development and final contours to provide for permanent drainage with a continuous cover over the entire facility. See Figure 1 for a description of these areas.

As part of an Act 641 Construction Permit GLDC received for this facility, GLDC had to submit additional plans to further upgrade the "existing filled site" to Act 641 standards. These plans were submitted on June 30, 1982 with a subsequent submission for a soil bentonite cutoff wall on August 24, 1983. In summary, a clay wall or slurry wall has been constructed around the existing filled site and a leachate collection system has been constructed on the landfill side of this wall around three quarters of the site. These features are shown in Figure 2.

In order to comply with RCRA 265 Subpart G, Closure and Post Closure Plans were originally developed in early 1981. These plans have been revised twice with the most current Closure Plan dated June 14, 1983 and the most current Post Closure Plan and Cost Estimate dated July 29, 1983. This Closure Plan is consistent with the prior prepared plans except for three substantial changes. The final cap is proposed herein to be 5' thick (compared to the original 2'), the proposed closure schedule is accelerated from 1988 to 1985 and substantially less waste (lower final contours) will be placed in the site then originally proposed. The "existing filled site" is the only area where hazardous waste has been placed at Granger Landfill. This is the area proposed for final closure under this plan and would constitute final closure under RCRA for the entire facility under RCRA.

Granger Landfill had operated as a codisposal facility from November 1981 through April 1983. Since April 1983, only non-hazardous waste has been placed in the facility to achieve final grades so that the site can be finally capped with an adequate permanent slope to provide drainage.

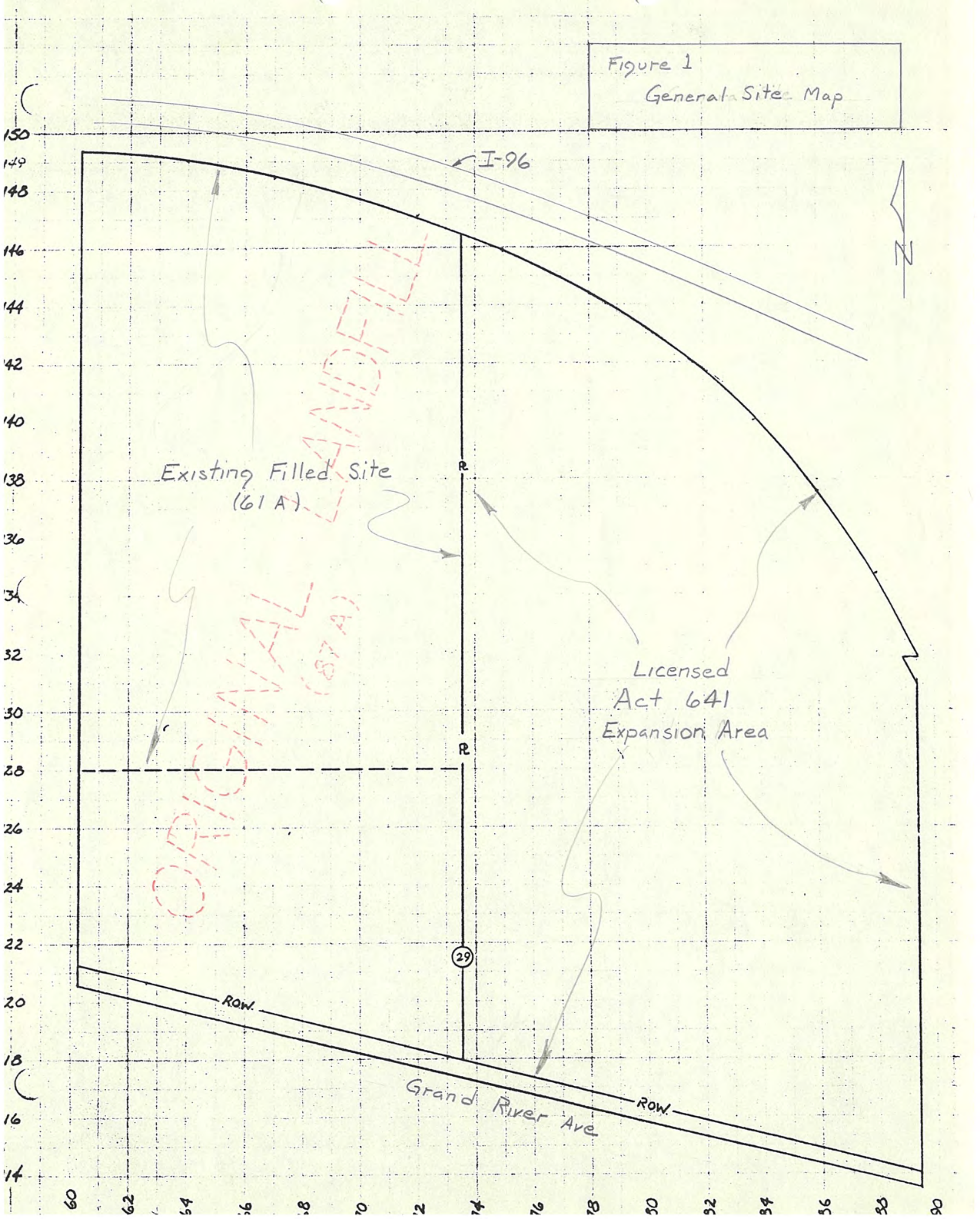

Figure 1
General Site Map

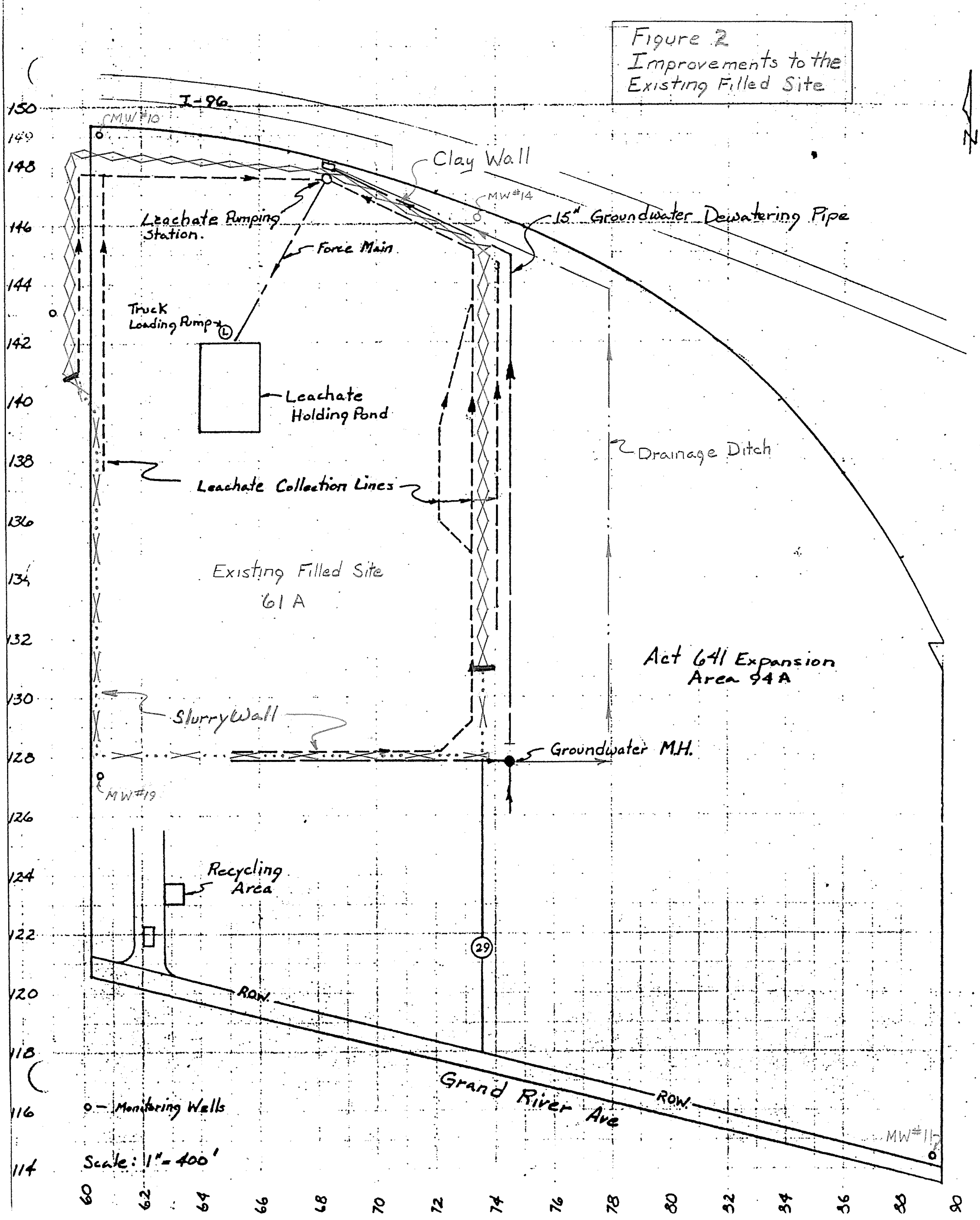
Figure 2
Improvements to the Existing Filled Site
I-96
MW#10
Clay Wall
MW#14
15" Groundwater Dewatering Pipe
Leachate Pumping Station.
Force Main
Truck Loading Pump
Leachate Holding Pond
Drainage Ditch
Leachate Collection Lines
Existing Filled Site
61 A
Act 641 Expansion Area 94 A
Slurry Wall
Groundwater M.H.
MW#19
Recycling Area
29
ROW.
Grand River Ave
ROW.
MW#11
o – Monitoring Wells
Scale: 1" = 400'
150
149
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II CLOSURE PLAN

A. Site Characteristics

1. Physical Descriptions

The location of the landfill is described on pages 3 - 6 of Appendix II, GLDC's Act 641 Construction Permit Application.

The generalized topography of the area is discussed in Appendix II, pages B-1 through B-3 of Appendix B, which is the Environmental Assessment. More detailed on-site topography is presented as the screened backround in Appendix III, the proposed Final Site Contour Plan.

Land use is discussed on page B-3 of Appendix II.

Groundwater in the area generally flows in two separate aquifers. The generalized geologic profile in the area is a surface brown sandy clay (4'-22' thick) followed by deposits of sands, silts and gravels (9'-61' thick) followed by a gray clay till which is underlaid by the Saginaw sandstone bedrock. This is discussed in more detail in Appendix II. (See Appendix A and Appendix B, page B-4) Additional discussion is presented in Appendix IV.

Drinking water in the area is primarily obtained from wells drilled into the underlying Saginaw sandstone. In Appendix IV pages 3 and 4, there is a discussion that only one of thirty-five available well logs in the area is in the drift. Furthermore, this well is upgradient from the landfill.

Surface water from the site is discussed on pages B-3 and B-4 of Appendix II.

2. Climate

A generalized climate discussion is presented on page B-5 of Appendix II.

In this reference, it is noted that the mean annual precipitation in the Lansing area is 30 inches. However, of particular interest to landfill management is the pH of the rainfall. A statewide study of the pH of precipitation was performed by the Air Quality Division of MDNR. The logarithmic weighted average of 13 studied sites for the years 1981 - 1983 was a pH of 4.2 (Reference 4).

3. Work Performed at the Site

As part of GLDC's Act 641 engineering plans and the associated subsequent submittals (discussed in the Introduction) to upgrade the "existing filled site", a number of major construction projects were performed to upgrade the site. These projects included:

(1) construction of a leachate collection around 75% of the site;

(2) construction of a leachate pumping station;

(3) construction of a leachate holding pond with tanker loading station;

(4) construction of clay walls;

(5) construction of a slurry wall.

This work is shown in plan view in Figure 2. With the completion of the slurry wall in August 1984, the site is now surrounded with a wall that has a permeability of less than 1×10^{-7} cm/sec.

As part of our leachate management system, a holding pond was constructed to temporarily hold the leachate until it can be hauled with tankers to the local wastewater treatment plant. This system will continue to be operated until a permanent connection to a municipal sewer can be developed.

B. Hazardous Waste On Site

1. Quantities Placed

As discussed in the Introduction, the type and quantities of hazardous waste that were received at the site were severly restricted due to the MDNR - GLDC Consent Agreement (See Appendix I). With these restrictions, the only types of hazardous wastes that were accepted at the landfill were EP Toxic wastes for heavy metals only and contaminated soils from spill cleanups. A summary of the wastes received are presented in Table 1.

At this time, there is an estimated 1,200,000 tons of solid waste in the "existing landfill site". From Table 1, 6,652 tons of RCRA hazardous waste were placed in the facility. This represents approximately 1/2 of 1% of the total waste placed. It should further be noted that many of the contaminated soils that were received had average concentrations of less than 100 mg/l (less than .001 percent) of hazardous waste constituent present.

2. Mobility

The EP Toxic wastes received included: air pollution control equipment dusts; junk yard sludge; wastewater treatment sludges; etc. The pH of the leachate from our landfill has ranged from 5.9 - 8.4. These pH's are not sufficiently acidic that a great deal of leaching would be expected to occur. However, it has been reported that even if the metals are leached, they are usually quickly adsorbed on small amounts of clay (Reference 1). Therefore, one would not expect heavy metal movement off-site.

Data available on the movement of the chlorinated organic compounds appears to be conflicting. When concentrated streams (greater than 50%) of chlorinated organic compounds have been placed on simulated clay liners, the permeability of the clays have been shown to increase (Reference 2). However, when these solvents are present with water at concentrations of less than 1% (GLDC situation), permeabilities do not appear to be affected (Reference 3). Future research will undoubtedly clarify these observations.

TABLE 1

Summary of Types and Quantities of Hazardous Waste in the Landfill
(Quantities Reported as Tons*)

Waste Type	1981 (12/80-11/81)	1982 (12/81-11/82)	1983 (12/82-4/83)	1984
		RCRA Hazardous Wastes		
D006 (Cd)		41	14	
D007 (Cr)		401	819	
D008 (Pb)		1966	172	
Soils Contaminated With:		2165	1070	
U154 Methanol				
U210 Tetrachloroethylene				
U220 Toluene				
U226 1,1,1 Trichloroethane				
U228 Trichloroethylene				
Subtotal	-0-	4573	2079	-0-
		Act 64 Hazardous Waste		
001D (Cu)			4	
003D (Zu)		3841	2248	
Subtotal		3841	2252	
TOTAL	-0-	8414	4327	-0-

*Assumes 1 yd^3 of waste = 1 ton

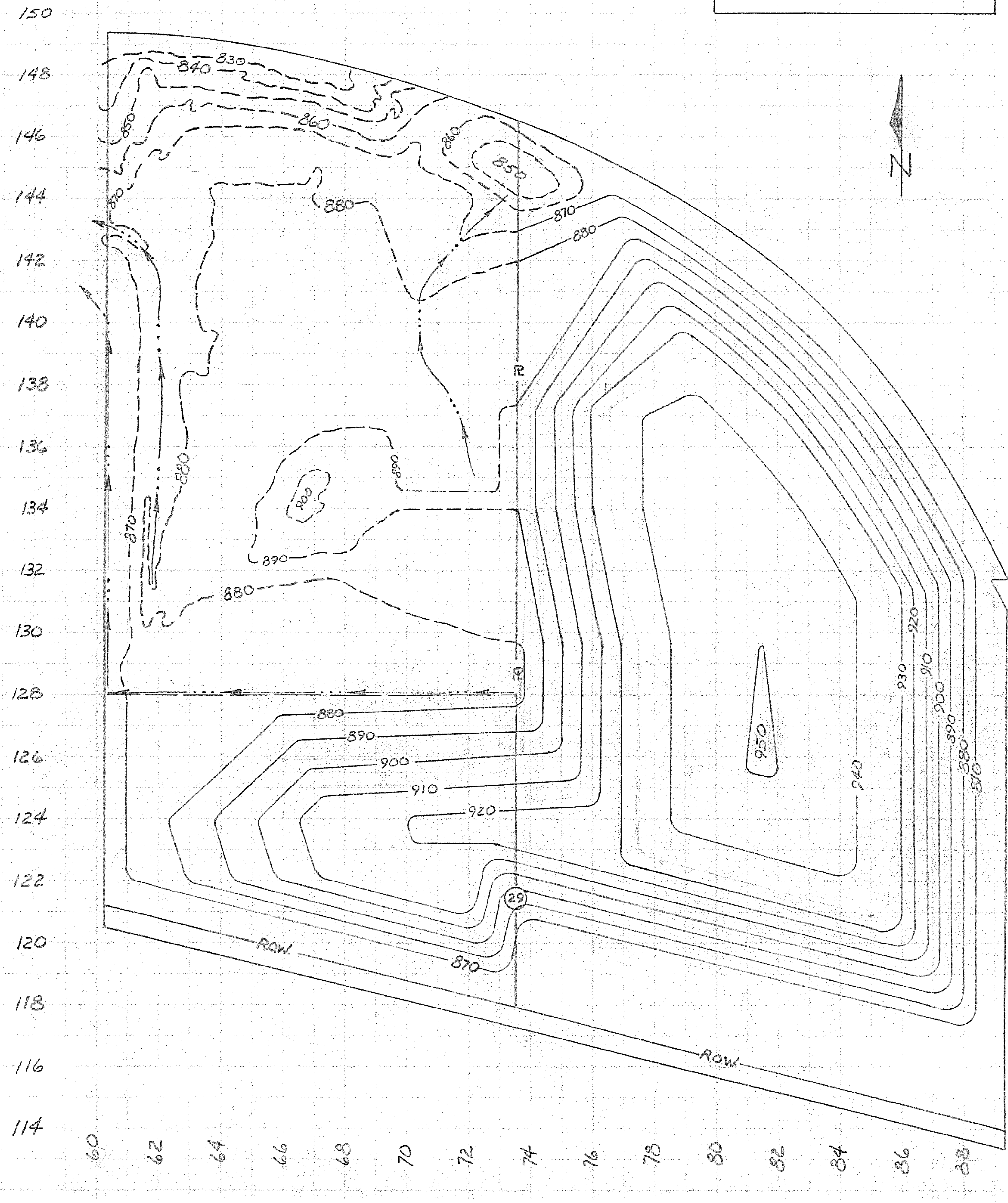
C. Final Cover

As portions of the "existing filled site" have been brought to final grades consistent with our Act 641 approved engineering drawings, these areas have been final covered, topsoiled and seeded. To date, approximately 29 acres of the total estimated 61 acres have been final covered. The areas that have been final covered and closed and the area to be closed under this closure plan is presented in Appendix III of this plan.

For the areas which will be final covered under this closure plan, GLDC is proposing to place 5' of compacted clay with 3"-6" of topsoil and seeding. GLDC will cover all the area within Areas I and II during the 1985 construction season at whatever grades exist on the facility at that time. In order to achieve the final grades for the "existing filled site" as presented in Appendix III, clean soils may have to be placed over the final filled cap in Area II in the future. These soils will be placed at a time when the fills adjacent to the south and east sides are brought to the grades shown in Appendix III. In any case, the final 5' cap placed during the 1985 construction season would constitute closure of the site. The proposed final grades for the entire facility are presented in Figure 3.

On the west and north sides of the site the proposed 5' of final cover of compacted clay will be keyed into the existing final cover. On the south side of the site, the 5' final clay cover will be keyed into a vertical clay wall which is a minimum of

Figure 3
Final Facility Grades



10' thick, the base of which is the slurry wall. On the east side, the final cover will extend over to the original property line where it will be keyed into the final cover of the Act 641 Expansion Area.

The material to be used for the final cover will be the on-site gray clay tills and the brown clay tills. Numerous proctor, atterberg limit and remolded permeability tests have been performed on these soils. Examples of these data are presented in Appendix V. These soils are ML's or CL's per the Unified Soil Classification System as determined by ASTM D 2487-75. The clay will be compacted to at least 90 percent of the maximum dry density of the material as determined by the Modified Proctor Test ASTM D 1557-78. Compaction will be performed between -2 and +5 percent of the optimum moisture content as determined by the Modified Proctor Test. When the clays are placed with these controls, laboratory and field verified permeabilities are always less than 1×10^{-7} cm/sec and usually $2 - 9 \times 10^{-8}$ cm/sec.

Final surface contours were developed to provide a minimum of 2 percent slopes to prevent ponding and slopes not greater than 25 percent to prevent erosion. The final grades are shown in plan view on the drawing in Appendix III.

Construction of the cap will proceed by first establishing the existing site grid, on the portion to be closed. Final elevations to achieve the required 5' clay cover will be determined. Clay will be placed and compacted in lifts not exceeding 12 inches using suitable earth moving and compaction equipment.

Following the placement of the clay cap, 3"-6" of topsoil obtained on-site will be applied to the clay cap. To this topsoil, 240 lb/acre of 12-12-12 fertilizer will be added. Seeding will be performed using mechanical drills where slopes permit or broadcast on steep slopes. Michigan Department of Transportation "Roadside Mix" of seed will be used at 100 lb/acre.

In order to prevent off-site migration of gas and to provide a vehicle to vent the gas through the compacted clay cover, gas vents will be installed. These vents will be installed per Figure 4 on a 300 foot grid across the final cover. On the completed portion of the site, three vents are already installed and obviously venting successfully based upon observed gas flow.

D. Geology and Hydrogeology

A series of geological and hydrogeological studies have been performed on the site. The first study performed by John R. Byerlay, Geological Survey Division, MDNR was performed in June, 1970 prior to initiating landfill operations. A second study was performed in February, 1977 by Allan Ostrander, Geologist, MDNR. Keck Consulting Service performed two additional studies presented in Appendix II (Appendix A) and Appendix IV. In addition, subsequent soil borings were performed as part of an upgrading of the existing Act 641 site and as part of the design of the slurry wall that was constructed in 1984.

All of these studies confirmed a continuous underlying gray till that exists between the landfill and the underlying sandstone

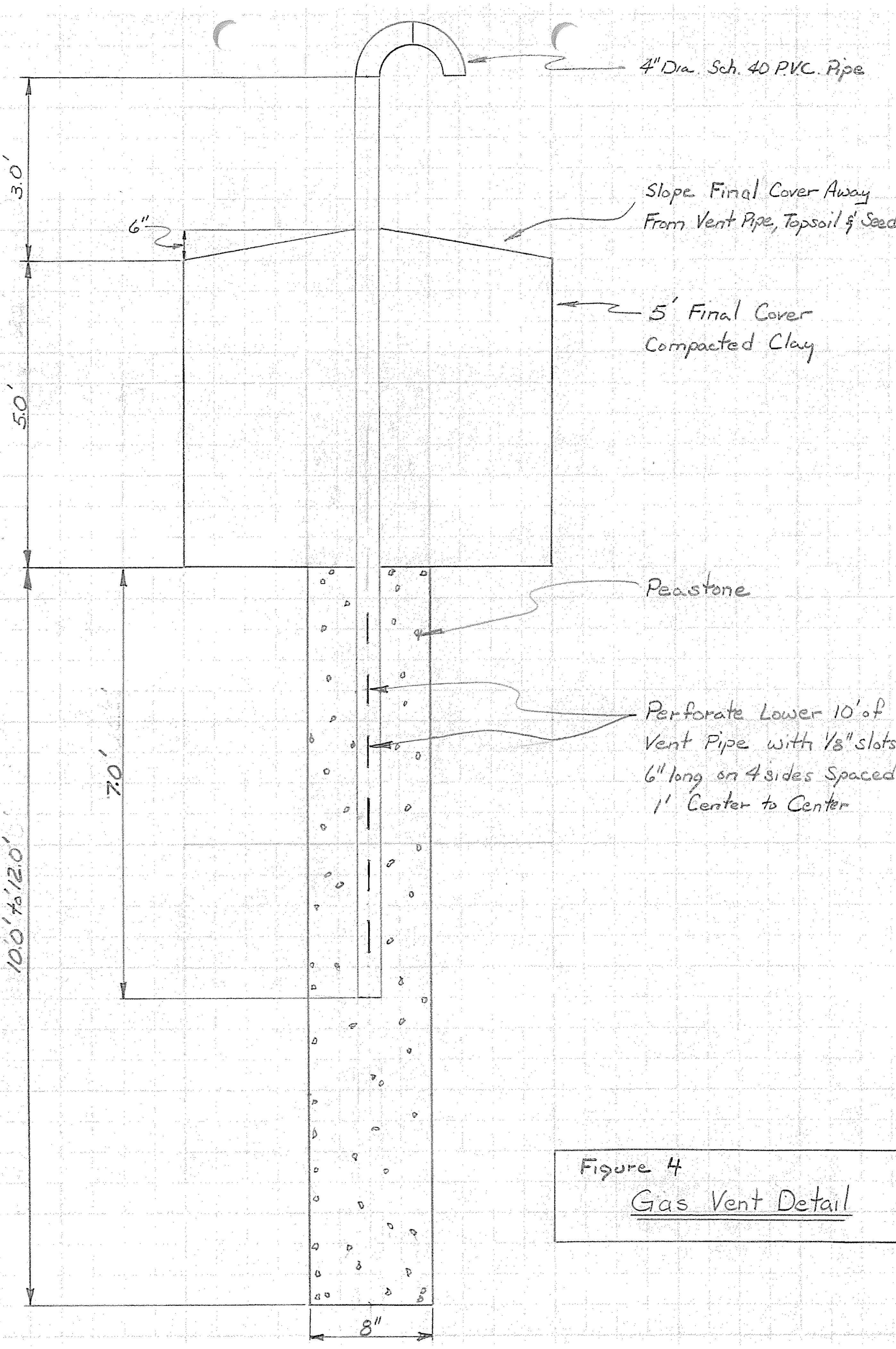


Figure 4
Gas Vent Detail

bedrock which is the primary source of drinking water in the area. The more recent Keck hydrogeological studies have shown that the permeable layer of sands and silts may extend below the base of the existing landfill.

To deal with this observed condition, all new areas of the site are being developed with constructed clay liners. In the "existing filled site", the site was surrounded with a clay/slurry wall with a leachate collection system on the landfill side of the wall set an an elevation that provides for a hydraulic gradient into the site and into the leachate collection system. An east-west section through the site at grid coordinate 136+00N showing these relationships is presented in Figure 5.

E. Groundwater Assessment Plan

During the 1982-83 period, GLDC, in compliance with 265 Sub-Part F, reported to U.S. EPA that based on the statistical analyses of the groundwater monitoring data at Granger Landfill, there appeared to be statistically significant changes between upgradient and downgradient groundwater quality. GLDC believed these data were "false positive" readings and provided additional documentation to EPA supporting that position.

After EPA reviewed GLDC's submission on this issue, EPA concurred that the results appeared to be false positive but directed GLDC to confirm that no hazardous waste constituents are leaving the site. A plan was submitted to EPA on September 27, 1984 to accomplish this directive.

Section 136+00

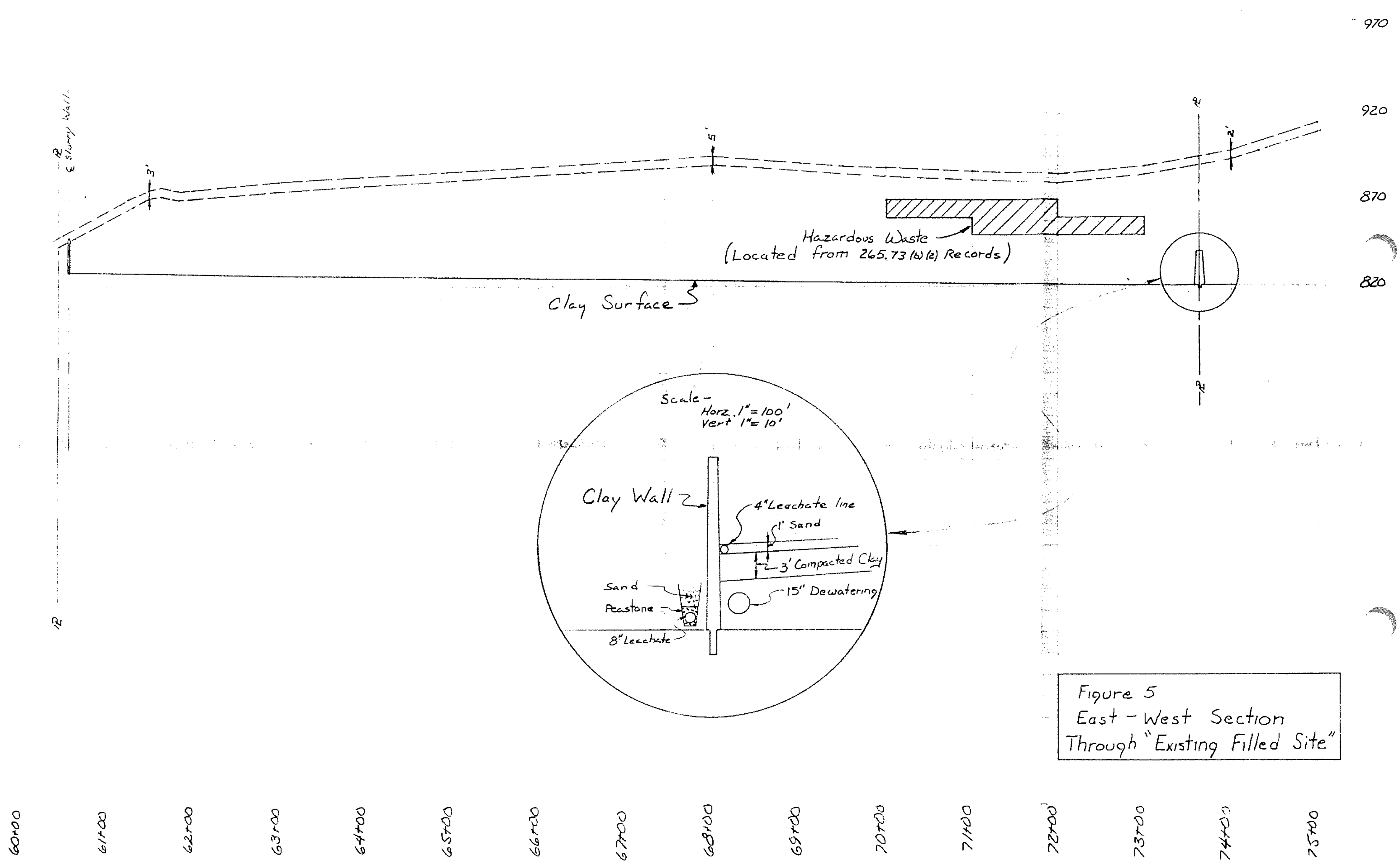


Figure 5
East - West Section
Through "Existing Filled Site"

Section 136+00

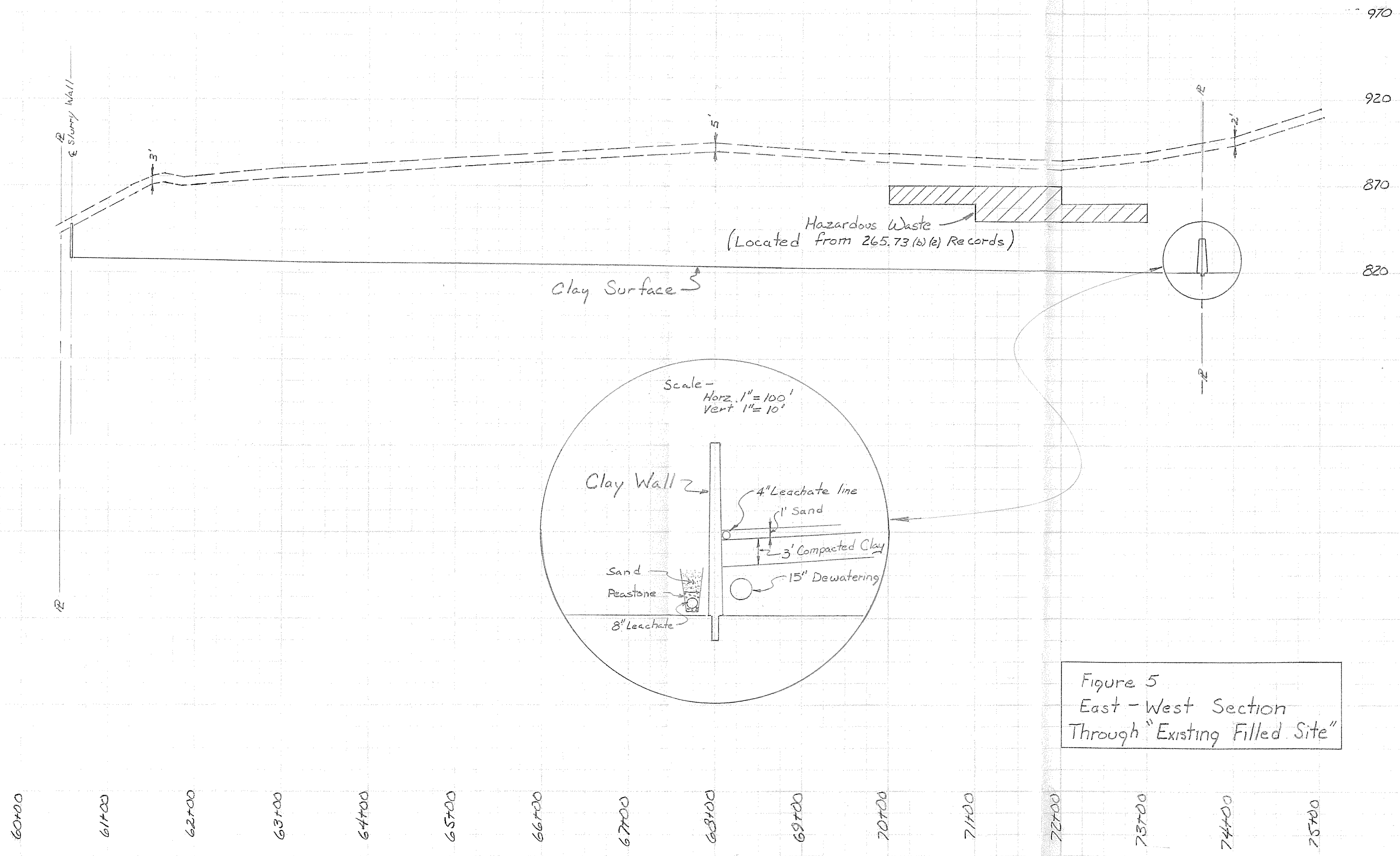


Figure 5
East - West Section
Through "Existing Filled Site"

F. Disposal or Decontamination of Equipment

In that the on-site hazardous waste is buried from 20 - 50 feet below the surface with municipal refuse and intermittent cover, no contact will be made between equipment used in closure and the hazardous waste (See Figure 5). Therefore, no decontamination will be required.

G. Closure Schedule

1)	Submit Closure Plan to U.S. EPA	October 1, 1984
2)	Receive EPA Approval to Closure Plan	April 1, 1985
3)	Initiate Placement of Final Landfill Cap	May 1, 1985
4)	Complete Placement of Final Landfill Cap	September 30, 1985
5)	Complete Placement of Topsoil on Area I	October 15, 1985
6)	Seed Areas I and II	October 15, 1985

Note: If approval of this Closure Plan is not obtained by May 1, 1985, GLDC may not be capable of complying with the subsequent dates in this schedule.

H. Certification of Closure

An independent registered professional engineer will be retained to perform inspection duties on the project. These duties will include:

(1) Performing our field density-moisture test for each 1000 cubic yards of clay placed with a minimum of one test per layer. The test procedure will be per ASTM D 2922-78.

(2) Particle size distribution and Atterberg limits will be performed on random samples for each 10,000 cubic yards of material placed following ASTM D 422-63, D 423-72 and D 424-71 procedures.

(3) Permeability tests on the completed liner will be performed at a frequency of one test for each 20,000 cubic yards of material placed. Tests will be performed on Shelby tube samples using triaxial testing techniques.

(4) If soil texture changes are observed, a modified proctor test ASTM 1557-78 will be performed to determine a new maximum density and optimum moisture content.

(5) Daily reports covering the work performed

At the completion of the project, a report summarizing all gathered field data and daily reports will be prepared with a certification that the work constructing the cap was in accordance with the closure agreement. This report will be certified by the independent professional engineer.

III POST CLOSURE PLAN

A. Introduction

Post-closure care of Granger Landfill's "existing filled site" will be performed for the required 30 year period per 40 CFR 265.117.

The groundwater monitoring plan presented herein is proposed based upon the best available current information. It is recognized by GLDC that the Groundwater Assessment Plan that was submitted to U.S. EPA on September 27, 1984 may change the monitoring program. GLDC will perform the Groundwater Assessment Plan as submitted and if the results of that study dictate a more comprehensive monitoring program, the more comprehensive program will be followed in lieu of the following.

B. Groundwater Monitoring Plan

(1) Well Description

The wells that will be monitored during the post closure period are MW No.'s 11 (upgradient) and 10, 14 and 19 (downgradient). These are the same wells that are currently monitored for RCRA 40CFR265 Sub-Part F compliance. The location of these wells are shown on Figure 2 which was presented earlier in this report.

(2) Monitoring Parameter/Frequency/Procedures

A summary of the monitoring program is presented in Table 2 which was developed based upon 265 Sub-Part F

TABLE 2

Annual Groundwater Monitoring Program
for
Thirty Year Post Closure Period

Parameter	Monitoring Well 10	11	14	19
Quality Parameter				
Chloride	A	A	A	A
Iron	A	A	A	A
Manganese	A	A	A	A
Phenols	A	A	A	A
Sodium	A	A	A	A
Sulfate	A	A	A	A
Indicator Parameter				
pH	S	S	S	S
Specific Conductance	S	S	S	S
TOC	S	S	S	S
TOH	S	S	S	S
Groundwater Elevation	W	W	W	W

Key - A - Annual Monitoring
S - Semi-annual Monitoring with 4 Replicates Measurements on Each Sample
W - Will be Measured Whenever Samples are Obtained

requirements. Sampling, preservation and analytical procedures will follow SW 846. Sampling, chain of custody, analyses and field observations related to groundwater monitoring will be performed by a contract laboratory.

C. Maintenance Activities

(1) Final Cover

Final Cover will be checked twice annually (spring and fall) for severe cracking, erosion and/or differential settlement that would cause ponding. The inspection will take the form of walking profiles across the landfill cap and walking each drainageway.

Ponding areas will be filled to ensure positive natural drainage. Eroded areas will be repaired to their original constructed or equal condition.

(2) Leachate Management System

Post closure care of the leachate management system will be discussed as initial and future conditions. The initial condition consists of a continuation of our current system while the future condition would be applicable to the time we can receive permission to connect to a municipal collection system.

For the initial condition, the automatically controlled leachate pump station will be checked weekly to ensure proper operation. From the pump station, leachate is pumped to the leachate holding pond where it is loaded into tankers and transported to a municipal wastewater treatment plant. The holding pond has a 40 day storage capacity. It is pumped on a regular basis to keep the water level in the pond as low as possible. This means of operation provides storage capacity if leachate cannot be transported for any reason. This leachate is managed as a hazardous waste and GLDC will continue to do so until delisting can be obtained.

If permission can be obtained to connect the pump station directly to a municipal collection system via force main, the holding pond would then only be needed for emergency leachate management. Once a force main is installed, the pump station would be checked weekly to ensure proper operation. If the pump station would malfunction, repairs would be made to correct the system to the design conditions.

For both initial and future conditions, when it becomes apparent that leachate production diminishes to a negligible or very low level, inspection frequency would be reduced accordingly.

(3) Gas Venting System

The gas venting system described in the closure plan will be checked during the semi-annual inspections.

If vents are damaged they will be repaired.

In lieu of venting, GLDC may install a landfill gas collection system to use the landfill gas as a fuel. No specific plans have been developed at this time.

(4) Surveyed Bench Marks

Permanent bench marks will be inspected during the semi-annual inspection. If they have been disturbed, they will be re-established.

(5) Restricted Access

During the semi-annual inspection, fences will be checked and repairs made if necessary to properly restrict access.

D. Post- Closure Period Contact

Kurt Guter
Granger Land Development Co.
6025 Aurelius Road
Lansing, MI 48910

(517) 393-2130 (Business)

(517) 349-0928 (Home)

REFERENCES

1) ATTENUATION OF POLLUTANTS IN MUNICIPAL LANDFILL LEACHATE by CLAY LINERS, U.S. EPA Publication EP 1.23/2 : 600/2-78-157, August 1978, page 125.

2) Anderson, D., "Does Landfill Leachate Make Clay Liners More Permeable?", Civil Engineering, September, 1982, pages 66 - 69.

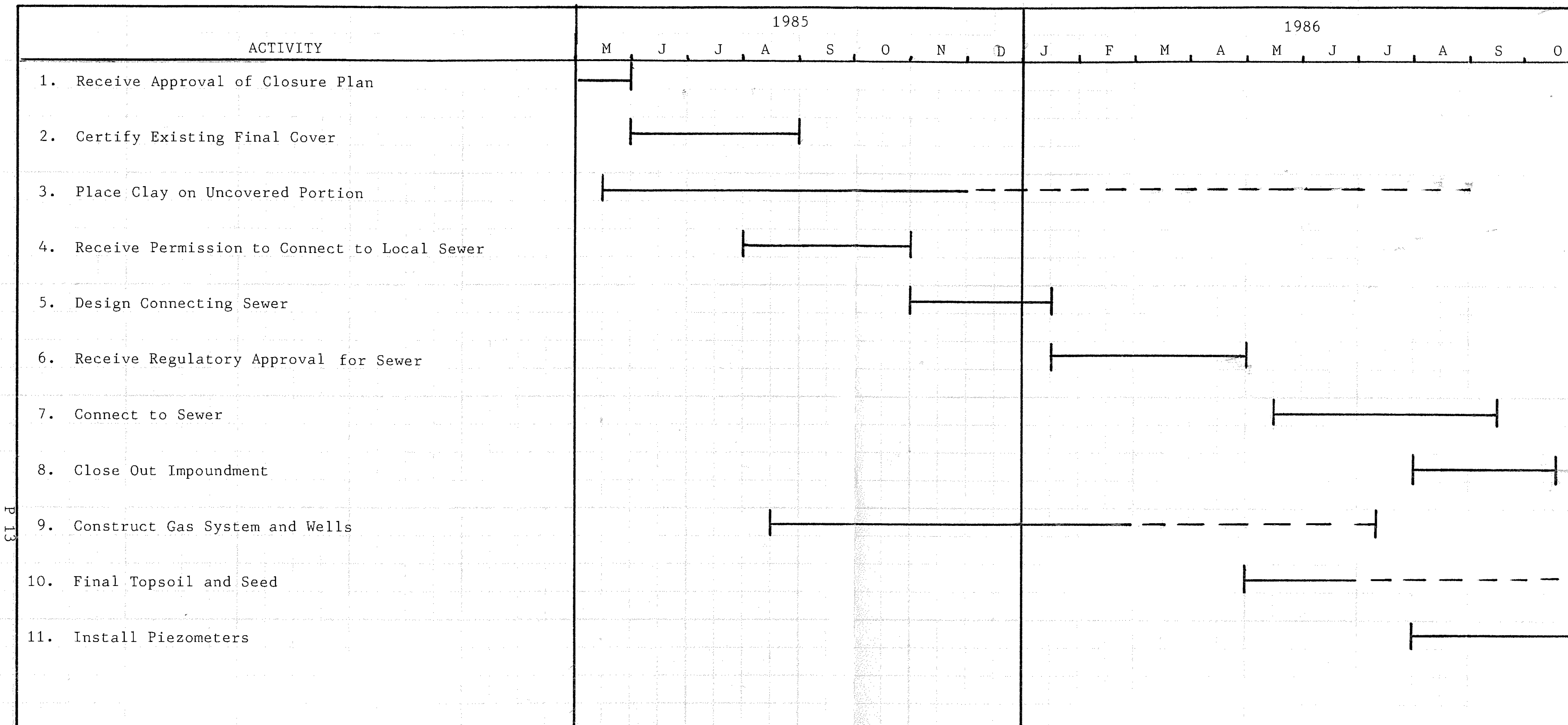
3) Green, W.J.; Lee, G.F.; Jones, R.A.; "Clay Soils Permeability and Hazardous Waste Storage", J. Water Pollution Control Federation; Vol. 53 No. 8; August, 1981; page 1353.

4) Terkeurst, L.; Telephone Conversation with Air Quality Division, Michigan Department of Natural Resources; 9/24/84.

APPENDIX V

Typical Proctor, Atterberg and Permeability Tests for the Material Proposed for the Clay Cap.

In addition to the following data, additional information is presented in Appendix II (Appendices E, F and G).



P 13

NOTES: (1) Schedule Assumes May, 1985 Regulatory Approval

(2) Solid Lines - Best Estimated Schedule
Dashed Lines - Possible Time Extension Areas

(3) Item 4,5,6,7,8 Require Permission to Connect to Sewer

FIGURE AI-1

CLOSURE SCHEDULE
GRANGER LANDFILL
MID 082771700

Prepared 4/12/85

Guter 0/1/88

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO THE ATTENTION OF:
5HS-13

JUL 24 1985

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Kurt Guter, Ph.D., P.E.
Vice President
Granger Land Development Co.
6025 Aurelius Road
Lansing, Michigan 48910-5799

RE: Closure and Post-Closure Plan
Granger Landfill
MID 082 771 700

Dear Dr. Guter:

The United States Environmental Protection Agency has reviewed the Closure and Post-Closure plans dated October 1, 1984 and revised plans dated April 12, 1985. These plans are approved but subject to the conditions contained in the enclosure to this letter.

When closure is completed, the certification required by 40 CFR 265.115 must be submitted.

If you have any questions regarding the plans, please contact Richard Traub of my staff, at 312 886-6138, for assistance.

Sincerely,

Basil G. Constantelos, Director
Waste Management Division

cc: Alan J. Howard, MDNR w/enclosure
John Bohunsky, MDNR w/enclosure

RECEIVED JUL 26 1985

ENCLOSURE

1. Certification that all areas previously covered have no less than 3 feet of compacted clay of a permeability equal to 5 feet of 1×10^{-7} centimeters/second material. This certification should be conducted as follows:

   a. Using a minimum of 10 Shelby tube samples and depth measurements (to verify thickness and permeability every 10,000 cubic yards placed). Samples should be taken from the following locations:

      13400 N, 6200 E
      13700 N, 6200 E
      14000 N, 6200 E
      14300 N, 6200 E
      14600 N, 6300 E
      13700 N, 6500 E
      14000 N, 6500 E
      14300 N, 6500 E
      14600 N, 6600 E
      14600 N, 6900 E

   b. If a sample fails, take samples 100 feet in each direction from the failed sample. Failed areas shall then be recertified as follows:

      i) By recompacting to achieve the equivalent of 3 feet of 1×10^{-7} cm/sec compacted clay on all areas within 50 feet of a failed sample.

      ii) By resampling to verify these specifications.

      iii) By regrading if compaction alone fails to meet the specification.

Subsequent Court order Allowed Delay to close pond

2. Closure of the leachate holding pond must be performed in accordance with 40 CFR 265.111, 265.114, 265.115, 265.228(a) and (b). The presence of this pond violates the objective of 265.310(b)(2), which is, to prevent pooling and control surface water infiltration. Also, the Hazardous and Solid Waste Amendments of 1984 require owners/operators of land disposal facilities (i.e. landfills, waste piles, surface impoundments and land treatment units used for treatment, storage or disposal) to submit a Part B permit application by November 8, 1985, if discharge to that unit is to continue after that date. Proper slope for control of ponding, runoff and erosion must be established when closure is completed and maintained during post-closure over the entire closed area.

3. For the five feet of compacted clay, particle size distribution and Atterberg limits are to be performed for each 5,000 cubic yards of material placed. Permeability tests are to be performed for each 10,000 cubic yards of material placed.

4. Final cover inspection for erosion, settlement, cracking and undesirable (deep rooted) plant species shall be conducted at least semi-annually.

5. The amount of soil to be placed over the clay cap shall be a minimum thickness of 18 inches.

6. Piezometers shall be installed in locations shown on drawing 85-100 and completion of a pump test to evaluate the area of influence of these wells (for effective dewatering), by October 1, 1985. Results of the pump test and as built plans for the piezometers shall be submitted to U.S. EPA, Region V and the Michigan Department of Natural Resources by October 31, 1985.

Determined to be unnecessary

7. The closure period shall be extended to October 31, 1986. The following activities shall be completed by this date:

   a. Closure of the leachate surface impoundment and discharge of leachate directly to a POTW or to a tank for storage (See item # 2). The surface impoundment shall be closed by filling to surrounding grade and capping with no less than 2 feet of 1×10^{-7} cm/sec compacted clay.

   b. Achievement of final grades. Areas which must be covered by clean fill to achieve final grade shall be final covered by not less than 2 feet of 1×10^{-7} cm/sec compacted clay, and 18 inches of top soil and shall be certified consistent with condition # 3.

8. A revised post-closure monitoring plan should include wells 19, 21, 23, and 24 in addition to the four "RCRA" wells proposed by the company (MW-11, 20, 22, and 25). Additional wells are needed to provide adequate lateral and vertical coverage of the site. Wells 11 and 19 have already had background established. However, other wells require quarterly samplin and analysis during the closure period to establish background. All wells should be sampled and analyzed in accordance with 40 CFR 265.92 during the post-closure period.

9. The revised post-closure monitoring plan shall include sampling and analysis of bedrock wells 16, 17 and 18. Although data indicates excellent hydraulic isolation between the shallow saturated zones and the bedrock aquifer, there are portions of the site in which it appears that the bedrock aquifer is the uppermost aquifer underlying the site. Since the bedrock aquifer is a major useable aquifer in this area its inclusion in the post-closure plan is critical. The wells shall be samplec annually for:

a. The following mobile hazardous constituents accepted at the site:

i) tetrachlorethylene
ii) toluene
iii) 1,1,1 trichloroethane
iv) trichloroethylene

b. The following "stiff diagram" parameters:

i) chloride (Cl^{-})
ii) iron (Fe^{+2})
iii) calcium (Ca^{+2})
iv) magnesium (Mg^{-2})
v) sodium (Na^{+})
vi) carbonate (CO_3)
vii) bicarbonate (HCO_3)
viii) sulfate (SO_4^{-2})

If concentrations of hazardous consitituents are detected in the bedrock wells during the post-closure period, the owner/operator must submit a Groundwater Quality Assessment Plan in accordance with 40 CFR 265.93(c).

10. Complete and return by August 30, 1985 the attached "Certification Regarding Potential Releases form Solid Waste Management Units".

CLOSURE AND POST-CLOSURE PLAN

for

GRANGER LANDFILL
MID 082771700

WATERTOWN TOWNSHIP

CLINTON COUNTY, MICHIGAN

ADDENDUM I

Prepared by

Granger Land Development Company

April, 1985

TABLE OF CONTENTS

for

ADDENDUM I

INTRODUCTION

On October 1, 1984 Granger Land Development Company (GLDC) submitted a Closure/Post-Closure Plan to U.S. EPA for Granger Landfill. Comments on this Plan were originally provided in a letter from Edith Ardiente, EPA, on January 29, 1985. On February 21, 1985 a meeting was held at GLDC offices with representatives of U.S. EPA (Richard Traub), MDNR (Al Howard and Phil Roycraft), Senator Reigle's office (Jim Jones) and GLDC (Kurt Guter and Mike Patton). The purpose of the meeting was to discuss EPA's January 29th letter and receive more detail as to what additional information EPA and MDNR were expecting in this Addendum to the Plan. A brief summary of the meeting was prepared by Phil Roycraft in his letter to Edith Ardiente dated March 5, 1985. In addition to the items discussed at the meeting, EPA has promulgated additional regulations related to Closure in the Federal Register on March 19, 1985.

Based upon the input described above, GLDC has prepared this Addendum to the Closure/Post-Closure Plan of October, 1984. In this Addendum, we will respond on a point by point basis to the 10 items in the Enclosure to Ms. Ardiente's January 29th letter.

Due to the changes described in the Addendum, the original schedule proposed on page 17 of the Original Closure Plan must be changed. A revised schedule is shown in Figure AI-1 following the narrative.

RESPONSE

1) Comment No. 1 defined a need for more data on the proposed groundwater monitoring system. Under a separate EPA action, we were required to prepare a Groundwater Assessment Plan under 40 CFR 293. The Assessment has been completed and is enclosed as Attachment I. Rather than reproducing the information presented in the Assessment, specific items will be discussed in the following paragraph with reference to the Assessment (Attachment I).

A groundwater contour map with flow direction is presented in Figure 1. Hydrogeologic cross-sections are presented in Figure 2 and Addendum II. A detailed discussion of the existing groundwater monitoring system is presented and a recommended new groundwater monitoring program is described in Chapter III, Section C. In Chapter II, Section B, geologic and water quality data are presented demonstrating poor communication, if any, between the bedrock and shallow aquifers.

The proposed post-closure monitoring would be per the "RCRA" wells and the bedrock wells (Numbered 16,17,18) as described in Table 7 of the Groundwater Assessment.

2) In Comment No. 2, we are directed to close the pond used for temporary leachate holding. As stated during our meeting on February 21st, this direction does not appear to be consistent with a prior MDNR/Court Order and the legislative direction provided in the RCRA Amendment's of 1984.

To be more specific, the leachate holding pond was constructed in April, 1983 under a court Order which was an agreement among MDNR, GLDC and PAL (Peoples Action League, a local citizens group). That Order specifically required GLDC to construct the holding pond on the landfill. Following construction of the holding pond, we received a letter from William Miner (U.S. EPA) dated June 17, 1983 indicating we were in non-compliance because of ". . . the addition of a hazardous waste storage unit (surface impoundment for leachate) without the approval of this Agency, as required by 40 CFR 270.72(c)." Based upon this June 17, 1983 letter, the following correspondence was exchanged.

a) July 1, 1983 letter - Kurt Guter (GLDC) to Joseph Boyle (EPA) Amending Part A

b) July 22, 1983 letter - William Miner (EPA) to Kurt Guter (GLDC) July 1, 1984 submission not adequate

c) August 24, 1983 letter - Kurt Guter (GLDC) to Technical Permits and Compliance Section - EPA - submitted a completely revised Part A Application

d) September 14, 1983 letter - Kurt Guter (GLDC) to Technical Permits and Compliance Section - EPA - submitted a photograph of the facility

e) September 12, 1983 letter - William Miner (EPA) to Kurt Guter (GLDC) Returned Part A because it was not correctly prepared

f) September 22, 1983 letter - Kurt Guter (GLDC) to Waste Management Division - EPA - Completely new Part A

g) October 14, 1983 letter - William Miner (EPA) to Kurt Guter (GLDC) Request for justification for changed Part A

h) October 26, 1983 letter - Kurt Guter (GLDC) to William Miner (EPA) Justification for change along with copy of Court Order dated April 22, 1983.

i) November 21, 1983 letter - Basil Constantelos (EPA) to Kurt Guter (GLDC) Interim Status for surface impoundment per 40 CFR 270.72(c) was approved.

With this approval, a review of, "The Hazardous and Solid Waste Amendments of 1984" (1984 RCRA Amendments) was performed. In Section 215 (j)(1), the law appears to provide for a four year period to submit a permit application for a surface impoundment. Furthermore, with the possible exception of Section 215 (j)(2)(B), we could be in compliance with Section 215 (j)(2) and, therefore, be in total compliance with the RCRA standards. To confirm this interpretation, a review of the text of the EPA video teleconference, conducted on December 11, 1984, was performed. On page 4 of Mr. Bruce Weddle's (Director, Permits and State Programs Division, OSW, EPA) speech, he stated, "The remaining facility owners and operators have until November, 1988 to submit their applications. Failure to meet this deadline will result in loss of interim status for those facilities in November of 1992."

Based upon the facts presented above, we believe we have MDNR approval (through the Order) and EPA approval (November 21, 1983 letter) to operate the surface impoundment. It appears that a Part B permit may have to be submitted prior to November, 1988 to be in continuing compliance with the law.

HOWEVER, we also would like to close the surface impoundment. A final decision on closure or upgrading must be delayed until a decision is made by the local unit of government to approve or deny our request to connect to the Southern Clinton County Municipal Utilities Authority (SCCMUA) Sewerage System. On December 12, 1984 we submitted a formal application to Watertown Township for permission to discharge to the sewerage system. Meetings on this subject were held February 25 and March 20, 1985. Negotiations are currently progressing.

Our specific closure plan follows:

I. By October 30, 1986, the leachate from Granger Landfill will be discharged to the SCCMUA system using a pumping station and a forcemain. After that connection and emptying of the surface impoundment, soil samples will be collected from the surface of the impoundment (at 2 samples/acre) and analyzed for EP toxicity and the hazardous waste constituents accepted at the site (see Table 8 of the Groundwater Assessment). If these samples demonstrate the soil to be hazardous, the hazardous soils will be removed and placed in the landfill. Following this checking and soils removal, if required, the soils in the base of the surface impoundment will be checked per item 4 of this response, verification of suitable cover, and brought into compliance with the provisions of item 4. The base of the surface impoundment would be top soiled and seeded per the provisions of item 4 of this response.

Current discussions with Watertown Township regarding connection to the municipal sewerage system are leading in the direction of requiring an on-site storage facility if the leachate would have to stop being accepted into the system for any reason. It has also been proposed that the existing surface impoundment could serve as that storage facility. We would like to explore this concept with the regulatory authorities.

The connection to the sewerage system could occur in 1985 but the realities of the approval process appear to indicate summer of 1986 is a more realistic time frame.

II. If we cannot connect to the municipal sewer system by October, 1988, we will submit a Part B application to upgrade the facility or propose an alternate location. It should be noted that detailed checking of the clay liner in the surface impoundment was performed by both MDNR and GLDC during installation. Records are available confirming a minimum of 3' of clay with a permeability of 1×10^{-7} cm/sec. Copies of detailed inspection reports including field density and permeability data are available from MDNR's Hazardous Waste Division. Based on these data and Section 202(O)(5)(B) of the 1984 RCRA Amendments, it is possible that the placement of a liner leak detection system and a synthetic liner is all that would be required to bring this facility into compliance.

3) Comment No. 3 relates to explaining the control and minimization of pollutant migration from the facility.

Groundwater:

Migration of pollutants to the groundwater is controlled by a clay wall and/or slurry wall that circumscribes the site. On the landfill side of this wall, a leachate collection system exists around 80% of the site (see Figure 2 of October 1984 Closure Plan). In the remaining areas, the installation of piezometers is proposed to demonstrate the inward hydraulic gradient around the site. These are shown on Figure 1 and discussed in Chapter III, Section C of the Groundwater Assessment (Attachment I). Invert elevations on the existing leachate collection system are also presented on Figure 1.

Surface Water:

Adequate slopes (minimum 2%) and drainage is proposed for the final capped site. See Appendix III of the Original Closure Plan dated October, 1984.

Air:

To control air emissions, we propose to install a landfill gas collection system. A proposed layout of this system is presented in Attachment II of this document. The landfill gas will initially be flared but our plan would be to subsequently use the gas to either generate electricity or as a fuel supply to a manufacturer. It is anticipated that either of these fuel uses will occur either on-site or in close proximity to the site.

To install the gas collection system, initially 2' - 4' of clay must be installed in the areas where no clay cover has been placed. This will be required so that the collection pipe will not be crushed. Following this clay placement, 30" - 36" diameter wells (averaging 40' - 60' deep) will be drilled into the trash and connected to a polyethylene pipe collection system, per Attachment II, which will be installed under the originally placed clay (2' - 4') and the completed liner (northwest corner). Following this construction, the final clay cap will be placed, topsoiled and seeded.

If this proposed concept of gas recycle is unacceptable or an alternative concept cannot be approved, steel pipes will be placed thru the liner per page 13 and Figure 4 (amended for steel pipe) of the Original Closure Plan dated October, 1984 and the gas will be flared.

4) In response to Comment No. 4, we are proposing to close the entire Part A Interim Status Site with the exception of the Surface Impoundment discussed in Item 2.

We propose the following certification/verification program to demonstrate an adequate cover was placed on the 29 acres discussed on page 10 of the Original Closure Plan. As stated, that portion of the facility was closed per approved Act 641 plans which require 2' of cover. The work was performed during 1981 and 1982.

Correspondence related to this activity is presented in Attachment III. Since every Act 641 landfill in the state is closing with this 2' cover requirement, it is obvious that MDNR believes this depth to be a structurally sound depth capable of withstanding some settlement. It should further be noted that Appendix III of the Original Closure Plan, October, 1984, clearly shows that no hazardous waste was placed under this area.

The following verification testing program will be performed on the existing "Final Covered Area" at a frequency equivalent to the testing frequency proposed in our Closure Plan. We specifically agree to verify clay cap thickness and permeability at a rate of one permeability test per 20,000 yards of clay in place. Each acre of cap would contain a minimum of 3,200 cubic yards of clay. Therefore, a minimum of one permeability test would be required for each 6 acres, or a total of five tests. To provide additional assurance, a total of eight depths will be checked to verify the 2' of final cover and eight Shelby tubes will be taken for permeability analyses. Triaxial permeability testing will be performed on these samples to verify a permeability of less than 1×10^{-7} cm/sec.

5) In response to Comment No. 5, please see page 21, c(1) of the Original Closure Plan. A decision to reseed will be made if there are areas larger than 10' x 10' with no vegetation. The areas will be reseeded per the original specification.

6) In response to Comment No. 6, in the event repairs or alterations are made to the cover, the quality assurance program defined under Section H, pages 17 - 18 of the Original Closure Plan will be performed. The one exception would be that certification would be performed by an "in-house" registered professional engineer per the proposed changes to 265.115 in the March 19, 1985 Federal Register.

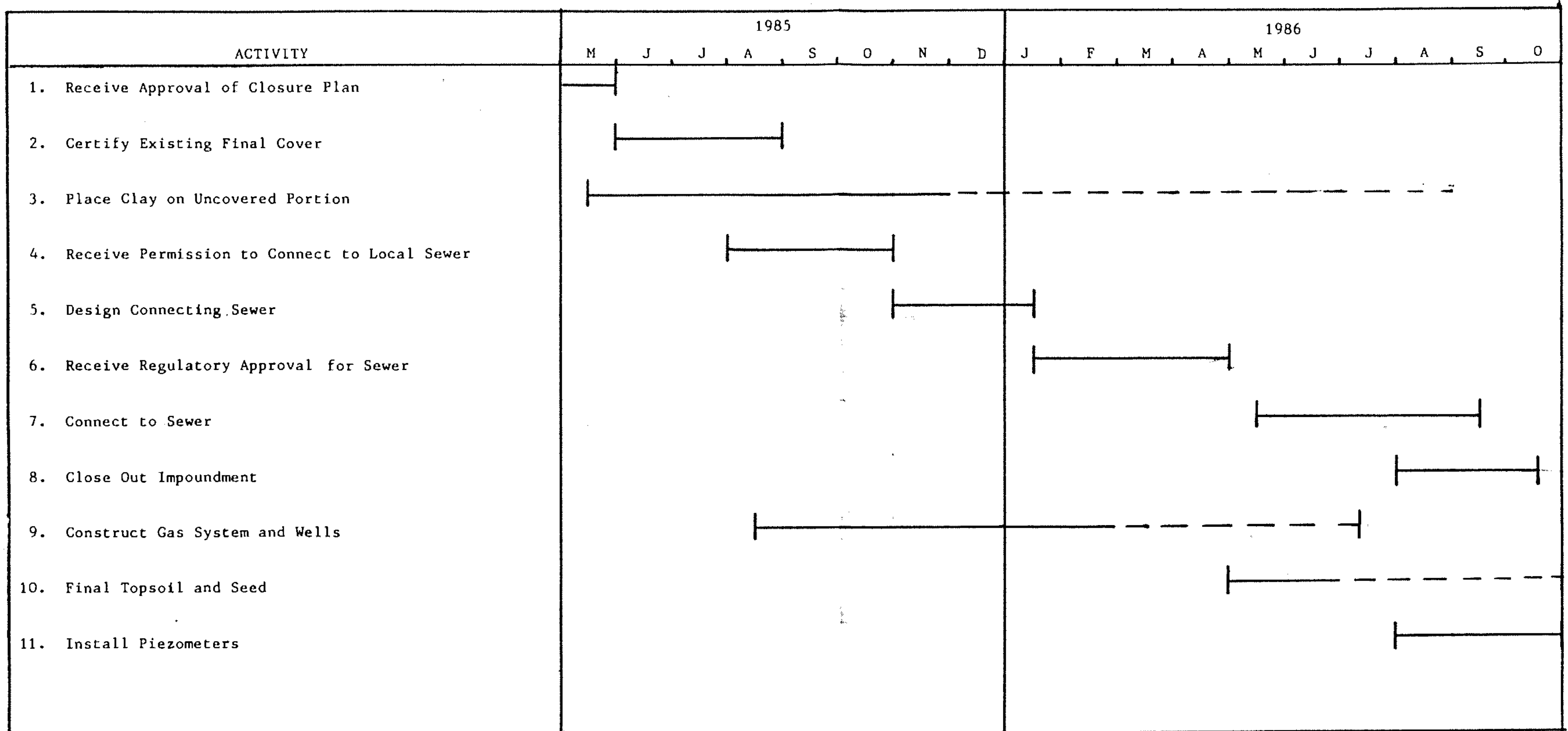
7) A detailed response to Item 7 was presented on pages 21 - 22 of the Original Closure Plan. In addition to this activity, the piezometers proposed in paragraph 3 of this response will be checked quarterly to verify an inward gradient toward the landfill. If leachate accumulates in the piezometers on the landfill side of the slurry wall, it will be removed using submersible pumps to limit its build up to 2'.

8) Response to Item 8 deals with procedures for elevation control during capping. Prior to clay placement, cross-sections on 100' centers will be developed across the area to be filled. The final soil depth requirements, per Item 10 of this response, will be added to the cross-sectional elevations to determine final cover elevations. Lath is used at alternating stations during clay placement to insure suitable lift thickness is placed and compacted prior to subsequent lifts.

9) Our response to Item 9 was discussed in some detail during our meeting with EPA and MDNR on February 21, 1985. In summary, the final site grades at closure are as shown in Appendix III with the exception of the southern 400 feet of the site. In the southeast corner, approximately 20' of clean soils will be placed over the cap during a three year period following closure. Initially, drainage will be per Appendix III except for the southeast corner. Initially, the southeast corner will drain to the southeast, then, after the above described soils are placed, the final drainage will be per Appendix III.

10) Item 10 relates to a desired topsoil thickness. It must first be noted that the proposed cover thickness will be 5' of clay, obtained from various sources, that meets a permeability requirement of 1×10^{-7} cm/sec. This proposed depth is 3' more than the approved engineering plan on the site for a 2' final cover. In addition, EPA and MDNR approved a similar closure plan for Woodland Meadows with a 5' clay cap and 6" of topsoil. In Mr. Roycraft's letter to EPA dated March 5, 1985, he states, ". . . we continue to believe more than 6" of topsoil is necessary to properly establish vegetation." We fail to understand this position when developers in Michigan use 3" - 6" of topsoil to establish lawns around homes, when MDNR approves 3" - 6" of topsoil on Act 641 landfill caps, when the Michigan Department of Transportation requires 3" ± 1" over 2" of friable soil (MDOT Spec. 6.53.03) for highway excavation in Michigan.

Based on the above citations and the precident set at Woodland Meadows, we propose the final cap on the uncapped portion of the landfill be 5' of compacted clay (1 x 10^{-7} cm/sec. permeability) and 6" of topsoil.



NOTES: (1) Schedule Assumes May, 1985 Regulatory Approval

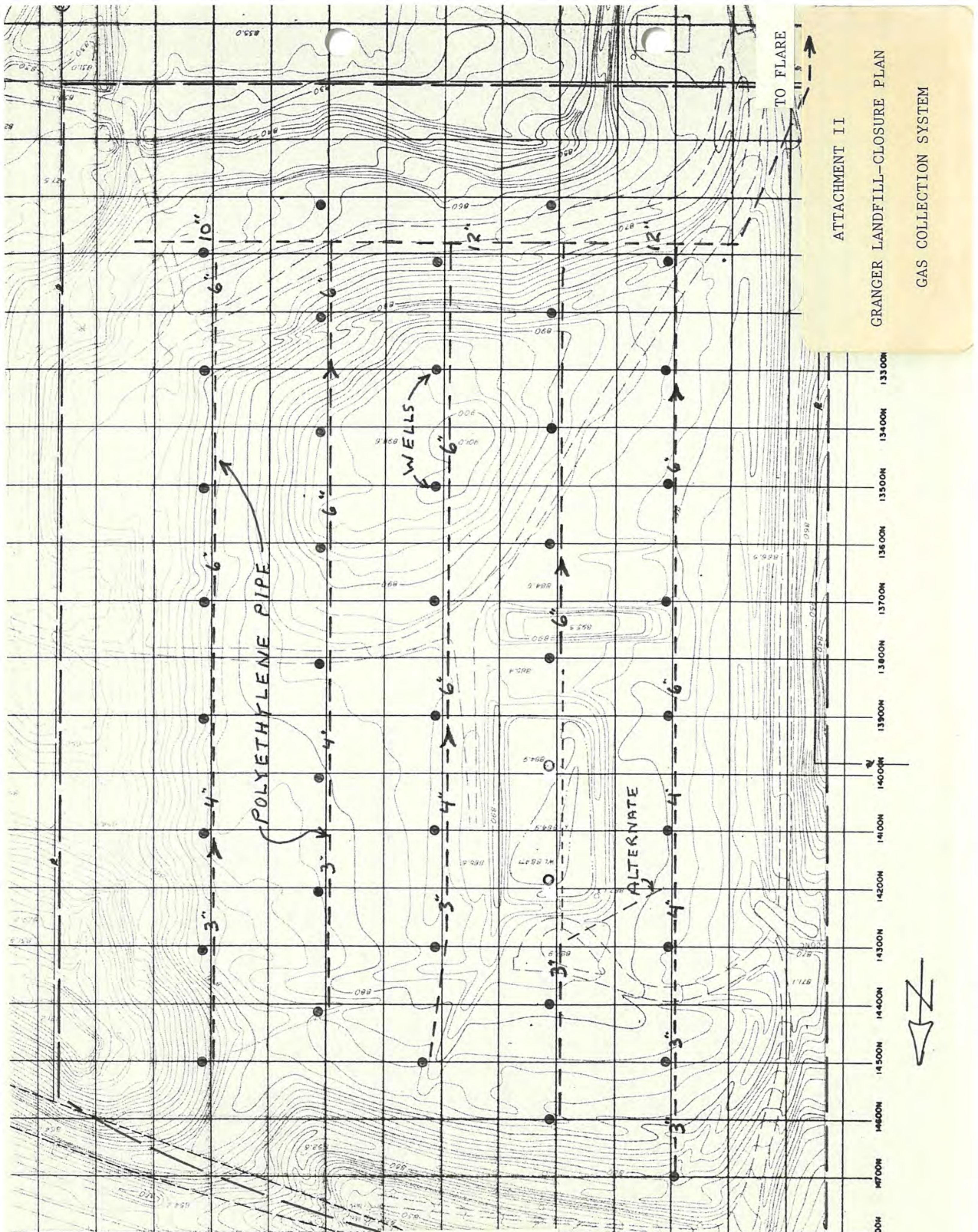
(2) Solid Lines - Best Estimated Schedule
Dashed Lines - Possible Time Extension Areas

(3) Item 4,5,6,7,8 Require Permission to Connect to Sewer

FIGURE AI-1

CLOSURE SCHEDULE
GRANGER LANDFILL
MID 082771700

Prepared 4/12/85


ATTACHMENT II
GRANGER LANDFILL-CLOSURE PLAN
GAS COLLECTION SYSTEM
TO FLARE
POLYETHYLENE PIPE
WELLS
ALTERNATE
10"
12"
12"
6"
4"
3"
13300N
13400N
13500N
13600N
13700N
13800N
13900N
14000N
14100N
14200N
14300N
14400N
14500N
14600N
14700N
14800N
N

ATTACHMENT III

Correspondence Related to Cap on Final Covered Area

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
RESOURCE RECOVERY DIVISION

L

EVALUATION REPORT

SANITARY LANDFILL: ☒ TYPE II ☐ TYPE III ☐ OTHER ____________

NAME OF FACILITY: Granger Land Development Co. Sanitary Landfill
FACILITY NO.: 19-000002

LOCATION: Main Roads — Section No. — Township — City — County: 1/4 mile west of I-96 on W. Grand River Sec. 29 Watertown Twp. Clinton Co.

NAME OF OPERATOR: Jerry Granger
NAME OF LICENSEE: Granger Land Dev. Co.

STATUS: ☒ Open & Licensed ☐ Closed & Inspecting ☐ Unlicensed

RESTRICTIONS/STIPULATIONS TO CONSIDER DURING INSPECTION

(C) = Compliance (N) = Noncompliance (—) = Does Not Apply

	Item
C	A. Protection of Surface Waters
C	B. Hazardous Material/Liquids/Sewage Materials Prohibited for Disposal
C	C. Surface Water Drainage
C	D. Period and Adequacy of Cover
C	E. Completion of Area/Final Coverage
C	F. Compaction
C	G. Leachate Control/Management
C	H. Engineering Plans, Hydrogeologic Evaluation & Construction Certification
C	I. Operations Conform to Plan & License Stipulations
C	J. Vermin Control/Bird Control
C	K. Blowing Debris, Dust & Odor Control
C	L. Gas Migration No visible problem
C	M. Fire Protection and Restriction of Burning
C	N. Equipment Adequacy
C	O. Restricted Access/Attendant
C	P. Traffic Flow
C	Q. Salvaging/Scavenging
X	R. Noise Level Not monitored
C	S. Fence/Screening Maintenance

REMARKS:

Final work is being done on north end of existing site - Cover/seeding will be completed shortly. As-built plans will be submitted.

Drain at north west corner is still a problem however the drain will be plugged when work begins on the west side of existing fill area. This has been included in submitted plans

Site/operation looks good.

RECEIVED OCT 2 1 1982

Inspection item definitions are on back of this form.

PERSON INTERVIEWED: Mike Patton
DATE (Y Y M M D D): 8 2 1 0 0 6
TIME OF INSPECTION: 1:50

INSPECTED BY: Karen Kligman
REPRESENTING: MDNR

GRANGER
Land Development Co.
6025 Aurelius Road
Lansing, Michigan 48910

ALTON L. GRANGER RONALD K. GRANGER JERRY P. GRANGER

December 3, 1981

Michigan Department of Natural Resources
Region III Resource
Recovery Division
Secondary Complex
P. O. Box 30028
Lansing, MI 48909

Attention: Ms. Karen Kligman

Dear Ms. Kligman:

I am writing this letter in response to your October 14, 1981 inspection report.

Since your inspection, in addition to the seeding on top of the landfill, we have seeded eight (8) additional acres, including the Grand River Ave. and I-96 berms, with generally good germination. As part of this seeding program, we are conducting a half acre experiment using wild flower cover for comparison to grass cover.

Erosion along the north side has been corrected by dressing up the bank and re-grading the road in that area. Specifically, we have created a drainage way down the center of the road to a point near the 60" culvert under I-96. At this location, we will be installing some type of drop structure to get the water down into the ditch without erosion.

In your report, you mention leachate seeps on the north side of the perimeter ditch. Refuse has never been placed north of that ditch. What we believe you are seeing is the oxidation of the high iron content in the natural groundwater in the area. The orange stains that result from this look like leachate, but it is simply iron stain. We believe that a lot of the "apparent leachate" problems from the two plastic pipes which discharge groundwater at the northwest corner of the site is the same problem.

We look forward to continuing to work with your to upgrade our site.

Very truly yours,

GRANGER LAND DEVELOPMENT COMPANY

Kurt J. Guter, Ph.D., P.E.

KJG/cmw

bcc: Jerry P. Granger
Michael Patton

Michigan Department of Natural Resources
Resource Recovery Division

Evaluation Report

Name of Disposal Facility: Granger Landfill (Granger Land Dev. Co.)

Location: W. Grand River Ave. (Street Address) (City) Watertown (Township) Clinton (County)

Name of Operator: Jerry Granger Address

Property Owner: Granger Land Dev. Co. Address

Municipalities from which refuse is received: Ingham, Clinton, Eaton, others

Isolation: (Nearest Residence) ____ (Miles) (Feet)

Type of Facility: [X] SL (Sanitary Landfill) [ ] PP (Processing Plant)
[ ] TR (Transfer Facility) [ ] CC (Collection Center)

(✓) Indicates Compliance (X) Noncompliance (-) Does not Apply

ITEMS REQUIRED IN ALL FACILITIES (SL, TR, PP, CC):

Plan on File	✓	Operation Conforms to Plan	✓
Restricted Access	✓	Salvaging	✓
Burning Restricted	✓	Attendant	✓
Traffic Flow	✓	On-Site Roads	✓

ITEMS REQUIRED IN SL, TR, PP:

Equipment	✓	Equipment Maintenance	✓
Fire Protection	✓	Dust & Odor Control	✓
Hazardous Material	✓	Paper Confined	✓
Vermin Control	✓	General Maintenance	✓

ITEMS REQUIRED IN SL ONLY:

Protection of Ground and Surface Water	✓ ✓	Period of Cover	✓
Spreading Refuse	✓	Cover Maintenance	✓
Compaction	✓	Completion of Area	✓
Cell Volumes	✓	Surface Water Drainage	✓

ITEMS REQUIRED IN TR AND PP ONLY:

Container Construction		Building Enclosed	
Container Removal		Dumping Area	
Storage Area		Daily Log	

ITEMS REQUIRED IN TR, PP, AND CC:
Screening Around Facility ____

REMARKS

Erosion problem along the north side of site below the road

Leachate seep in perimeter ditch on north - across from center standpipes

Leachate seep on west side of site, south of first east-west tree line

(Both seeps were shown to Mike)

Northwest corner drain still flowing - strong odor

Seed taking on top of fill area - looks good

[X] Approved [ ] Not Approved

Person Interviewed: Mike Patton Inspected By: Karen Kligman

Date: 10/14/81 Representing: DNR

RECEIVED OCT 21 1981

R 5504
6/23/77

Michigan Department of Natural Resources
Resource Recovery Division

Evaluation Report

Name of Disposal Facility: Granger's Sanitary Landfill

Location: W. Grand River (Street Address) | (City) | Watertown (Township) | Clinton (County)

Name of Operator: Jerry Granger — Address:

Property Owner: Granger Land Dev. Co. — Address:

Municipalities from which refuse is received: Ingham, Clinton, Eaton, others

Isolation: (Nearest Residence) ______ (Miles) (Feet)

Type of Facility: [X] SL (Sanitary Landfill) [ ] PP (Processing Plant)
[ ] TR (Transfer Facility) [ ] CC (Collection Center)

(✓) Indicates Compliance (X) Noncompliance (–) Does not Apply

ITEMS REQUIRED IN ALL FACILITIES (SL, TR, PP, CC):

Item		Item	
Plan on File	✓	Operation Conforms to Plan	✓
Restricted Access	✓	Salvaging	✓
Burning Restricted	✓	Attendant	✓
Traffic Flow	✓	On-Site Roads	✓

ITEMS REQUIRED IN SL, TR, PP:

Item		Item	
Equipment	✓	Equipment Maintenance	✓
Fire Protection	✓	Dust & Odor Control	✓
Hazardous Material	✓	Paper Confined	✓
Vermin Control	✓	General Maintenance	✓

ITEMS REQUIRED IN SL ONLY:

Item		Item	
Protection of Ground and Surface Water	✓ ← X	Period of Cover	✓
Spreading Refuse	✓	Cover Maintenance	✓
Compaction	✓	Completion of Area	✓
Cell Volumes	✓	Surface Water Drainage	✓

ITEMS REQUIRED IN TR AND PP ONLY:

Item		Item	
Container Construction		Building Enclosed	
Container Removal		Dumping Area	
Storage Area		Daily Log	

ITEMS REQUIRED IN TR, PP, AND CC:
Screening Around Facility ______

REMARKS

Water level in perimeter ditch extremely low

2 minor leachate seeps identified on north toe. I was told they had already been detected and plans had been made to address the problem on 8/13.

* continued problem with leachate running out of concrete drain on NW corn.

Final cover on top of site looks good

Papers appeared under contr.

Site in good condition – good operation

[X] Approved [ ] Not Approved

Person Interviewed: Gary Beard — Inspected By: Karen Kligman

Date: 8/12/81 — Representing: DNR

R 5504
6/23/77

RECEIVED AUG 2 6 1981

APPENDIX D

Restrictive Covenant Documentation

Granger Grand River Landfill 700
Clinton County

KERMIT ID# 11311100003

LIBER 887 PAGE 207

RECEIVED
JAN 25 2000
Waste Management

HPRM
DO NOT ALTER

RECORDED
JAN 14 2 04 PM '00
REGISTER OF DEEDS
CLINTON COUNTY, MICH.
Carol Worley

RESTRICTIVE COVENANTS RUNNING WITH THE LAND

MDEQ REF# RC-WHMD-111-00-003

Granger Land Development Company, (**Granger**),
(Property Owner) (Abbr. Company Name)

a **Michigan** corporation, is located at **16980 Wood Rd., Lansing, MI 48906**.
(Address)

Granger is the record owner of land located in
(Abbr. Company Name)

Watertown Township, **Clinton** County, Michigan,
(City, Village, Twp.) (County Name)

described in Exhibit A attached ("the land").

Granger notified the Michigan Department of
(Abbr. Company Name)

Environmental Quality of their hazardous waste disposal activity pursuant to 1979 PA 64 MCLA 299.503 et seq, as amended ("Act 64") and obtained interim status to continue operation of their hazardous waste disposal facility located at the land. Act 64 was recodified to become Part 111 of 1994 PA 451 MCL 324.11102-11152, as amended ("Act 451"). The interim status designation authorized disposal of hazardous waste at the disposal facility on the land pursuant to the requirements of Michigan law, including, but not limited to the requirements of closure and other obligations more fully set forth under Part 111 of Act 451 and the regulations promulgated thereunder. The land and Disposal Facility are herein referred to as the "Property." The following restrictive covenants

63586

are executed by Granger (Abbr. Company Name) as the sole owner of the Property pursuant to Part 111 of Act 451 to ensure the care, maintenance, monitoring and longterm integrity of the Property for the protection of the health, safety and welfare of the people of the State of Michigan and the natural resources and the environment of the State of Michigan:

1. The Property has been used to manage hazardous wastes.

2. The Property has been used as a landfill for hazardous waste disposal.

3. Use of the Property, including use of the land and/or the Disposal Facility, shall not disturb the final cover, liners, components of any containment system, or the function of the monitoring systems on or in the Property.

4. No one, including Granger (Abbr. Company Name), any purchaser of the record owner of the land or Disposal Facility, any purchaser of the land or Disposal Facility, or any of their agents, employees, heirs, successors, lessees, or assignees, shall engage in any development, including any filling, grading, excavating, building, drilling or mining on the Property following completion of the landfill closure without obtaining prior written authorization from the Director of the Department of

Environmental Quality.

5. The survey plat and records of the types, locations and quantities of hazardous wastes on or in the Property have been filed with the local zoning or land use authority as required by Part 111 of Act 451 and its Rules.

6. Ownership of all or a portion of the land or Disposal Facility shall not be conveyed without the owner of the land or Disposal Facility sending written notice to the prospective purchaser(s) of the existence of these restrictive covenants. Such notice shall state:
   (a) that there are restrictive covenants on the Property;
   (b) that development on the Property is prohibited without prior written authorization from the Director of the Department of Environmental Quality;
   (c) that the prospective purchaser(s) must comply with the restrictive covenants, Part 111 of Act 451 and Rules promulgated under Part 111 of Act 451; and
   (d) that the prospective purchaser(s) cannot interfere with the containment or monitoring systems on or in the Property.

Such notice shall include a copy of these restrictive covenants and shall be sent to the prospective purchaser(s) by certified mail with a copy sent to the Director of the Department of Environmental Quality.

These restrictions may be enforced in law or in equity in a court of competent jurisdiction. Such action(s) may be taken against anyone, including any person, corporation, partnership, agent, successor, assignee, heir, employee or lessee, who violates or threatens to violate any of these restrictive covenants.

These restrictive covenants shall run with the land in perpetuity and shall be binding upon Granger (Abbr. Company Name), any purchaser of the record owner of the land or Disposal Facility, or any of their agents, employees, heirs, successors, lessees, or assignees.

This document was drafted by Granger - Chuck Annett at 16980 Wood Road, Lansing, Michigan.

Signed in presence of:

Charles S. Annett
(Witness Name)
Charles S. Annett

Kimberly K. Smelker
(Witness Name)
Kimberly K. Smelker

[COMPANY NAME]

By: Ralph L. Nuerenberg
Ralph L. Nuerenberg

Its: **President**

STATE OF MICHIGAN }
} SS.
COUNTY OF **Clinton** }

The foregoing instrument was acknowledged before me this 30th day of September, 1999, by Ralph L. Nuerenberg, of Granger corporation, on behalf of the corporation.

Maria E. Copeland
Notary Public
Clinton County, Michigan
My commission expires ________.

MARIA E. COPELAND
Notary Public, Clinton County, MI
My Comm. Expires Mar. 6, 2004

Signed in presence of:

Mary Beth Thelen
(Witness Name)
Mary Beth Thelen

Linda Davaloz LeVeque
(Witness Name)
Linda Davaloz LeVeque

STATE OF MICHIGAN

By: Russell J. Harding
Russell J. Harding

Its: Director of the Department of Environmental Quality for the State of Michigan

STATE OF MICHIGAN }
} SS.
COUNTY OF Ingham }

The foregoing instrument was acknowledged before me this 18th day of November, 1999, by Russell J. Harding, on behalf of the Department of Environmental Quality.

Julie A. Blanchard
Notary Public
Ingham County, Michigan
My commission expires Sept. 23, 2002

EXHIBIT A

LEGAL DESCRIPTION OF HAZARDOUS WASTE CELLS

AT

8550 W. Grand River Avenue, Grand Ledge, Michigan

The following legal property description pertains to the 59.72 acre parcel of land located in Watertown Township, Clinton County, with a property address of 8550 West Grand River Avenue, Grand Ledge, Michigan. The property is owned by the Granger Land Development Company, a corporation located at 16980 Wood Road, Lansing, Michigan. The legal description is as follows:

Commencing at a point on the E-W 1/4 line distant S 89°58'41" E 1316.40 feet from the W 1/4 Corner Section 29, T5N, R3W, Watertown Township, Clinton County, Michigan, thence N 00°19'38" E along the W 1/8 line 186.75' to the point of beginning, thence continuing on the said 1/8 line N 00°19'38" E 2091.60 feet to a point on the south right-of-way line of I-96, as now located, thence along said south limited access right-of-way on the arc of a curve to the right, said curve having a delta angle = 13°45'17", radius of 5626.58 feet, long chord bearing and distance = S 77°38'15" E 1347.52 feet, a distance of 1350.76 feet, thence S 00°22'16" W along the N-S 1/4 line 1803.09 feet, thence S 90°00'00" W 1316.54 feet to the point of beginning. The above described lands contain 59.72 acres and are subject to all easements and restrictions of record, if any.

Mich Dept of Envionmental Quality
PO Box 30241
L 48909-7741

GRANGER
LAND DEVELOPMENT COMPANY

September 14, 1994

Watertown Charter Township
Watertown Planning Commission
Zoning Board
12803 S. Wacousta Road
Grand Ledge, Michigan 48837

Dear Sirs:

During the 1982-1983 time frame a small amount of contaminated soil from spill cleanups and waste material classified as hazardous due to the presence of heavy metals were accepted at the Granger Grand River Act 64 Landfill. The enclosed Table 1.7.1 provides a description of the materials and the amounts of each which were accepted at the site.

Subsequent to the acceptance of those materials, the entire site was capped and closed in accordance with the appropriate regulations. The Michigan Department of Natural Resources acknowledged in a April 13, 1990 correspondence that all the closure criteria had been fulfilled.

We are presently finalizing the terms of a Post-Closure Operating License for the Granger Grand River Act 64 Landfill. As part of that license, the federal regulations in 40 CFR 265.119(b)(1)(iii) require that the local zoning authority be provided with information regarding the location, type and quantity of hazardous waste disposed of in the landfill. The information in this correspondence is provided to fulfill that criteria. Table 1.7.1 describes both the type and amount of hazardous waste in the landfill, while Figures 1.7.1 and 1.7.2 identify the area in which all the hazardous wastes were placed. The area is bounded on the north by the 14350 coordinate line, to the south by the 12900 coordinate line, to the east by the 7000 coordinate line, and to the west by the 7350 line. All of the waste materials were placed at elevations from 830-870 msl.

Thank you for your assistance in the filing of this information in accordance with the state and federal regulations.

Sincerely,

Charles Annett Ph.D.
Senior Scientist

cc: Ms. De Montgomery--MDNR

APPENDIX E

Waste Management Unit Description and Historical Engineering Drawings

4.0 DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS (SWMUs)

This section contains file review information supplemented by results of the VSI and telephone conversations with facility representatives.

4.1 Unit Type: Type I Solid Waste Landfill

Regulatory Status: SWMU. This area is an inactive disposal area. Closure certification was submitted to MDNR by GLDC. On April 13, 1990, MDNR released GLDC from financial capability requirements for closure of the Type I Solid Waste Landfill (155). The Type I Solid Waste Landfill received hazardous waste under RCRA interim status until 1983 (11).

A. Unit Description: The Type I Solid Waste Landfill was used for solid municipal and hazardous waste disposal. The hazardous waste consisted primarily of contaminated soil (47). The landfill does not have a constructed clay liner. Instead, the natural clay deposits serve as the liner material. In addition, there is no internal construction barrier between the solid and hazardous waste portions of the landfills (59). A clay wall has been constructed around the Type I Solid Waste Landfill. In addition, a leachate collection system has been constructed on the landfill side of the clay wall around three quarters of the site (73). Figures 3 and 7 show the Type I Solid Waste Landfill. Photographs 1, 2, 3, 4, and 5 in Appendix A show the Type I Solid Waste Landfill.

B. Period of Operation: 1970 - 1986

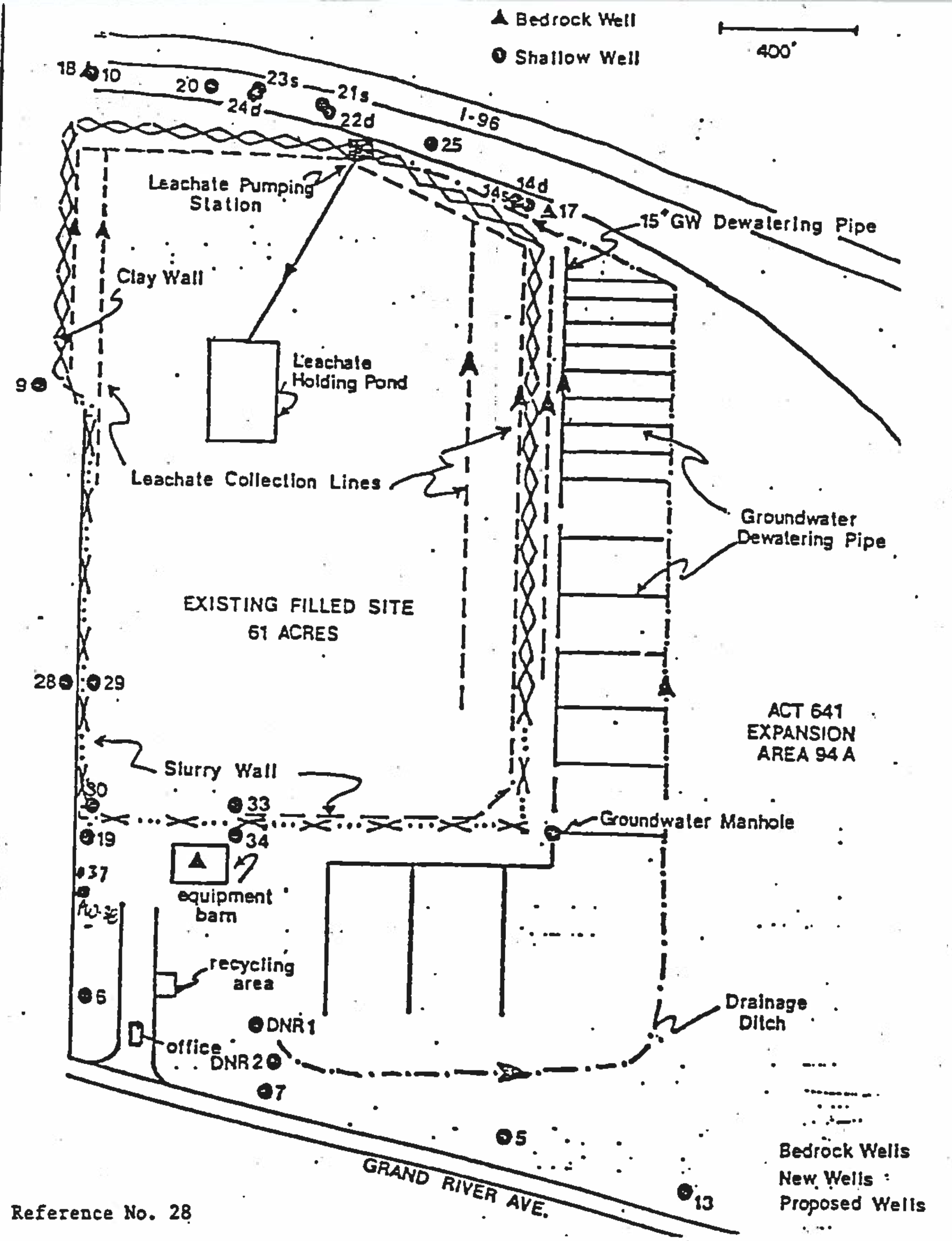
C. Waste Type: Solid waste classified as D001, D003, D005, D006, D007, D008, F006, F008, F014, F017, F018, K056, K058, K059, K079, U013, U080, U122, U154, U155, U210, U220, U226 and U228 wastes.

Waste Volume/Capacity: 61 acres (1,200,000 tons of solid municipal solid waste, 6,651 tons of RCRA hazardous waste).

Waste Constituents: Solid municipal waste and hazardous waste. The hazardous waste consisted primarily of EP Toxic wastes for heavy metals only and contaminated soil generated from spill cleanups (73). EP Toxic waste consisted of air pollution control equipment dusts and junk yard sludge. Other hazardous wastes approved for disposal included paint sludge, polyester resins, nylon production sludge, and aluminum hydroxide sludge (149).

D. Release Controls: A clay wall has been constructed around the Type I Solid Waste Landfill. In addition, a leachate collection system has been constructed on the landfill side of the clay wall around three quarters of the site (73).

E. Release History: In 1982 and 1983, an uncontrolled discharge of water containing VOCs, (maximum of 0.270 mg/L of methylene chloride) including methylene chloride, 1,1,1-trichoroethane, and 1,1-dichloroethane were discovered in the Openlander Drain and subsequently in the Looking Glass River (40). The presence of VOCs (maximum of 0.220 mg/L of trans-1,2-dichloroethene) in the groundwater, including chloroethene, 1,1-dichloroethane, 1,2-dichloroethane, 1,2-dichloropropane, trans-1,2-dichloroethene, methylene chloride, TCE, benzene, and toluene were detected in the southwest corner of the landfill, outside the clay wall in 1985 and 1986 (13). In addition, trans-1,2-dichloroethene and trichloroethene were detected during a soil gas analysis in 1986 at the above mentioned area (maximum of 52 ppb of trans-1,2-



Reference No. 28

METCALF & EDDY

FIGURE 7: Type I Solid Waste Landfill

SCALE: NONE

dichloroethene) (34, 35).

F. VSI Observations: The cover of the Type I Solid Waste Landfill has been revegetated.

G. Sample Results: Groundwater samples obtained from MW-19 and MW-28 detected the following constituents: 1.9 to 50 μg/L of chloroethane, 42 to 86 μg/L of 1,1-dichloroethane, nondetectable to 6.2 μg/L of 1,2-dichloropropane, 1.2 to 4.9 μg/L of trans-1,2-dichloroethene, nondetectable to 10 μg/L of methylene chloride, nondetectable to 20 μg/L of chloromethane, nondetectable to 66 μg/L of vinyl chloride, nondetectable to 5 μg/L of 1,1-dichloroethane, nondetectable to 15 μg/L 1,1,1-trichloroethane, and nondetectable to 5.2 μg/L of trichlorothene (154). Surface water samples obtained from the Openlander Drain detected the following constituents: 0.0087 mg/L of 1,1-dichloroethane, 0.0086 mg/L of 1,1,1-trichloroethane and 0.270 mg/L of methylene chloride (115). Soil gas analysis samples obtained from the area bounded by MW-19, P-28, and MW-35 detected the following constituents: Nondetectable to 52 ppb of trans-1,2-dichloroethene and nondetectable to 3.1 ppb of trichloroethene (35).

4.2 Unit Type: Leachate Surface Impoundment

Regulatory Status: <u>SWMU.</u> This area is inactive and has been closed. Closure certification was submitted to MDNR by GLDC. On April 13, 1990, MDNR released GLDC from financial capability requirements for closure of the Leachate Surface Impoundment (155). Interim status for this unit was granted in 1983 by the U.S. EPA (42, 45). The leachate contained in the surface impoundment was managed as a hazardous waste until it was delisted.

A. Unit Description: The leachate surface impoundment was located on a portion of the closed 61 acre Type I Solid Waste Landfill. The leachate was pumped to the surface impoundment via the onsite pump station. Leachate contained in the leachate surface impoundment was periodically disposed of at the Lansing Wastewater Treatment Plant (40). During closure, approximately one foot of material was excavated from the bottom of the 150 foot by 300 foot surface impoundment and disposed of in a Type II landfill. In addition, 18 inches of top soil was placed over the surface impoundment (5). Currently, landfill leachate is discharged to the Southern Clinton County Municipal Utility Authority's (SCCMUA) Wastewater Treatment Plant (WWTP) via a force main in accordance with a Waste Water Discharge Permit (5, 24). Figures 3 and 8 show the Leachate Surface Impoundment. Photographs 1, 2, and 4 in Appendix A show the Leachate Surface Impoundment.

B. Period of Operation: 1983 to 1987.

C. Waste Type: Liquid waste classified as D80 and D83 wastes.

Waste Volume/Capacity: 300 feet by 150 feet/40 day storage capacity.

Waste Constituents: Heavy metals, halocarbons, aromatic hydrocarbons, chlorinated hydrocarbons, phthalate esters, polynuclear aromatic hydrocarbons and phenols (40).

D. Release Controls: The leachate surface impoundment was located directly above the Type I Solid Waste Landfill. Thus, all vertical releases of leachate would be contained in the Type I Solid Waste Landfill. In addition, approximately two feet of freeboard was provided.

E. Release History: None known.

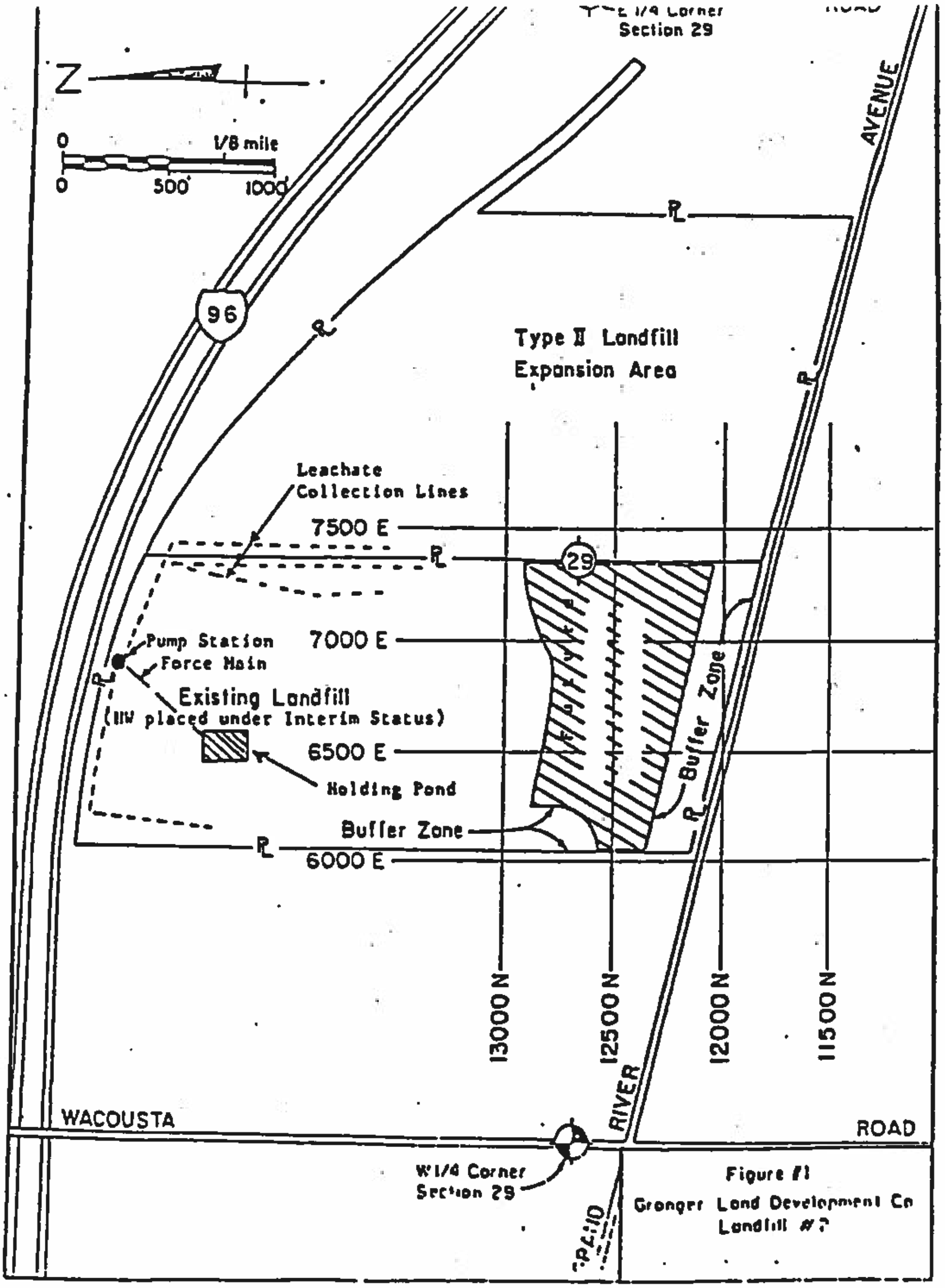
F. VSI Observations: The area above the leachate surface impoundment has been revegetated.

G. Sample Results: During an MDNR inspection on July 15, 1988, random soil sample results taken from the excavation indicated that the metal levels were within two standard deviations of the mean for typical soils of similar soil type in the Saginaw Lobe. Organic compounds were nondetectable in the soil samples (20).

4.3 Unit Type: Openlander Drain

Regulatory Status: SWMU. The Openlander Drain is used to discharge GLDC landfill's surface runoff to the Looking Glass River.

A. Unit Description: The majority of the surface runoff from the closed and existing portions of the



Reference No. 104

METCALF & EDDY

FIGURE 8: Leachate Surface Impoundment And Pump Station

SCALE: NONE

landfill at the GLDC facility drains into the Openlander Drain. Surface runoff water is collected from a series of collection ditches that are located around the perimeter of the landfill facility. The collection ditches discharge into a collection area. The collection area discharges the effluent to the Openlander Drain. The Openlander Drain is a tributary of the Looking Glass River, which is located approximately 1.5 miles to the north of the landfill facility (73). Photographs 15 through 23 in Appendix A show the surface runoff collection areas and drainage ditches.

B. Period of Operation: 1970 to present.

C. Waste Type: Landfill surface runoff.

Waste Volume/Capacity: No information is available.

Waste Constituents: No information is available.

D. Release Controls: None known.

E. Release History: In 1982 and 1983, approximately 100,000 gallons of surface water containing methylene chloride, 1,1,1-trichoroethane and 1,1-dichloroethane was discharged to the Openlander Drain (maximum of 0.270 mg/L of methylene chloride) (40, 45, 52, 113, 115).

F. VSI Observations: During the VSI, an oil film was identified in a collection ditch. Photograph 19 in Appendix A shows the oil film.

G. Sample Results: Current sample results are not available from this area. However, surface water samples obtained from the Openlander Drain in 1983 contained the following constituents: 0.0087 mg/L of 1,1-dichloroethane, 0.0086 mg/L of 1,1,1-trichloroethane, and 0.270 mg/L of methylene chloride (115).

4.4 Unit Type: Catch Pond

Regulatory Status: SWMU. The catch pond is used to discharge GLDC landfill's surface runoff to the groundwater and/or surface water.

A. Unit Description: The catch pond is used to retain surface runoff from the large berm on the south side of the landfill to prevent flooding on Grand River Avenue (14). Surface runoff is retained by a small berm and collected with a tile collection line. Collected water is routed under Grand River Avenue to the catch pond. Water is usually discharged from the catch pond by percolation into the soil. However, if the water level in the catch pond reaches a certain level, effluent is discharged to the ultimate outlet via the outlet pipe to the surface water. Photographs 27 and 28 in Appendix A show the catch pond.

B. Period of Operation: Unknown to present.

C. Waste Type: Surface runoff.

Waste Volume/Capacity: 200 feet by 50 feet.

Waste Constituents: No information is available.

D. Release Controls: None known.

E. Release History: None known.

F. Observations: The catch pond area consists of a depressed area that is covered with mowed vegetation.

G. Sample Results: Sample results are not available from this area.

4.5 Unit Type: Type II Solid Waste Landfill

Regulatory Status: SWMU. This area is an active disposal area. On December 8, 1989, GLDC renewed the required Act 641 operating license (3).

A. Unit Description: The Type II Solid Waste Landfill is an expansion to the closed Type I Solid Waste Landfill. The use of this landfill is limited to the disposal of residential and commercial refuse and non-hazardous industrial waste delivered by private individuals, contract haulers and municipal corporations (73). The Type II Solid Waste Landfill expansion areas are illustrated in Figure 3. Photographs 6, 7, 8, 9, 10, and 11 in Appendix A show the Type II Solid Waste Landfill.

B. Period of Operation: 1986 to present.

C. Waste Type: Residential and commercial refuse and non-hazardous industrial waste.

Waste Volume/Capacity: 94 acres; 15 year design life.

Waste Constituents: Residential and commercial refuse and non-hazardous industrial waste.

D. Release Controls: A clay liner and leachate collection system are utilized to contain contaminants. Monitoring wells are located upgradient and downgradient of the landfill in both the shallow and bedrock aquifer (128).

E. Release History: None known.

F. VSI Observations: Residential and commercial refuse and non-hazardous industrial waste is disposed of in the Type II Solid Waste Landfill. The areas of the landfill not in active use appeared to have adequate cover.

G. Sample Results: Sample results are not available from this area.

4.6 Unit Type: Leachate Pump Station

Regulatory Status: SWMU. This is an active pumping unit.

A. Unit Description: The leachate pump station is used to pump landfill leachate generated at the closed Type I Solid Waste Landfill, the existing Type II Solid Waste Landfill, and the purge wells to the SCCMUA WWTP via a force main in accordance with GLDC's wastewater discharge permit (5, 60). The above mentioned leachate disposal system was initiated on November 24, 1987 (22). Prior to leachate discharge to the SCCMUA system, landfill leachate was disposed of at the Lansing WWTP via tanker trucks (40). The Leachate Pump Station is illustrated on Figure 8. Photographs 12, 13, 14, 25, and 26 in Appendix A show the Leachate Pump Station.

B. Period of Operation: 1987 to present.

C. Waste Type: Landfill leachate.

Waste Volume/Capacity: 20,000 gallons/day

Waste Constituents: Heavy metals, halocarbons, aromatic hydrocarbons, chlorinated hydrocarbons, phthalate esters, polynuclear aromatic hydrocarbons, and phenols(40).

D. Release Controls: An automatic float system located in the concrete wet well controls the water elevation of the Leachate Pump Station.

E. Release History: None known.

F. VSI Observations: The leachate pump station consists of a single wet well. The pumps are located in an adjacent dry well.

G. Sample Results: Sample results are not available from this area.

Historical Engineering Drawings

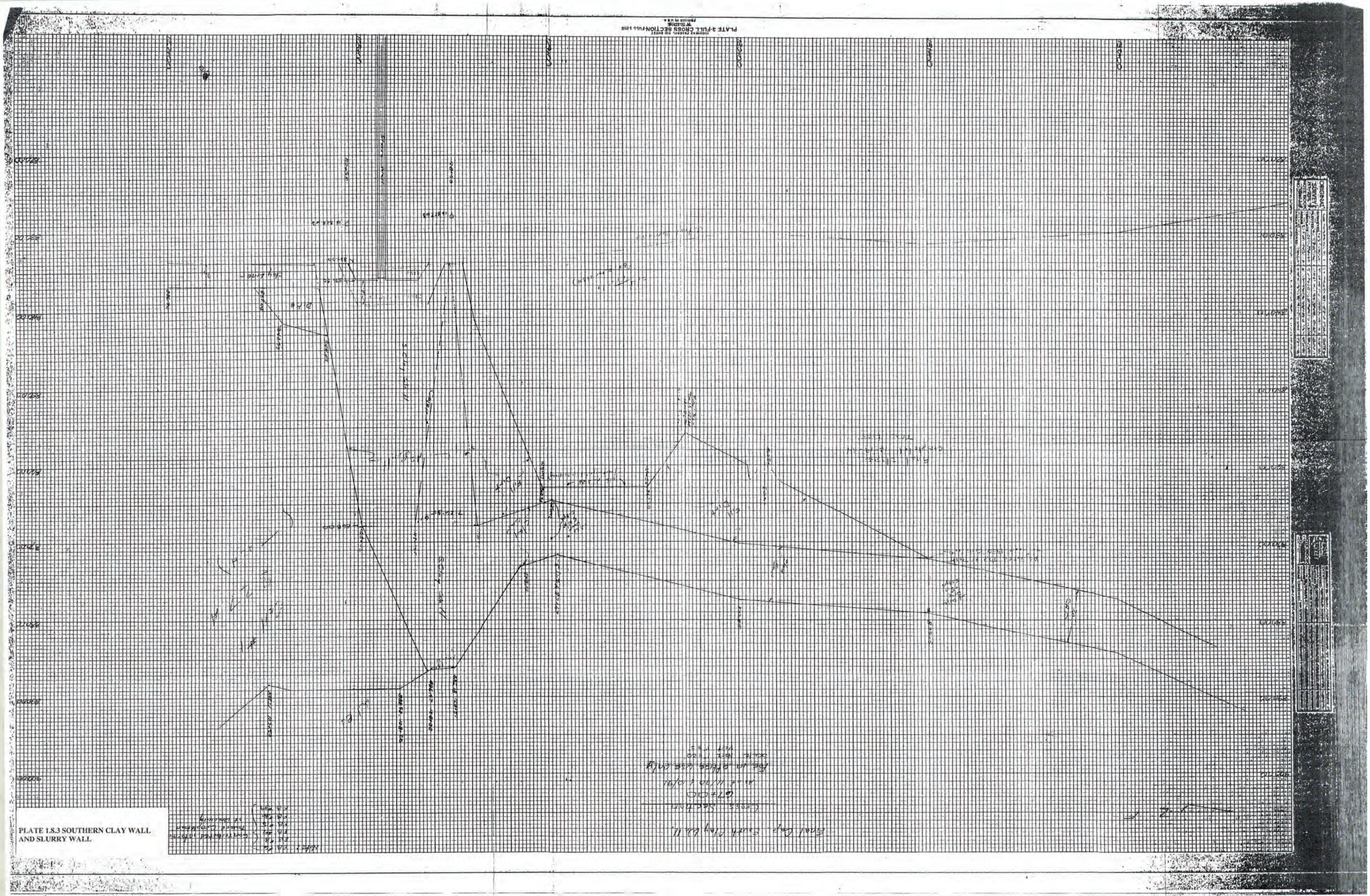


PLATE 1.8.3 SOUTHERN CLAY WALL AND SLURRY WALL

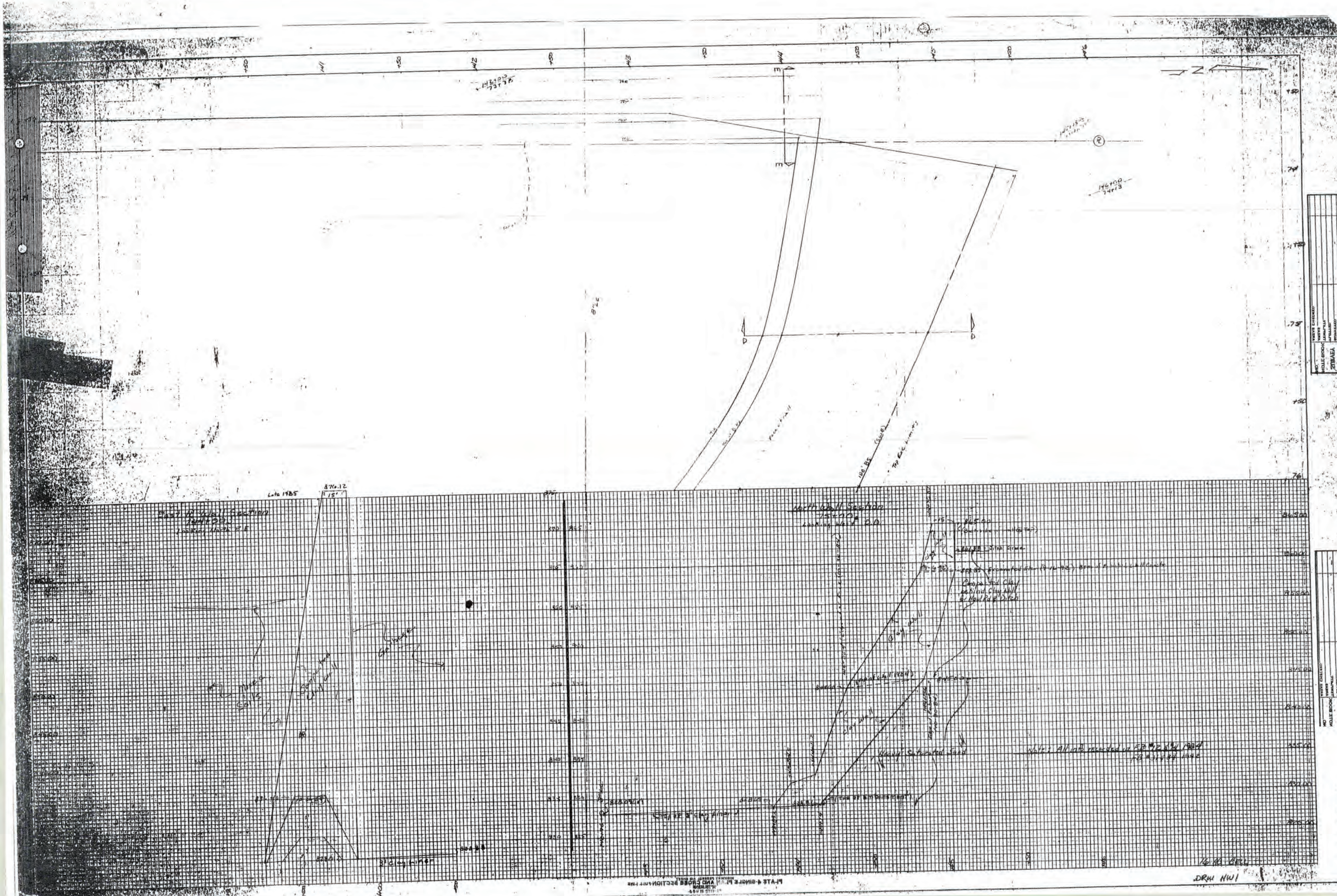


PLATE 1.8.4 NORTH WALL

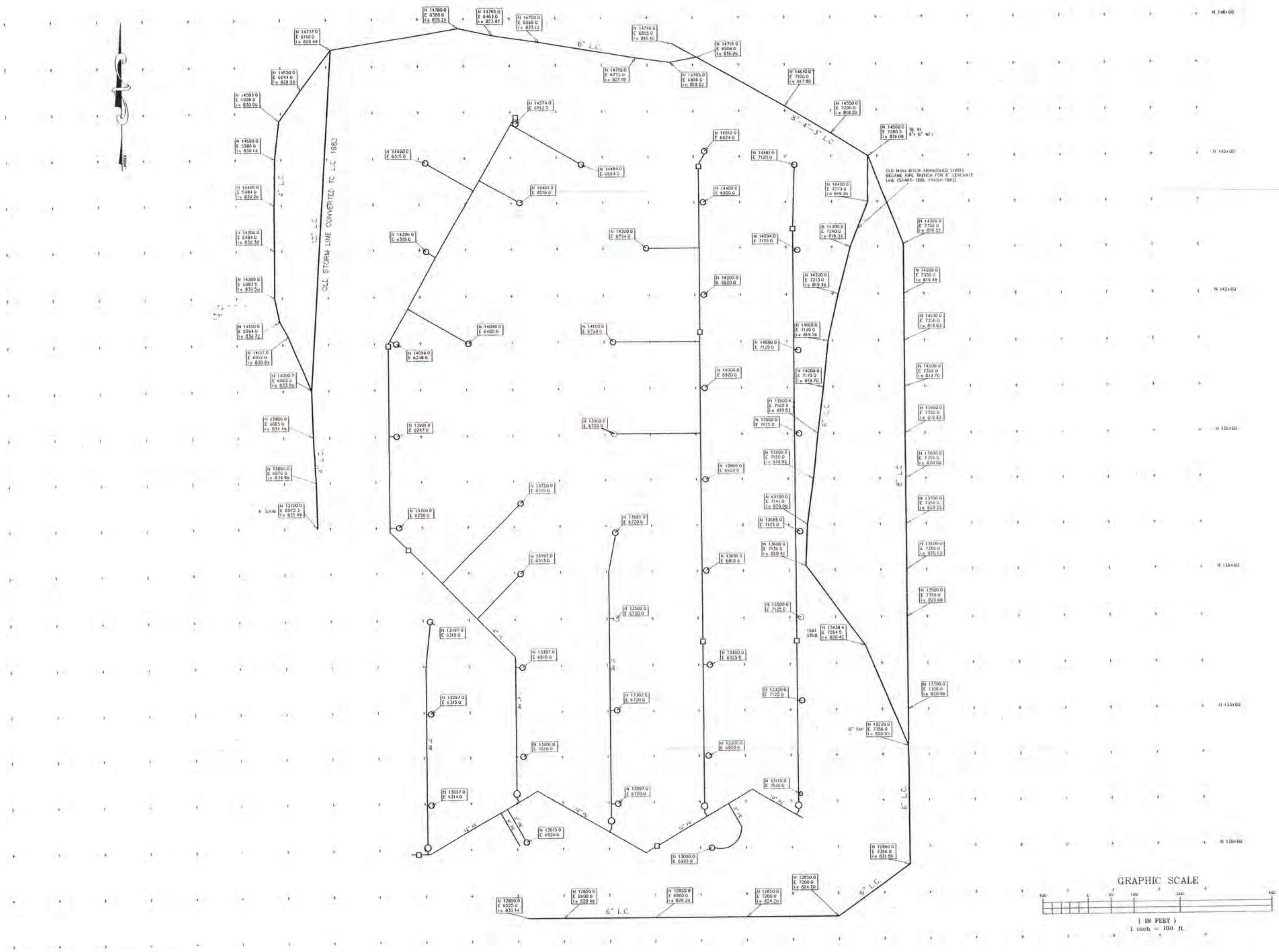


PLATE 1.9
COMPLETE LEACHATE SYSTEM

SHEET 1 OF 2

LAND DEVELOPMENT

GRAND RIVER AVE. LANDFILL
COMPLETE LEACHATE SYSTEM
(CLOSED PORTION OF LANDFILL)

DRAWING INFORMATION
DATE: DECEMBER 24, 1994
SCALE: 1" = 100'
DRAWN BY: MAS
APPROVED BY:
DRAWING: D:\LF2\CLOSDLEA

COMMENTS

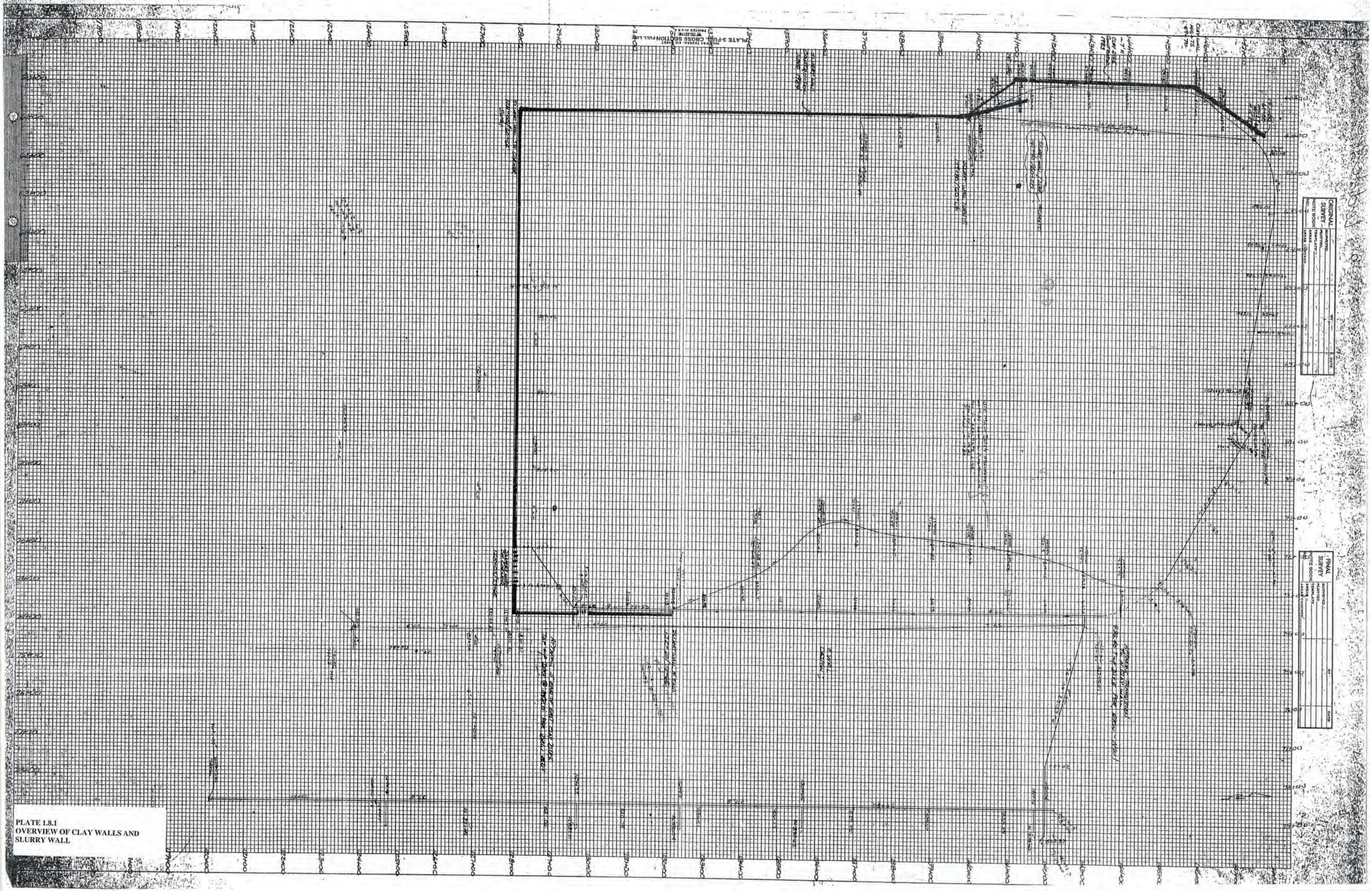


PLATE 1.8.1
OVERVIEW OF CLAY WALLS AND SLURRY WALL

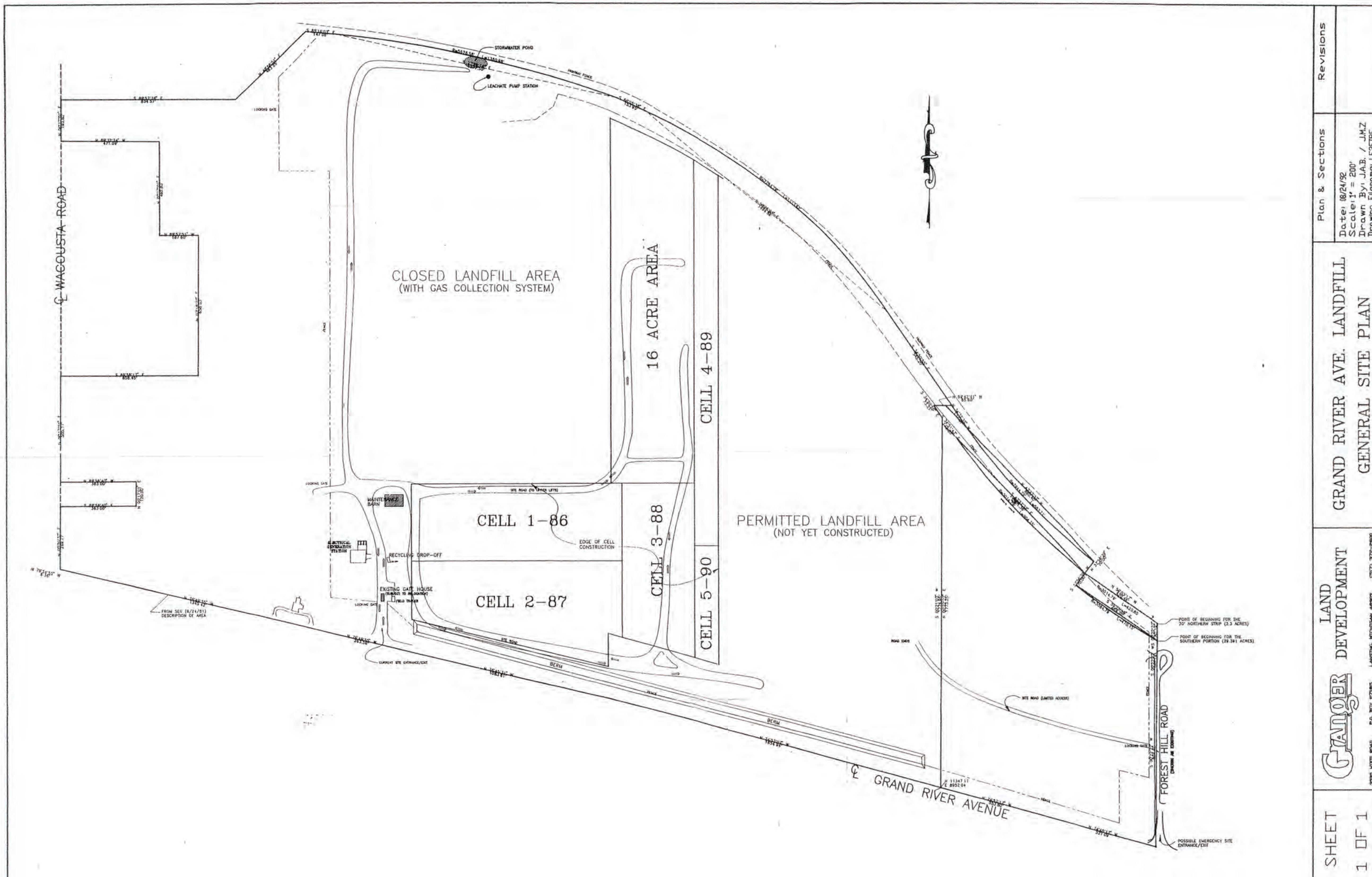
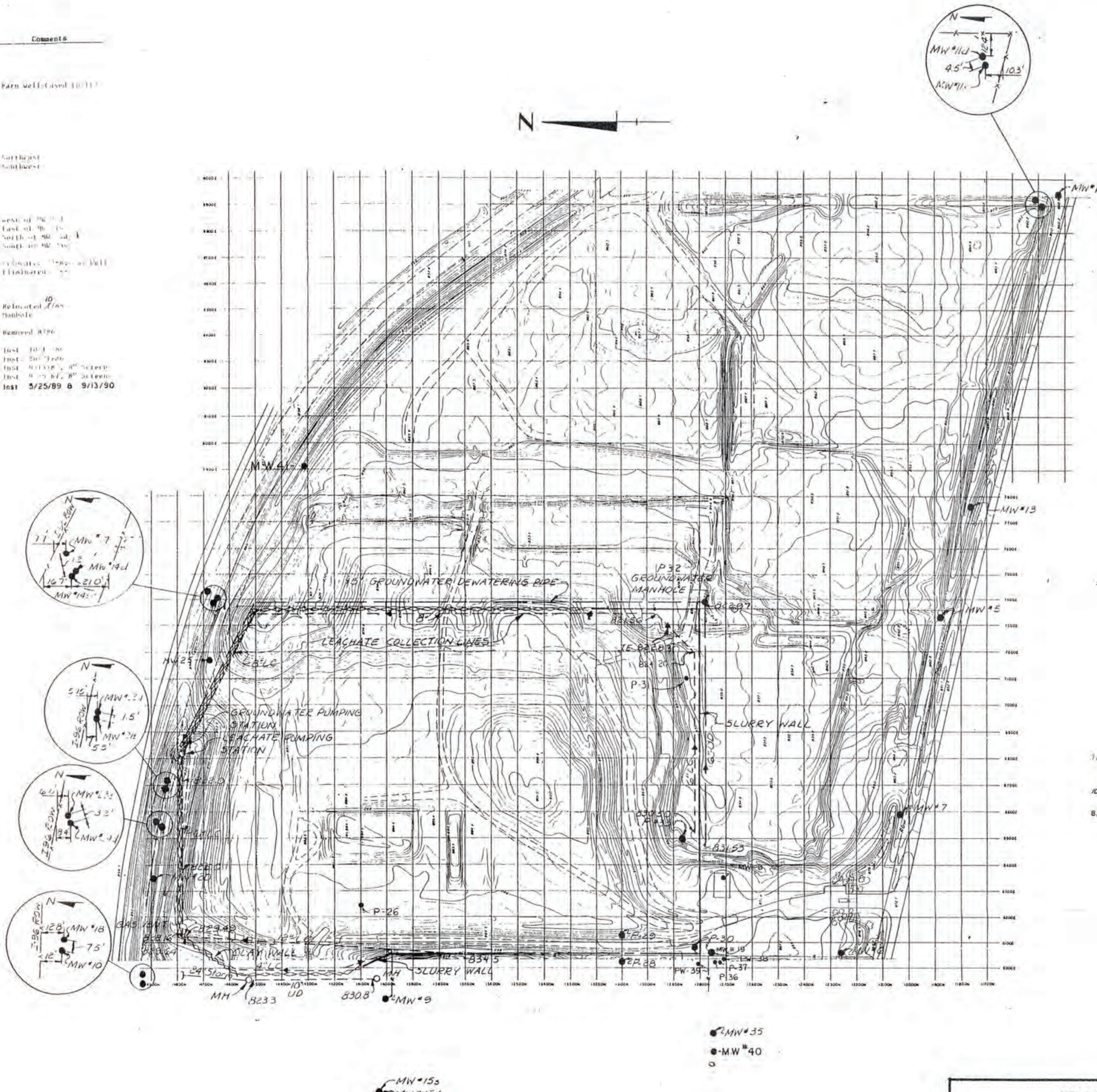


PLATE 6.1
GENERAL SITE PLAN

MONITORING WELLS

No.	North Coordinates	East Coordinates	Elev. Top of Casing (1)	Well Depth	Elev. Well Wizard (2)	Comments
5	11,890	7,320	871.89	50'		
6	12,262	6,069	874.47	56'		
7	[illegible],028	6,591	868.94	31'		
[illegible]	12,700A	6,350A	NA	215'		Farm Well: Cased [illegible]
9	11,996	5,885	851.70[illegible]	[illegible]	856.9[illegible]	
10	12,912	6,000	839.84	22'		
11s	11,46[illegible]	8,945	868.5[illegible]	37'	869.04	
11d	11,564	[illegible]	[illegible]	95'		
13	11,74[illegible]	7,741	871.37	58'		
14s	14,698	7,506	861.[illegible]	29'		
14d	14,698	7,406	861.86	61'		
15s	11,996	[illegible]	859.8[illegible]	[illegible]		Southeast
15d	11,996	5,311	859.6[illegible]	[illegible]		Southwest
16	11,500A	8,900A	86[illegible].10	60'		
17	14,61[illegible]	7,517	859.60	[illegible]		
18	13,9[illegible]	6,062	820.96	101'		
19	12,750	6,066	870.156	60'	870.[illegible]	
[illegible]	14,890A	6,350A	836.[illegible]	[illegible]	837.11	
[illegible]	14,810A	6,700A	876.60	[illegible]		West of MW [illegible]
[illegible]	14,810A	6,700A	[illegible]	[illegible]	827.92	East of MW [illegible]
[illegible]	14,880A	6,510A	[illegible]	[illegible]		South of MW [illegible]
[illegible]	14,880A	6,510A	[illegible]	[illegible]		South of MW [illegible]
25	14,[illegible]	[illegible]	[illegible]	[illegible]	866.[illegible]	
P26	13,099	[illegible]	[illegible]	[illegible]		[illegible] 4" [illegible] Estimated [illegible] Well Eliminated [illegible]
P27						
28	11,160	[illegible]	[illegible]	[illegible]	866.[illegible]	
P29	14,1[illegible]	6,13[illegible]	864.50	56'		
P30	12,819	6,076	869.4[illegible]	51'		
P31	12,[illegible] 854	7,100	887.58	65'		Relocated 10/8[illegible]
P32	12,790	7,190	916.56	94'		Manhole
P33	12,865	6,500	876.67	52'		
P34	12,730	6,500				Removed 8/86
35	12,758	7,256	864.58	36'		
P36	12,747	6,038	867.53	36'		Inst [illegible]
P37	12,728	6,030	868.54	35'		Inst [illegible]
PW38	12,716	6,052	869.88	34'		Inst [illegible] 8" Screen
PW39	12,811	6,019	867.11	36'		Inst [illegible] 8" Screen
P40	12,752	5,686	865.46	40'	865.61	Inst 5/25/89 & 9/13/90
P41	14,313	7,915	869.61	65'		

NOTES:
P - Piezometer
A - Approximate
W - See Well Wizard Elevation
PW - Purge Well
(1) Top of 2" Metal Casing
(2) Top of Gray Plastic Plate Inside Well Wizard



REVISIONS

3/7/88	Removed - MW-[illegible], P27, leachate holding pond and forcemain to holding pond Relocated - P31, P26 Added - P36, P37, PW38, PW39, MW8
10/25/88	CORRECTED P-31 LOCATION
8/1/92	RAISED ELEVATIONS FOR OW5, P32, P40

LEGEND

- - -	6"UD - 6" UNDERDRAIN
- - - -	6"LC - 6" LEACHATE COLLECTOR
>—<	CLAY WALL
——	SLURRY WALL

Control Elevations - MW5 - 863.55 / MW19 870.15

REVISIONS	
DATE	
5/9/86	Relocated the S.E. corner piezometers and added MW 25
9/3/86	Added Well Wizard Elevations
5/4/89	MW40 installed, Well Wizard inst. 5/25/89
4/22/92	Up Dated Well Information

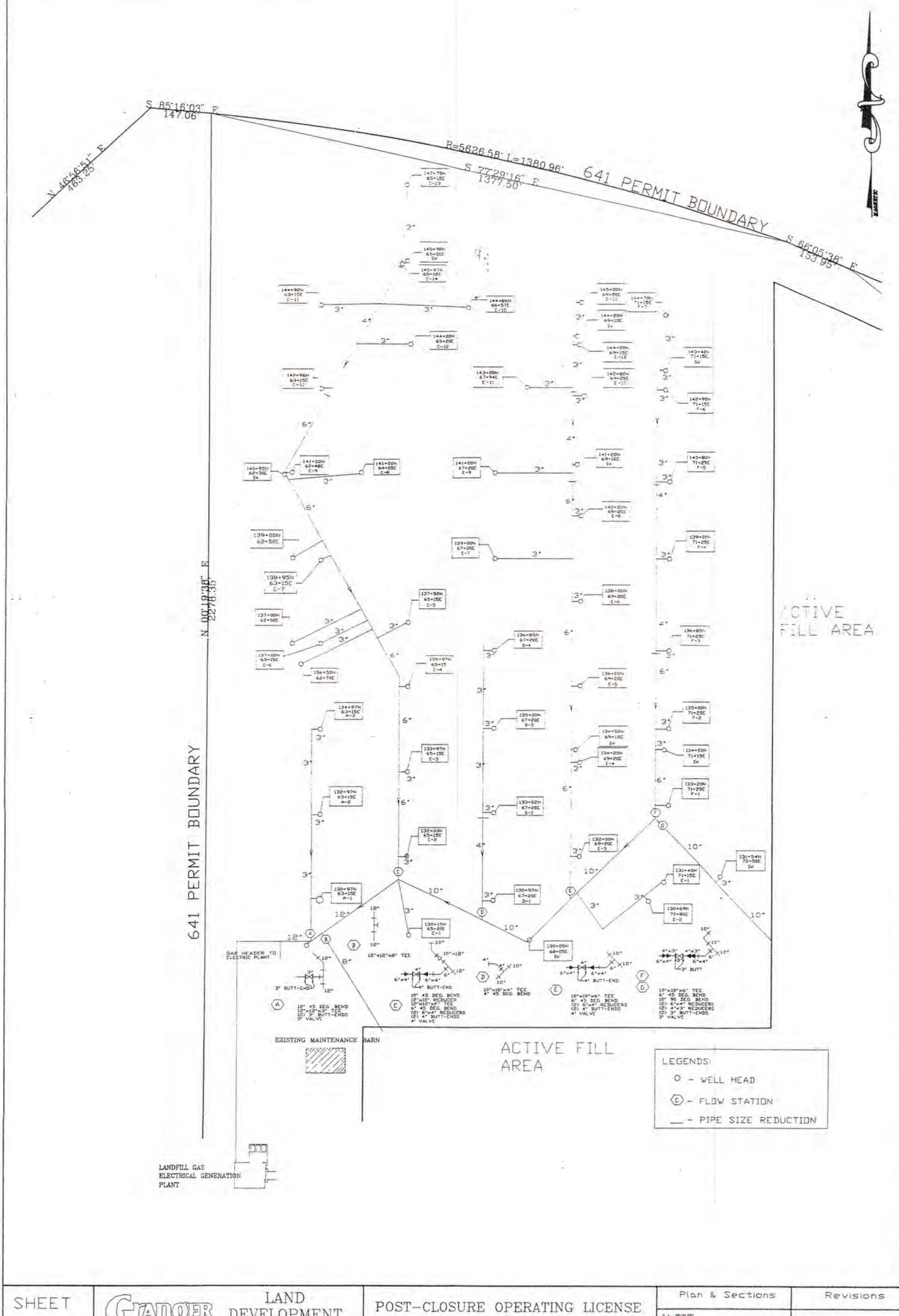
GRANGER WASTE MANAGEMENT FA

SCALE 1" = 200' | APPROVED BY K. GUTER | DRAWN BY MH
DATE 11-15-85 | REVISED

MONITORING WELL AND GROUNDWATER DATA SURVEY

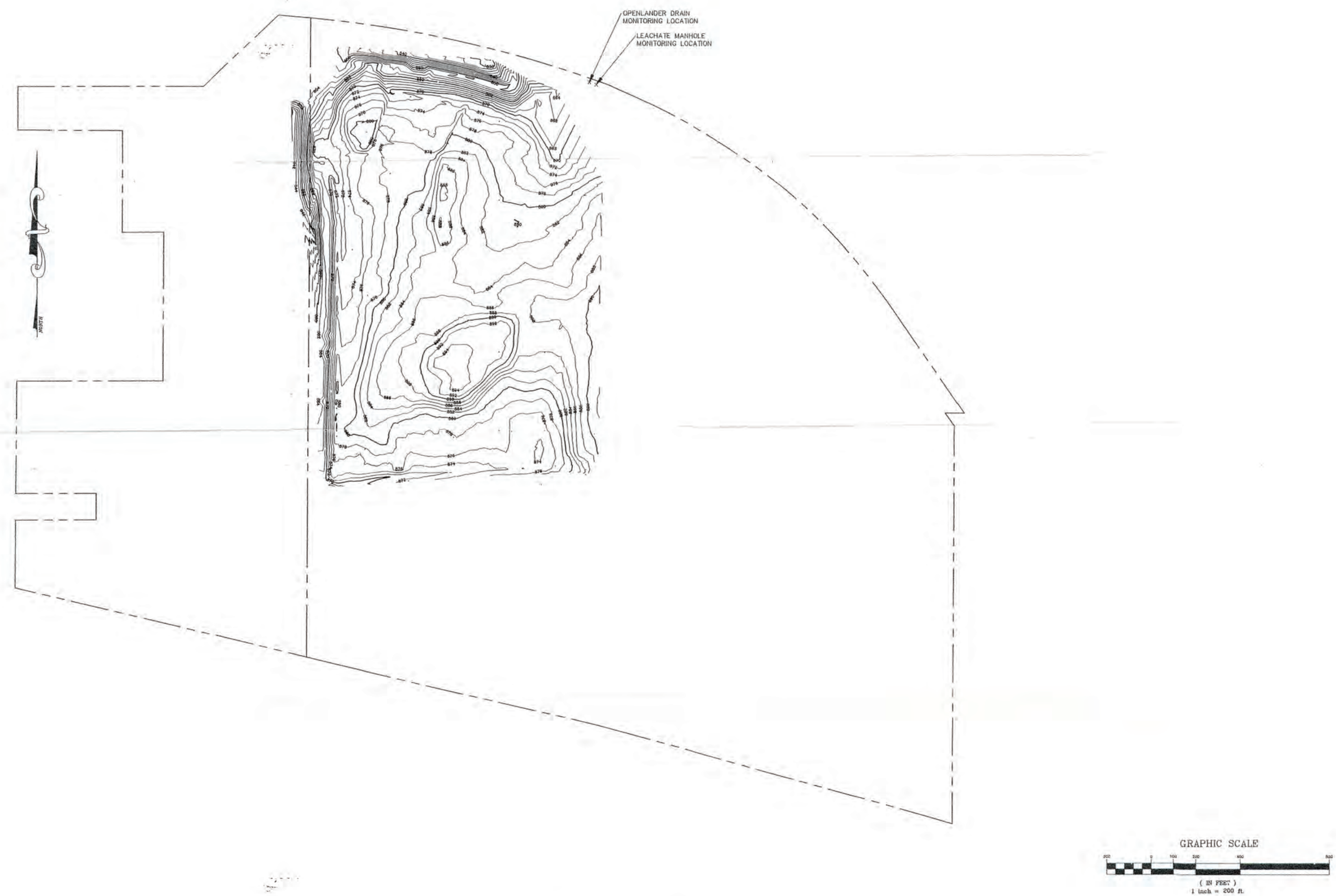
DRAWING NUMBER 85-600

PLATE 6.2
MONITORING WELL AND GROUNDWATER DATA SURVEY



SHEET 1 OF 2	GRANGER LAND DEVELOPMENT 3535 WOOD ROAD P.O. BOX 27185 LANSING, MICHIGAN 48999 (517) 372-2800	POST-CLOSURE OPERATING LICENSE GAS COLLECTION SYSTEM	Plan & Sections Date: 08/11/92 Scale: 1"=100' Drawn By: JAB Filename: #3 \LF2\PCPERM	Revisions

PLATE 6.3
GAS COLLECTION SYSTEM



GRANGER LAND DEVELOPMENT

GRANGER GRAND RIVER AVE.
ACT 64 LANDFILL
FINAL CONTOURS (June 1994)

DRAWING INFORMATION:
DATE: SEPTEMBER 14, 1994
SCALE: 1" = 200'
DRAWN BY: M.ANNETT
APPROVED BY: C.S.A.
DRAWING: C:\CSA\CLSDCON.DWG

COMMENTS:

SHEET 1 OF 1

PLATE 6.4
FINAL CONTOURS

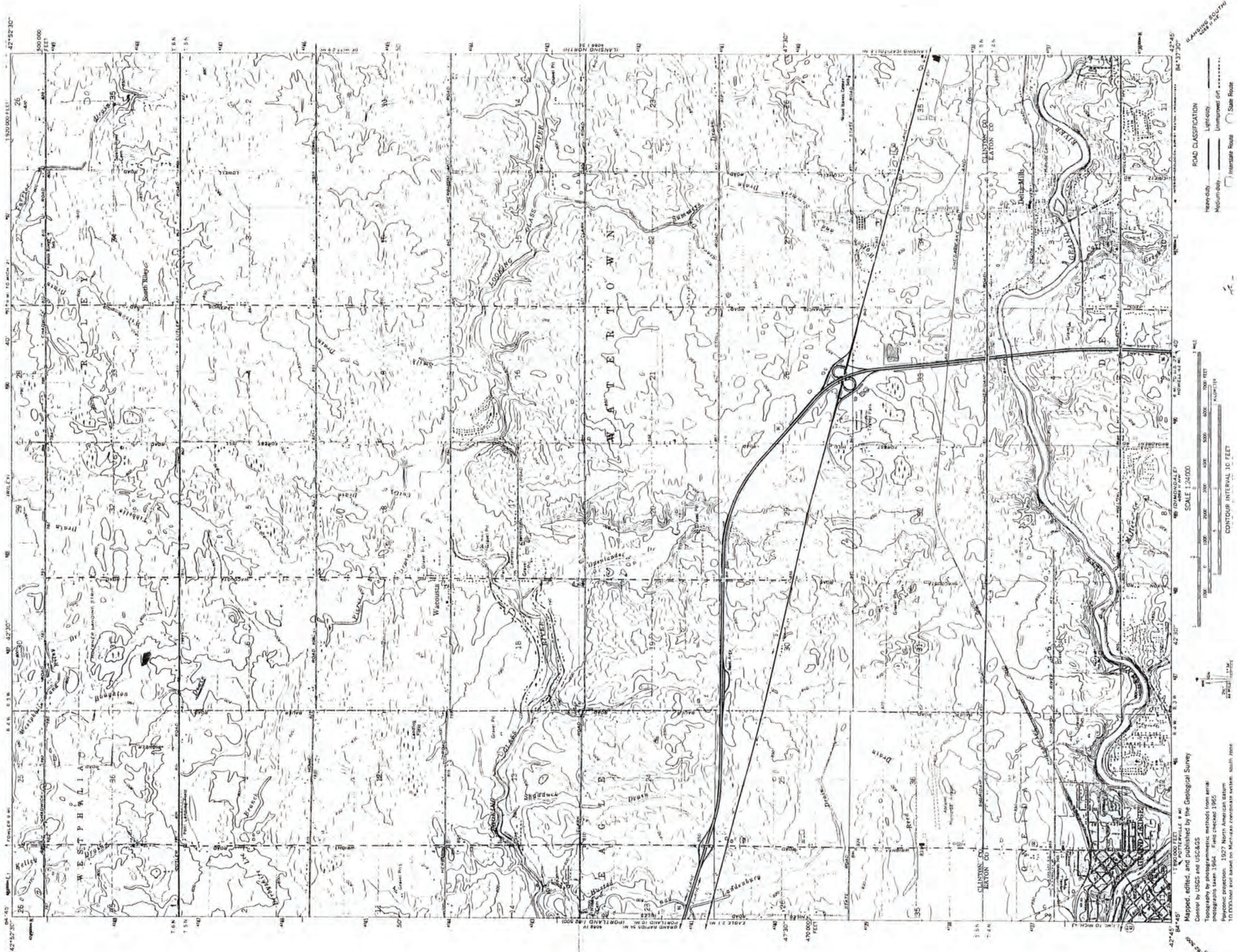


PLATE 7.2
USGS WACOUSTA QUA
LANDFILL BASE

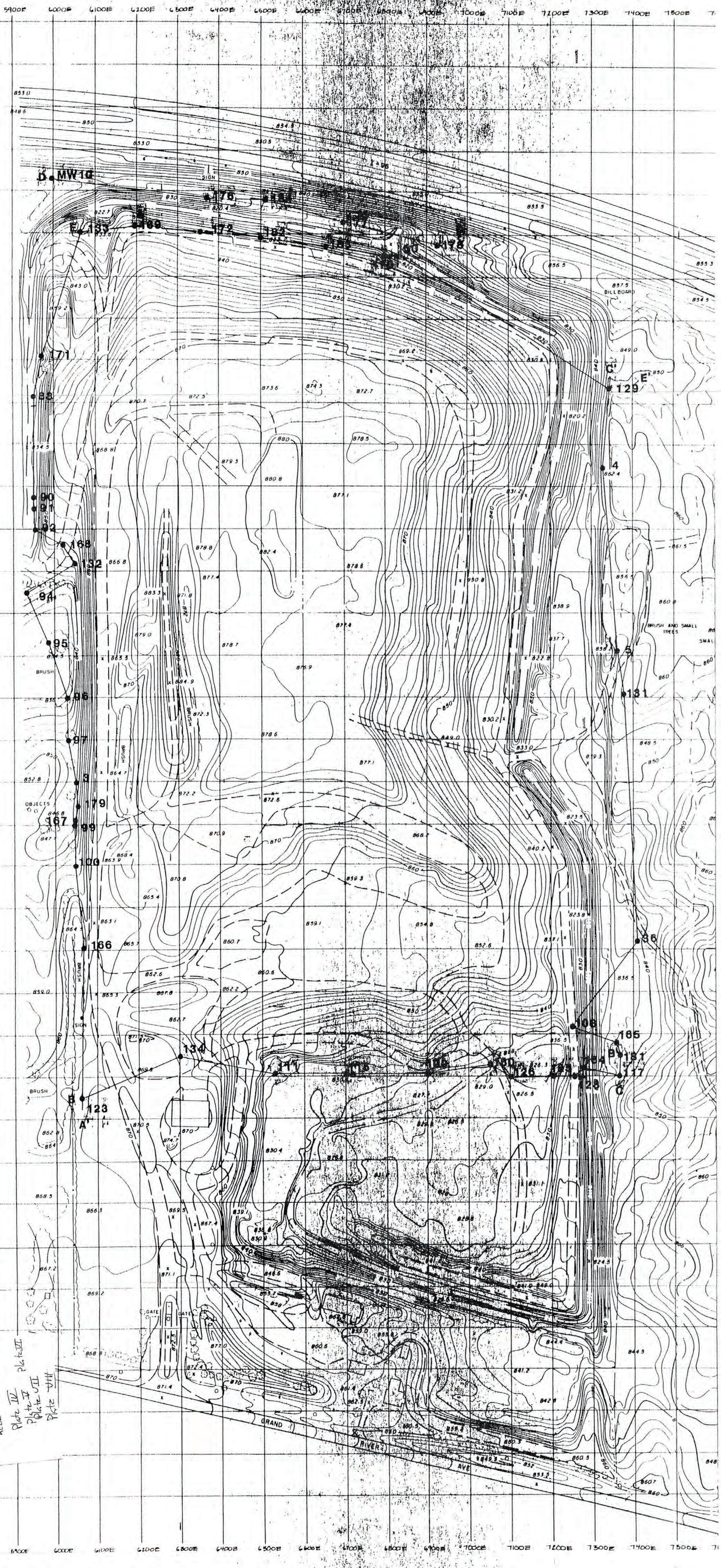


PLATE 7-D
LITHOLOGIC PROFILE LOCATIONS

LITHOLOGIC PROFILE LOCATIONS

GRANGER LAND DEVELOPMENT COMPANY SITE #2

WATERTOWN TOWNSHIP, CLINTON COUNTY MICHIGAN

SCALE 1" = 100'

PREPARED BY KECK CONSULTING SERVICES OCTOBER 1983

PLATE III

PLATE IV

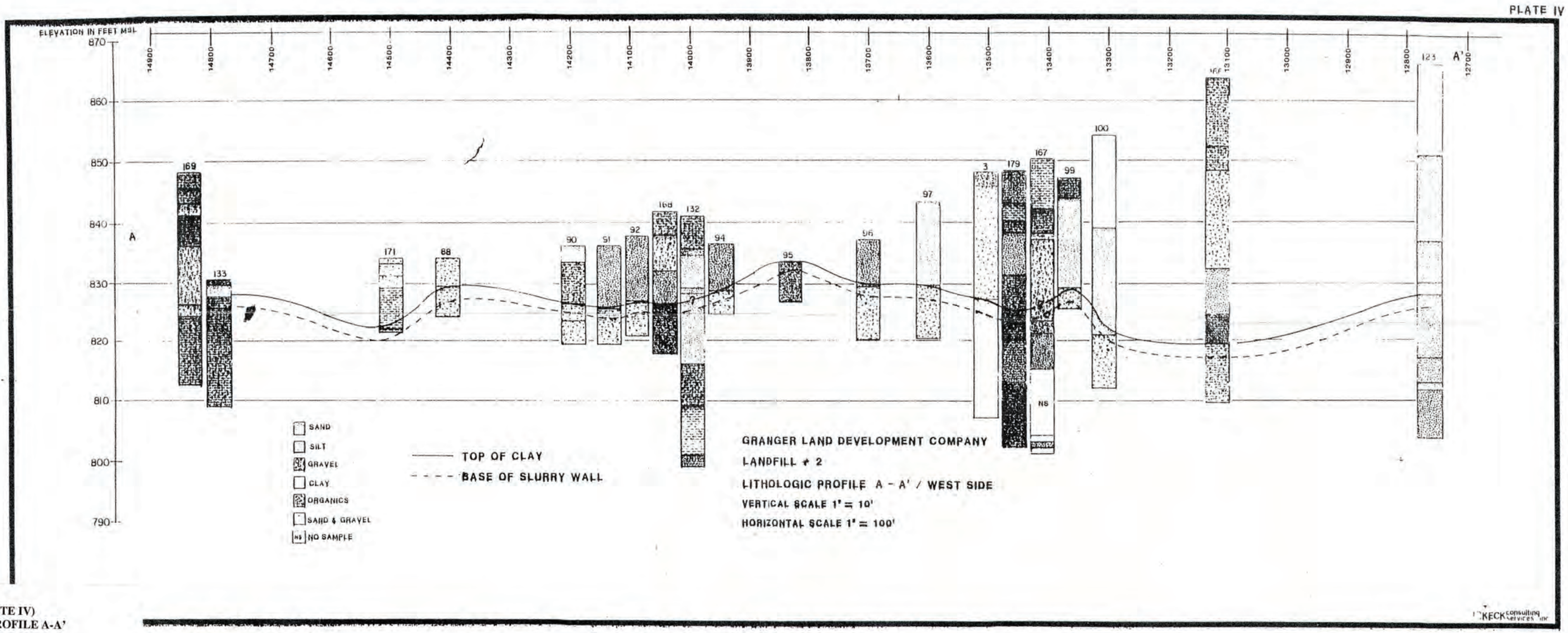


PLATE 7-D (PLATE IV)
LITHOLOGIC PROFILE A-A'

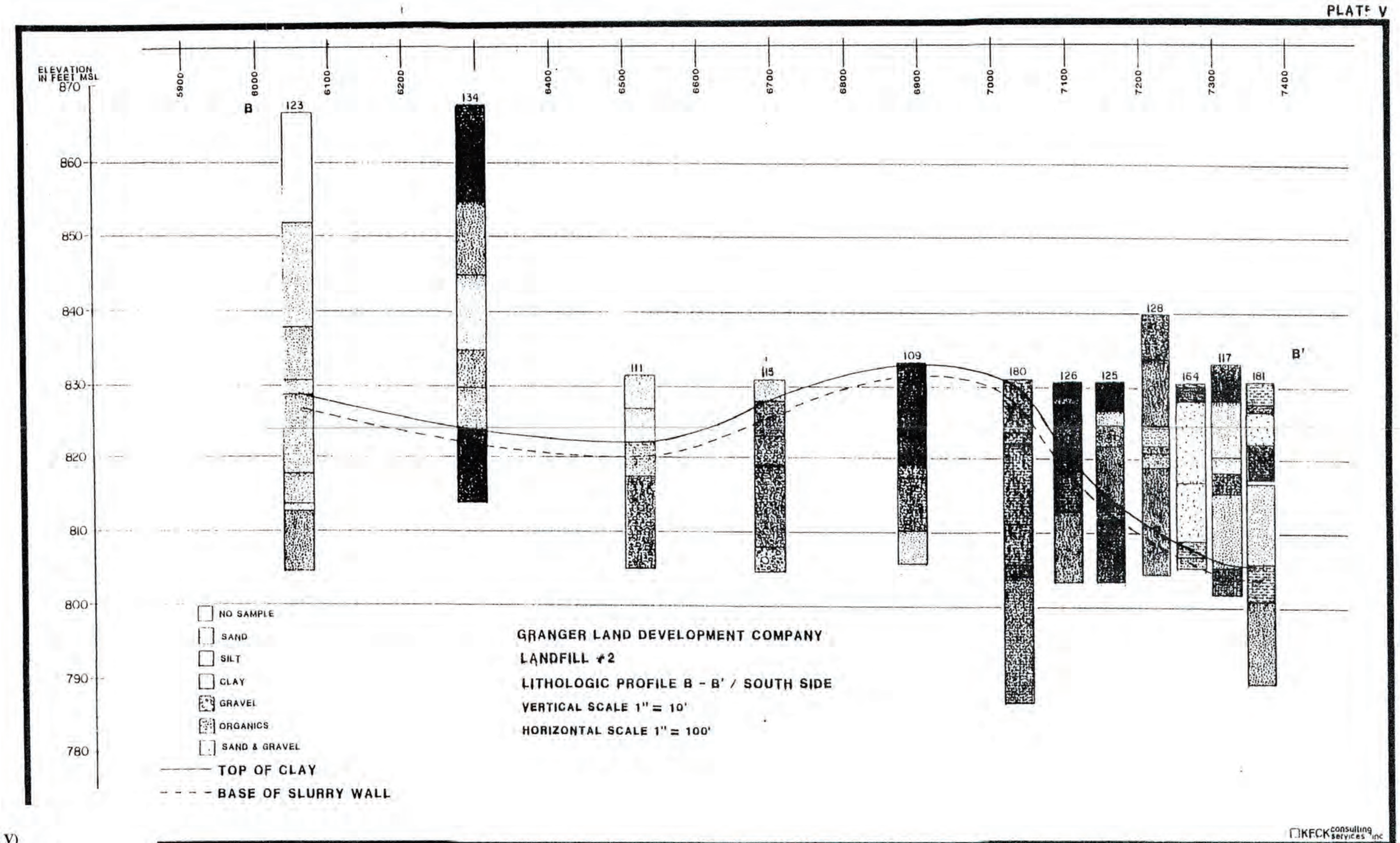


PLATE 7-D (PLATE V)
LITHOLOGIC PROFILE B-B'

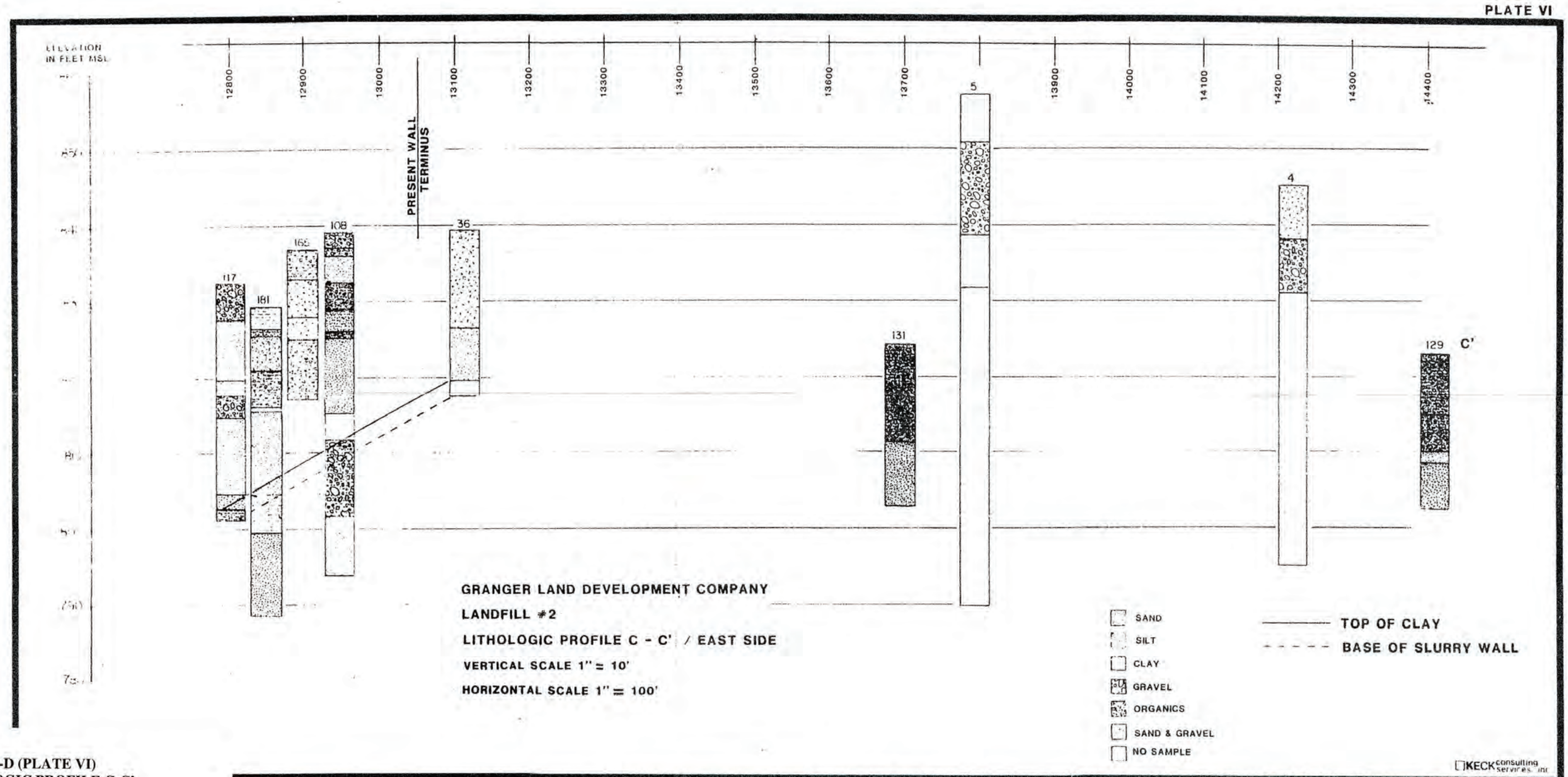


PLATE 7-D (PLATE VI)
LITHOLOGIC PROFILE C-C'

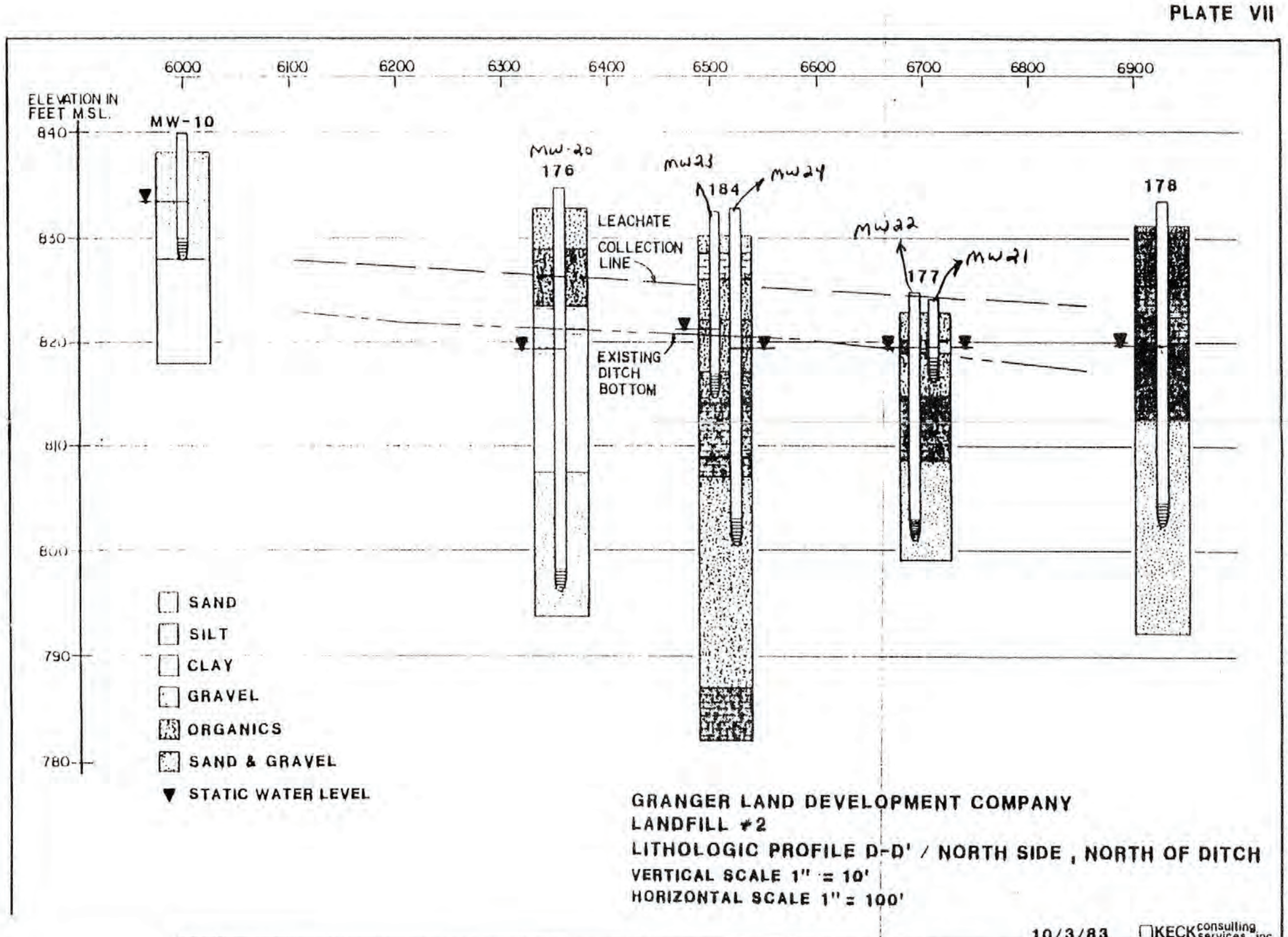


PLATE 7-D (PLATE VII)
LITHOLOGIC PROFILE D-D'

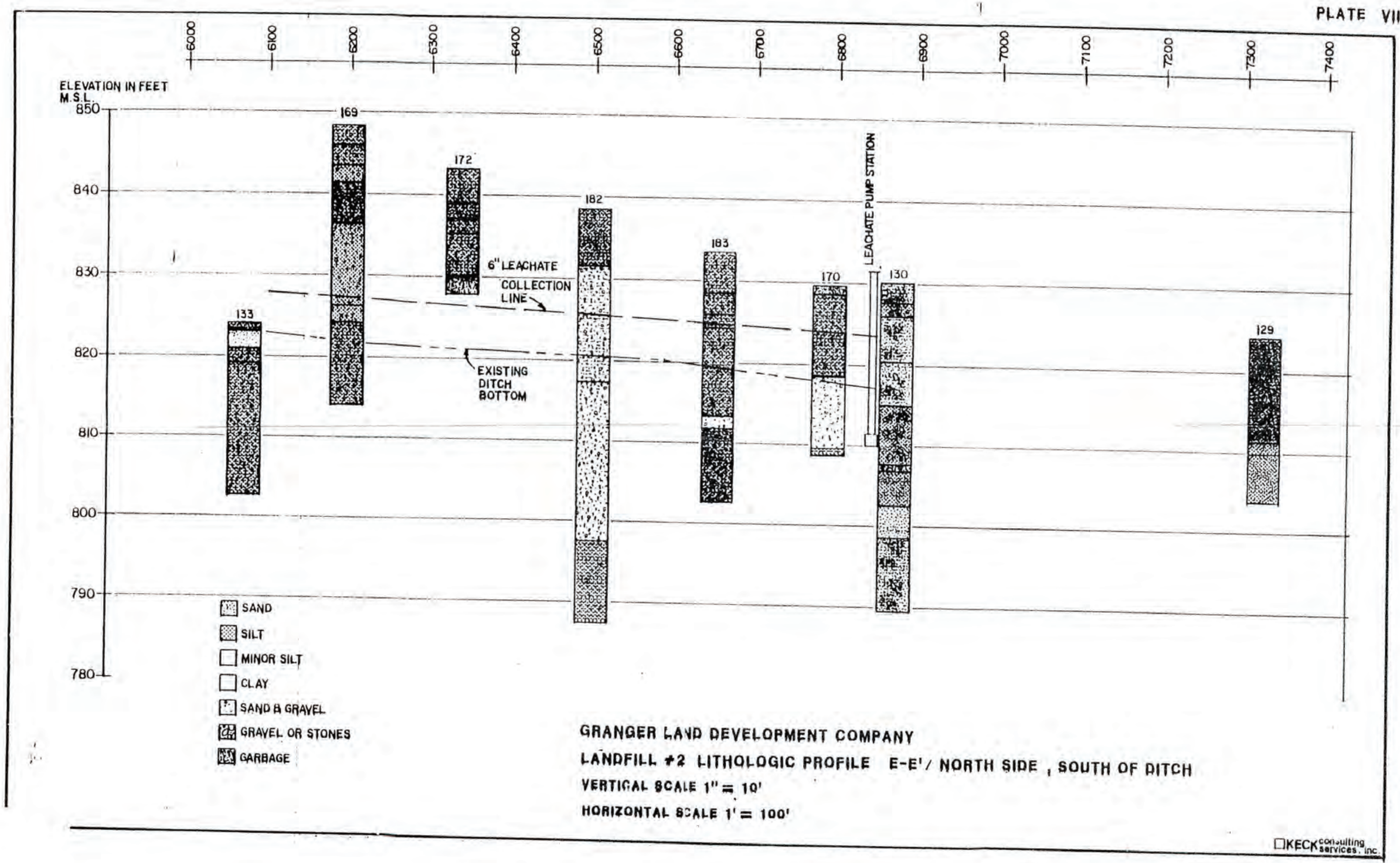


PLATE 7-D (PLATE VIII)
LITHOLOGIC PROFILE E-E'

APPENDIX F

Monitoring Plan

REPORT

Monitoring Plan

Granger MID 082 771 700

Submitted to:

Granger Land Development Company

Lansing, MI

Submitted by:

Golder Associates Inc.

15851 South US 27, Suite 50, Lansing, Michigan, USA 48906

+1 517 482-2262

21494044

December 2021

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 GROUNDWATER MONITORING PROGRAM

This post-closure groundwater monitoring program has been designed in accordance with the requirements listed in Part 111 of the 1994 Public Act 451, as amended, 40 CFR 265 .118 and other sections referenced therein. The groundwater monitoring system has been designed to provide the capability of determining if any significant impact has occurred to the groundwater at the site. The monitoring system has been designed and installed in accordance with the criteria listed in 40 CFR 265.91.

1.1 Monitoring Well Network

The monitoring well network for the MID landfill is summarized in Table 1. Monitoring well locations are shown on **Figure 1**.

Table 1: Monitoring Well Network

Unit	Monitoring Wells
Shallow Glacial Drift:	MW-9, MW-14S, MW-21S, MW-23S, MW-40, MW-43S
Deep Glacial Drift:	MW-44^{U}, MW-14D, MW-20, MW-22S, MW-24D, MW-25, MW-41, MW-43D, MW-45
Bedrock:	MW-16^{U}, MW-17, MW-18
Purge/Recovery Area:	MW-19, P-28, P-29, PW-38, PW-39

^{U} – Indicates well in located upgradient.

1.2 Static Groundwater Level Measurements

During each semi-annual monitoring event, static groundwater level measurements will be collected from all monitoring wells and piezometers (MW-5, MW-6, MW-7, MW-9, MW-10, MW-11S, MW-11D, MW-13, MW 14S, MW-14D, MW-15S, MW-15D, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21S, MW-22D, MW-23S, MW-24D, MW-25, P-28, P-29, P-30, P-31, P-32, P-33, MW-35, P-36, P-37, PW-38, PW-39, MW-40, MW-41, MW-42, MW-43S, MW-43D, MW-44, MW-45, P-46, P-47, P-48, P-49, P-50 and P-51).

During each quarterly purge system sampling event, static groundwater levels will be collected from the following piezometers and wells: MW-19, P-28, P-29, P-30, P-31, P-32, P-33, MW-35, P-36, P-37, MW-40 and MW-44.

Static water level measurements from all wells and piezometers must be collected within a 24-hour period to maintain data integrity. At the time of static water level measurement, the well must be inspected to verify that each monitor well is clearly labelled, visible, undamaged, properly vented, capped and locked when it is first encountered. When leaving the well, verification will be made to ensure that the well is capped and locked. Any problems identified should be recorded and scheduled for maintenance.

Groundwater contour maps from the 2020 Annual Groundwater Report are provided in **Attachment F-1**.

1.3 Sampling and Analysis

A Sampling and Analysis Plan (SAP) is included in **Attachment F-2**. This document identifies techniques for collection, preservation, transport and storage of samples as well as the Quality Assurance/Quality Control (QA/QC) measures.

1.3.1 Groundwater Sample Collection

The appropriate groundwater monitoring wells will be sampled in an order such that the unimpacted wells are sampled first, progressing to the most impacted well as the last well sampled. Purge water from contaminated wells will be contained and disposed of in the leachate collection system.

On a semi-annual basis the wells sampled will include: MW-6, MW-9, MW-14s, MW-14d, MW-19, MW-20, MW-21s, MW-22d, MW-23s, MW-24d, MW-25, MW-40, MW-41, MW-43s, MW-43d, MW-45s, P-28, and P-29. The bedrock aquifer wells will be sampled annually, including: MW-16, MW-17, MW-18.

Both pH and specific conductance will be measured in the field using portable meters that have been standardized at the beginning of each day in accordance with the protocol described in the SAP. The field data sheets will provide for identification and notation of the standardization.

Each piece of sampling equipment (either Teflon bailers, stainless steel bailers or submersible pumps) will be thoroughly decontaminated after each well sampled as described in the SAP. These procedures are designed to minimize the potential for any cross-contamination and interference with the analytical processes.

All samples obtained shall be representative of groundwater quality. To ensure a representative sample is collected, one of the following must occur:

- Field parameter (pH, specific conductance and temperature) measurements must stabilize to within 10 percent;
- Volume of groundwater equal to at least three times the amount of groundwater in the well casing will be evacuated;
- or until the well is dry.

Wells will be sampled immediately after purging where recovery rates allow. Wells evacuated to dryness will be allowed sufficient time for recovery prior to sampling such that the necessary volume can be collected.

As described in the SAP, groundwater evacuated from any monitoring well or purge well which has been identified as impacted will be discharged to the leachate collection system or handled in an alternative manner which is consistent with all applicable regulations. Purged groundwater from unimpacted monitoring wells will be discharged to the ground at least ten feet downgradient from the well. The collection of samples from wells which are designated for volatile organic analyses will be obtained using the protocol described in the SAP.

1.3.2 Groundwater Analyses

Groundwater samples will be analysed for the parameters listed in Tables 2, 3, 4, and 5, below.

Table 2: - Primary Groundwater Analytical Parameters

Primary Parameter	Analytical Method	Detection Limit (µg/L)
Bromodichloromethane	8260	1
Bromoform	8260	1
Carbon Tetrachloride	8260	1
Chlorobenzene	8260	1
Chloroethane	8260	1

Primary Parameter	Analytical Method	Detection Limit (µg/L)
Chloroform	8260	1
Dibromochloromethane	8260	1
o-dichlorobenzene	8260	1
p-dichlorobenzene	8260	1
1, 1-dichloroethane	8260	1
1,2-dichloroethene	8260	1
1, 1-dichloeoethene	8260	1
cis-1,2-dichloroethene	8260	1
trans-1,2-dichloroethene	8260	1
1,2-dichloropropane	8260	1
cis-1,3-dichloropropene	8260	1
trans-1,3-dichloropropene	8260	1
Methyl Bromide	8260	5
Methyl Chloride	8260	5
Methylene Bromide	8260	1
Methylene Chloride	8260	5
Methyl Iodide	8260	1
T-Butanol	8260	50
1, 1, 1,2-tetrachloroethane	8260	1
1, 1,2,2-tetrachloroethane	8260	1
Tetrachloroethene	8260	1
Tetrahydrofuran	8260	5
1, 1, I-Trichloroethane	8260	1
1, 1,2-Trichloroethane	8260	1
Trichloroethene	8260	1
Trichlorofluoromethane	8260	5
1,2,3-trichloropropane	8260	1
1,2,4-trimethylbenzene	8260	1
Vinyl Chloride	8260	5
Benzene	8260	1
Ethyl benzene	8260	1
Styrene	8260	1
Toluene	8260	1
Xylenes	8260	1

Table 3: Secondary Groundwater Analytical Parameters

Secondary Parameter	Analytical Method	Detection Limit (µg/L)
Cadmium (dissolved)*	6010B	5
Chromium (dissolved)*	6010B	20
Lead (dissolved)*	6010B	1
Boron (dissolved)*	6010B	20
Arsenic (dissolved)*	6010B	1

* - metals samples from bedrock aquifer will be analysed for total metals annually

Table 4: Tertiary Groundwater Analytical Parameters

Tertiary Parameter	Analytical Method	Detection Limit (µg/L)
Ammonia Nitrogen	450-NH3-g	10
Nitrate Nitrogen	4500-NO3-f	10
Bicarbonate Alkalinity	310.1	20,000
Chloride	4500-Cl-B	1,000
Sodium (dissolved)*	6010B	1,000
Potassium (dissolved)*	6010B	100
Calcium (dissolved)*	6010B	1,000
Iron (dissolved)*	6010B	20
Magnesium (dissolved)*	6010B	1,000
Manganese (dissolved)*	6010 B	5

* - metals samples from bedrock aquifer will be analysed for total metals annually

Table 5: Field Groundwater Parameters

Field Parameter	Analytical Method	Units
pH (Field)	Field Sampling	SU
Specific Conductance (Field)	Field Sampling	umhos/cm
Temperature (Field)	Field Sampling	Celsius

1.3.3 Statistical Analysis

The site is utilizing the Post-Closure Groundwater Statistical Evaluation Program prepared by RMT, Inc dated January 2006 (Revision 3) which is provided in **Attachment F-3**. The statistical program utilizes an intra-well approach as previously approved by the State. [(Section 2.1 of Attachment F-3.)]

Statistical comparisons will be made for the primary parameters (Table 2) for each of the monitoring wells identified in Section 3.2 of the Statistical Program as being associated with the shallow glacial aquifer, the deep glacial aquifer, or the bedrock aquifer. Statistical comparisons will also be performed for the secondary parameters (Table 3) for the same monitoring wells.

The tertiary parameters provide information regarding the general chemistry of the groundwater and to assist in determining if a release has occurred or if other factors, such as well seal or grout contamination are issues.

1.4 Assessment Monitoring Program

Within 30 days of verification of a statistically significant increase in primary or secondary groundwater parameters, an incident specific Assessment Monitoring Plan will be submitted to EGLE which will be capable of determining the following:

- Whether a hazardous waste or hazardous waste constituent has entered the groundwater.
- The rate and extent of migration of hazardous waste or hazardous waste constituents in the groundwater.
- The concentrations of hazardous waste or hazardous waste constituents in the groundwater.
- Performance of risk assessment of detected levels of hazardous waste or hazardous waste constituents and identification of what immediate actions may need to be initiated (e.g. plume modelling, pathway analysis, interim measures, etc.).

Assessment monitoring will be conducted quarterly, at a minimum, until EGLE personnel have determined if Detection Monitoring or Compliance Monitoring is appropriate or whether Corrective Action is appropriate.

1.5 Groundwater Monitoring Reporting and Recordkeeping

Results of the analytical results will be submitted to EGLE within 60 days of the sampling event. Chain-of-Custody and sampling data sheets will be completed by field sampling personnel. These records will be stored at the Granger Wood Street office as part of the Operating Record.

2.0 SURFACE WATER MONITORING PLAN

2.1 Introduction

The following post-closure surface water monitoring program has been designed in compliance with the requirements listed in Part 111 of the 1994 Public Act 451, as amended, and 40 CFR 264.118 and other sections referenced therein. The detection monitoring system has been designed to provide the capability of determining if any significant impact has occurred to the surface water at the site. Stormwater runoff from the site travels through the ditches along the west and north sides of the landfill and, after leaving the site and traveling under Interstate I-96, empties into the Openlander Drain. An area of deeper excavation of the ditch on the north end just adjacent to the culvert running under the Interstate represents the only surface water body at the site. Samples of the surface water in the ditch are obtained at this location as shown on **Figure 1**.

2.2 Surface Water Sampling

Monitoring of the surface water in the ditch leading to the Openlander Drain will be performed on a semi-annual basis. Because of the variability of the surface water, each monitoring event will entail the collection of three discrete samples within a 24-hour period. Each sample will be analyzed for the parameters identified in **Table 6** using the analytical methods and detection limits listed. These monitoring parameters have been identified based on an examination of prior monitoring results of leachate, groundwater, and surface water, as well as toxicities of parameters, and absorbabilities.

Representative samples will be obtained by avoiding a disturbance of the sediments prior to sampling, and by obtaining the sample below the water surface and away from the shore and sediments. Each piece of sampling equipment will be thoroughly decontaminated in accordance with the Sampling and Analysis Plan.

Field measurements of pH, specific conductance, and temperature will be obtained using field instruments that have been calibrated at the time of sampling.

Samples collected for analysis of metals will not be field filtered. Each sample container will be labeled with sampling location, time and date, and the sampler's initials. After collection the samples will be preserved according to the appropriate protocol, placed in coolers, and kept on ice. The coolers will be stored in a secure location at all times, and will be delivered to the laboratory on the same day they were collected. A chain of custody form will identify each sample and will accompany each cooler. Each person responsible for the handling of the coolers will sign and date the form.

Table 6: Surface Water Monitoring Parameters

Parameter	Analytical Method	PQL/RDL (µg/L)
Primary Parameters		
VOCs	8260	(Note 1)
Secondary Parameters		
Ammonia nitrogen	350.1	10
Nitrate nitrogen	353.2	10
Cadmium (dissolved)	200.7/6010	5
Chromium (dissolved)	200.7/6010	20
Lead (dissolved)	200.7/6010	50

Parameter	Analytical Method	PQL/RDL (µg/L)
Arsenic (dissolved)	206.2/7060	1
Copper (dissolved)	200.7/6010	20
Tertiary Parameters		
Calcium	215.1/7140	1,000
Magnesium	242.1/7450	1,000
Sodium	273.1/7770	1,000
Chloride	325.0	1,000
Bicarbonate alkalinity	310.1	20,000
Field Parameters		
pH (field)	150.1	SU
Specific conductance (field)	120.1	umchos/cm

1 – PQL/RDLs defined in Federal Register for each volatile organic compound included in Method 8260.

2.3 Surface Water Data Evaluation

The surface water data evaluation program is designed to signal concentrations of monitoring parameters which are in excess of the specified standards. Different techniques are used for different parameters which have been divided into four categories: Primary; Secondary; Tertiary; and Field Parameters.

The list of Primary Parameters will be comprised of volatile organic compounds included in Method 8260. This analytical method contains all the compounds that have been detected in prior characterization of the leachate from the site. Since these compounds are not naturally occurring, a confirmed detection for any single compound will be considered an exceedance. Within 10 days of verification of an exceedance (as evidenced by their continued detection in the follow-up sampling), an "incident Specific Assessment Monitoring Plan" will be submitted to the Department.

The Secondary Parameters are mainly inorganic parameters that are found in elevated concentrations in the leachate. Since these parameters are naturally occurring, their presence in surface water may or may not be an indication of a release. In this program, Secondary Parameters are used to detect a possible release in the following way:

> The analytical results will be compared directly to the non-drinking water "Water Quality Values" published for Rule 57 in Part 31 of 1994 Public Act 452, as amended. Analytical results in excess of the Rule 57 water quality values for any two or more Secondary Parameters observed in at least two of the three discrete samples will be considered an exceedance. This approach is designed to detect relatively subtle changes in surface water quality as evidenced by several parameters at once.

The Tertiary Parameters are those parameters that will be measured during detection monitoring, but will not be subjected to the compliance evaluation. The analytical results for parameters in the Tertiary list will be used to evaluate potential non-release related surface water quality. These parameters will not be analysed statistically because they are poor indicators of a release due to low relative concentrations within the landfill leachate.

Field Parameters are those parameters measured and recorded in the field during sample collection. These parameters will not be analysed statistically.

3.0 LEACHATE MONITORING PLAN

3.1 Introduction

The site has an internal perimeter leachate collection system. In addition, a slurry wall has been constructed along the entire south border of the landfill, and extended north along the east and west borders. The landfill has also been capped in accordance with an encapsulation plan approved by the State, and a separation wall constructed along the east border of the landfill.

Those efforts resulted in a 1984 determination by the MDNR that the actions had accomplished the goal of "permanently and completely encapsulating the portion of its landfill site where hazardous wastes have been disposed of in the past on or before May 2, 1983". This understanding was confirmed when the State approved Closure of the site on April 13, 1990.

In addition, as part of the post-closure maintenance and operation of the leachate collection system, six 4-inch diameter leachate piezometers (LMW-1 through LMW-6) were installed in 1995-1996 at the locations shown in **Figure 2**. Each piezometer was designed to have a pumping capacity to reduce the leachate static elevations. Following installation, all of the piezometers had pumping systems installed and the piezometers were connected by a forcemain that resulted in the leachate being discharged to the leachate pump station manhole on the north side of the site. In 2020, a gas extraction well was converted to an extraction well, LMW-7.

The following post-closure leachate monitoring program has been designed in compliance with the requirements listed in 40 CFR 265.118 and other sections referenced therein. In addition, post-closure monitoring of the leachate will be performed in accordance with the monitoring required under the terms of the discharge permit issued by the Southern Clinton County Municipal Utility Authority (SCCMUA).

Monitoring of the character of the leachate discharged to the SCCMUA treatment facility will be performed by an independent consultant and laboratory on an annual basis. Following receipt of monitoring data from the consultant and laboratory, the data will be provided to EGLE.

3.2 Monitoring Locations

The leachate monitoring stations are identified in **Figure 2**. These stations include the leachate manhole located on the north end of the property, the leachate manhole on the west line, and the piezometers located within the fill area (P-29, P-30, P-31, P-33, LMW-1, LMW-2, LMW-3, LMW-4, LMW-5, LMW-6 and LMW-7).

3.3 Monitoring Schedule

Monitoring of the leachate will be performed on an annual basis.

3.4 Static Leachate Level Measurement

Leachate level monitoring is necessary to ensure that the leachate collection systems were functioning properly, which results in controlling the hydraulic head on the landfill base. Leachate level measurements in the piezometers are performed on a quarterly basis. Along the eastern edge of the landfill, a head of no more than one foot is acceptable, while no more than four feet of head is acceptable in the interior of the landfill. Aside from times of normal maintenance of pumping systems, should these levels be exceeded, the Department will be notified immediately. In addition, within 5 business days, the Department will be provided with an outline of steps to be taken to mediate the head exceedances. Static leachate level measurements will also be obtained quarterly from P-29, P-30, P-31 and P-33.

3.5 Sample Collection

Leachate samples are collected from the one inch line at the pump station manhole. A grab sample using a 5-gallon bucket is done prior to the MID leachate mixing with leachate from the Grand River Avenue Landfill. Approximately 5 gallons will be purged from the forcemain prior to sample collection and care will be taken to collect samples during times of pumping operation.

3.6 Sample Analysis

Leachate samples will be analysed for the parameters listed in **Table 7**. Unfiltered samples will be analysed.

Table 7: Leachate Monitoring Schedule

Parameter	Method	PQL/RDL (µg/L)	Schedule
Modified Appendix IX List -dioxane/furans, +boron	Note 1	Note 1	Odd Years
VOCs	8260	Note 2	Annual
1,2,3-trimethylbenzene	542.2/8260	0.5	Annual
1,2,4-trimethylbenzene	524.2/8260	0.5	Annual
pH	150.1	pH	Annual
Specific Conductance	120.1	umhos/cm	Annual
Ammonia	350.1	10	Annual
Cyanide	335.2/9010	5	Annual
Nitrate/Nitrite	353.2	10	Annual
Bicarbonate alkalinity	310.1	20,000	Annual
Calcium	215.1/7140	1,000	Annual
Sodium	273.1/7770	1,000	Annual
Chloride	325.0	1,000	Annual
Magnesium	242.1/7450	1,000	Annual
Sulfate	375.4	2,000	Annual
BOD	405.1	2,000	Annual
Phenols	420.2/9066	10	Annual
Total arsenic	206.2/7060	1	Annual
Total boron	6010B	20	Annual
Total cadmium	200.1/6010	5	Annual
Total chromium	200.1/6010	20	Annual
Total copper	200.1/6010	20	Annual
Total lead	200.1/6010	50	Annual
Total mercury	245.1/7470	0.2	Annual
Total nickel	200.1/6010	50	Annual
Total zinc	200.1/6010	4	Annual

1 – Methods and detection limits per 40 CFR 264 Appendix IX..
2 – PQL/RDLs defined in Federal Register for each volatile organic compound included in Method 8260.

4.0 PURGE SYSTEM MONITORING AND OPERATION

4.1 Introduction

Corrective actions have been implemented to address VOC concentrations in the southwest corner of the site and boron concentrations on the north and west of the site.

A system of two purge wells (PW-38 and PW-39) were installed in the southwest corner of the site in late 1987 after low concentrations of VOCs were detected in shallow groundwater. The original purge wells were replaced by PW-46 and PW-49 in 2004-2005 and the system has consistently operated. Purge water is discharged to the Southern Clinton County Municipal Utilities Authority sanitary sewer system through the leachate system.

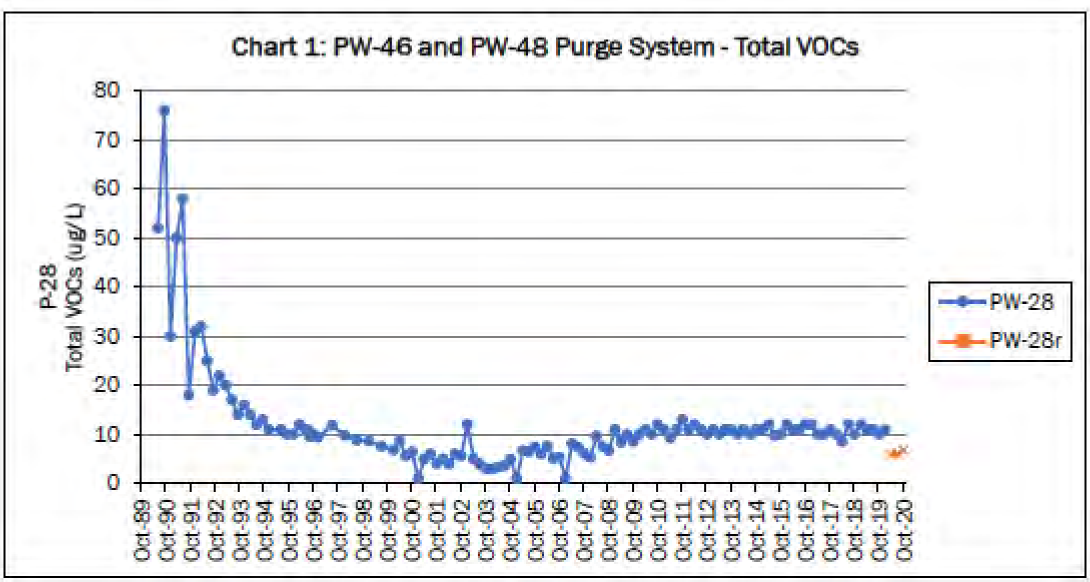
Following the identification of concentrations of boron in groundwater on the west and north side of the site, purge wells PW-40 and PW-50 were installed in September 2006 to address the impacted groundwater. In addition to the groundwater purge system, extensive source remediation was performed which included excavation of boron-containing materials present in the ditches as documented in submittals to EGLE dated May 4, 2007, September 14, 2007, November 29, 2007, March 19, 2008, June 13, 2008, and September 17, 2008.

4.2 VOC Purge System

4.2.1 Capture Zone Analysis and Effectiveness

Static groundwater elevations are obtained during quarterly monitoring events to evaluate if the purge system is maintaining a cone of depression. Recent annual reports indicate the system is producing a cone of depression.

Well P-28 is located within the influence of the purge system where there is a detection of low concentrations of tetrachloroethene. A historical summary is provided in **Chart 1**, below. The VOC concentration data show a sharp reduction in total VOCs following by sustained lower concentration. In April 2020, P-28 was abandoned and replaced with P-28r.



Both the static groundwater elevations and groundwater data (annual groundwater reports) reflect the effectiveness of the VOC purge system.

4.2.2 Monitoring Schedule

Static groundwater elevations are collected during quarterly monitoring events from the following wells and piezometers: MW-6, MW-19, P-28, P-29, P-30, P-31, P-32, P-33, MW-35, P-36, P-37, MW-40, MW-43s, MW-43d and MW-44d. The static groundwater elevations will be determined using methods giving precision to 0.01-feet and will be measured prior to any purging. Measurements will be made from the top of the casing, with the elevation of the casings being related to a permanent on-site reference point.

Details on the measurement of elevations as well as sampling protocols are included in the SAP. As described in that protocol, each piece of sampling equipment will be thoroughly decontaminated before use in the monitoring well to minimize the potential for any cross-contamination and interference with the analytical processes.

The quarterly purge system monitoring will involve the collection of samples from MW-19, P-28, P-29 and purge wells PW-46 and PW-48. Samples will be analysed for VOCs listed in **Table 2**.

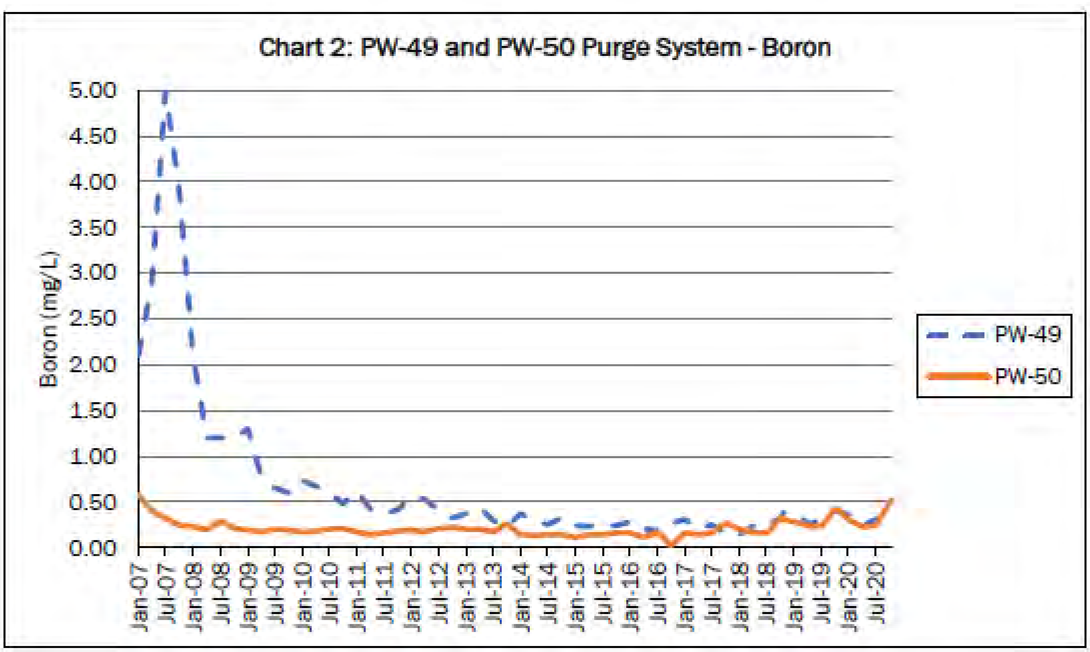
4.2.3 Record Keeping

Laboratory analytical results and static groundwater elevation measurements will be submitted to EGLE within 60 days of the sampling event. Field sampling forms and chain-of-custody will be completed by field sampling personnel. Sampling records will be stored as part of the Operating Record at the Granger Wood Street office.

4.3 Boron Purge System

4.3.1 Capture Zone Analysis and Effectiveness

Recent annual groundwater monitoring reports document the effectiveness of the boron purge system. In recent years, there were no exceedances of any primary parameters, including boron. The purge wells effectively reduce the concentrations of boron in the surrounding wells, groundwater and purge water. Consistent evacuation from PW-49 (645,180 gallons in 2020) and PW-50 (3,818,870 gallons is 2020) have resulted in the creation of a potentially larger than necessary capture zone in the vicinity of the purge wells. The improvement in groundwater quality in the purge wells is demonstrated in **Chart 2**, below.



Recent data indicate that: 1) the entire west side of the site is influenced by the purge system and the effectiveness of the capture zones is clearly seen in the groundwater quality data; 2) the purge system on the north side has a significant impact on both the hydrogeologic conditions and the quality of the groundwater; and 3) the impacted groundwater on both the west and north side is being effectively remediated.

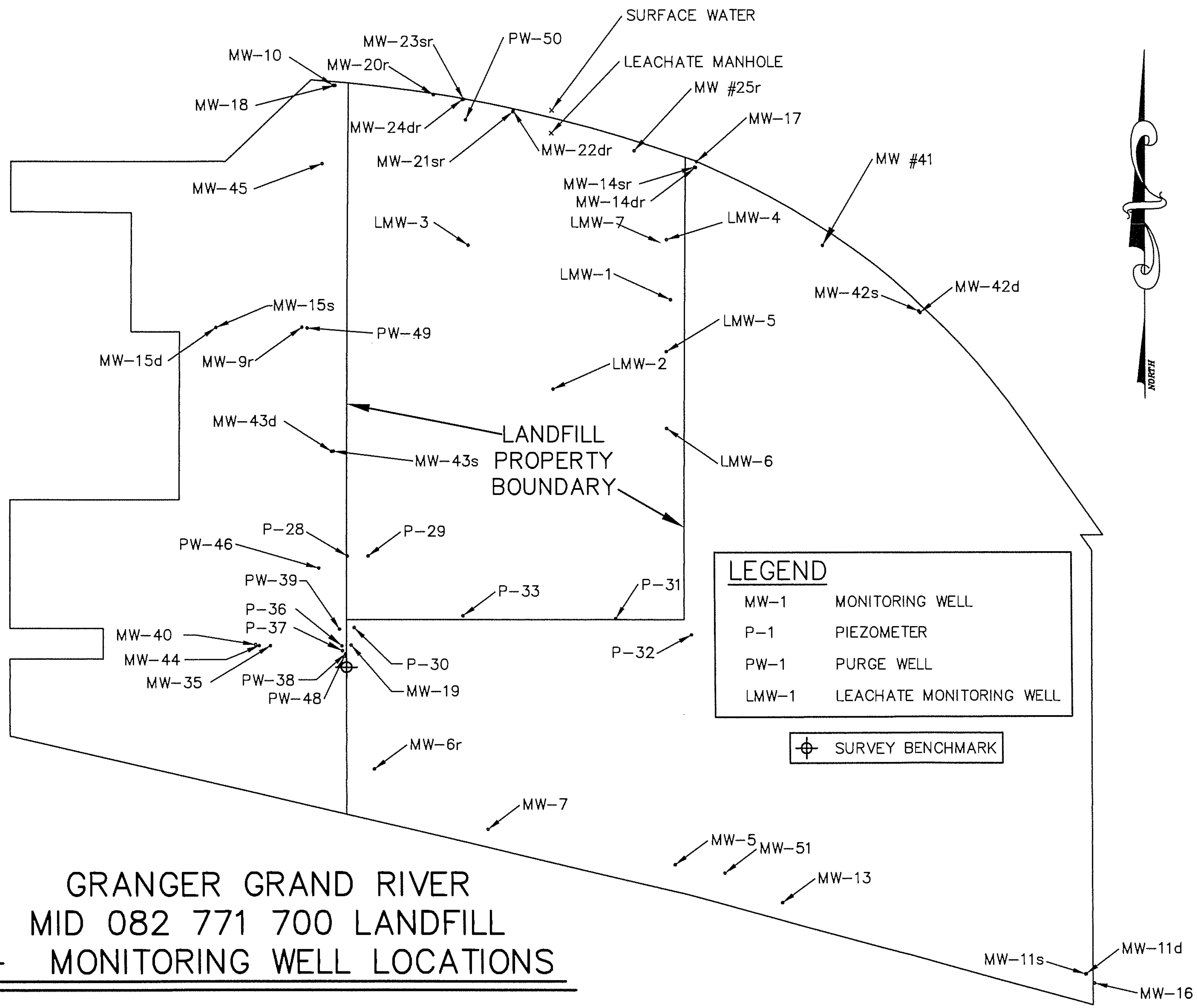
4.3.2 Monitoring Schedule

During each quarterly monitoring event static groundwater elevations will be measured in the following monitoring wells: MW-9r, MW-45, MW-20r, MW-23sr, MW-24dr, and MW-21sr. The static groundwater elevations will be determined using methods giving precision to 0.01 feet and will be measured prior to any purging. Measurements will be made from the top of casing, with the elevation of the casing being related to a permanent on-site reference point.

The quarterly purge system monitoring will involve the collection of samples from MW-21sr, MW-23sr, and MW-24sr. In addition, a sample of the purge water will be obtained from both PW-49 and PW-50. Samples will be collected from the purge lines at the individual pump stations. Both the groundwater and purge water samples will be analysed for boron utilizing the analytical method and detection limit identified in **Table 3**.

4.3.3 Record Keeping

Laboratory analytical results and static groundwater elevation measurements will be submitted to EGLE along with the quarterly sampling reports of the sampling event. Field sampling forms and chain-of-custody will be completed by field sampling personnel. Sampling records will be stored as part of the Operating Record at the Granger Wood Street office.



GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
– MONITORING WELL LOCATIONS

SCALE: 1"=500'

FIGURE 1.1.2 – MONITORING LOCATIONS

MONITORING WELLS LOCATIONS

Description	Northing	Easting	Top of Casing Elevation
MW #5	11890	7320	871.79
MW #6r	12262	6150	871.99
MW #7	12028	6591	868.91
MW #9r	13966	5876	852.99
MW #10	14932	6000	839.88
MW #11s	11465	8925	868.38
MW #11d	11466	8928	867.40
MW #13	11742	7741	870.05
MW #14sr	14615	7410	867.51
MW #14dr	14614	7413	865.96
MW #15s	13996	5533	859.81
MW #15d	13996	5533	859.67
MW #16	11430	8960	862.13
MW #17	14637	7417	859.61
MW #18	14932	6007	840.56
MW #19	12750	6064	870.14
MW #20r	14872	6411	836.28
MW #21sr	14807	6725	826.62
MW #22dr	14811	6727	826.89
MW #23sr	14859	6529	833.48
MW #24dr	14854	6524	834.40
MW #25r	14679	7178	869.10
P #28	13100	6051	866.04
P #29	13100	6132	872.86
P #30	12819	6076	869.60
P #31	12854	7100	887.29
P #32	12790	7390	918.69
P #33	12865	6500	874.95
MW #35	12748	5746	864.22
P #36	12747	6028	867.50
P #37	12728	6030	868.52
PW #38	12716	6042	869.88
PW #39	12813	6019	866.82
MW #40	12752	5686	865.47
MW #41	14313	7915	872.74
MW #42s	14060	8292	873.46
MW #42d	14054	8298	874.16
MW #43s	13511	5999	855.59
MW #43d	13510	5992	855.69
MW #44	12748	5701	866.09
MW #45	14629	5956	843.17
PW #46	13053	5939	862.51
PW #48	12706	6037	0.00
PW #49	13993	5897	0.00
PW #50	14797	6515	0.00
MW #51	11857	7512	875.87
LMW #1	14102	7317	886.97
LMW #2	13753	6860	885.61
LMW #3	14313	6525	882.58
LMW #4	14334.7	7302	867.93
LMW #5	13900.2	7300.1	888.66
LMW #6	13598	7301.2	890.83
LMW #7	14322.3	7279.2	867.23

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APPROVED BY: CSA

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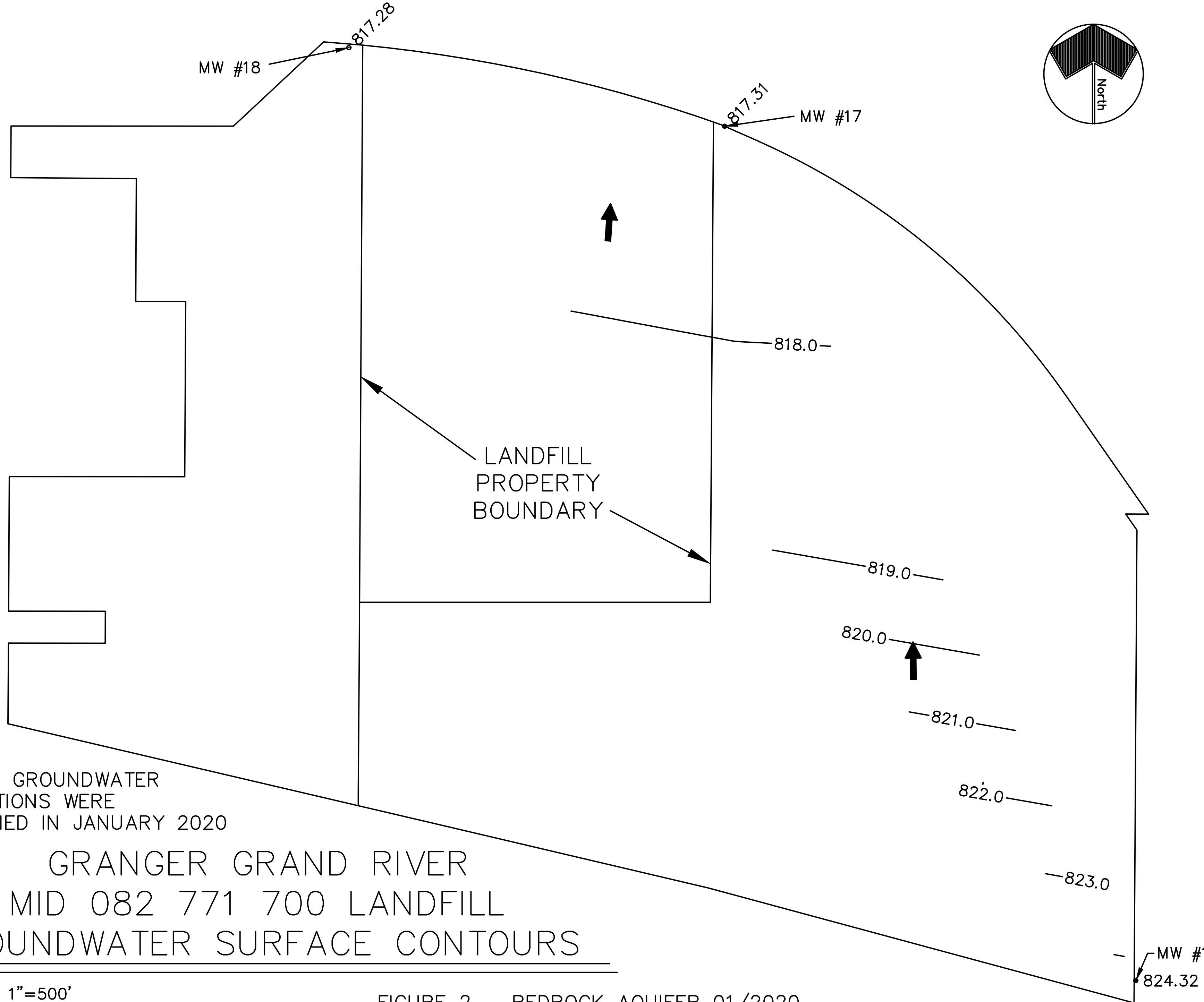
APPENDIX F-1

Groundwater Contour Maps

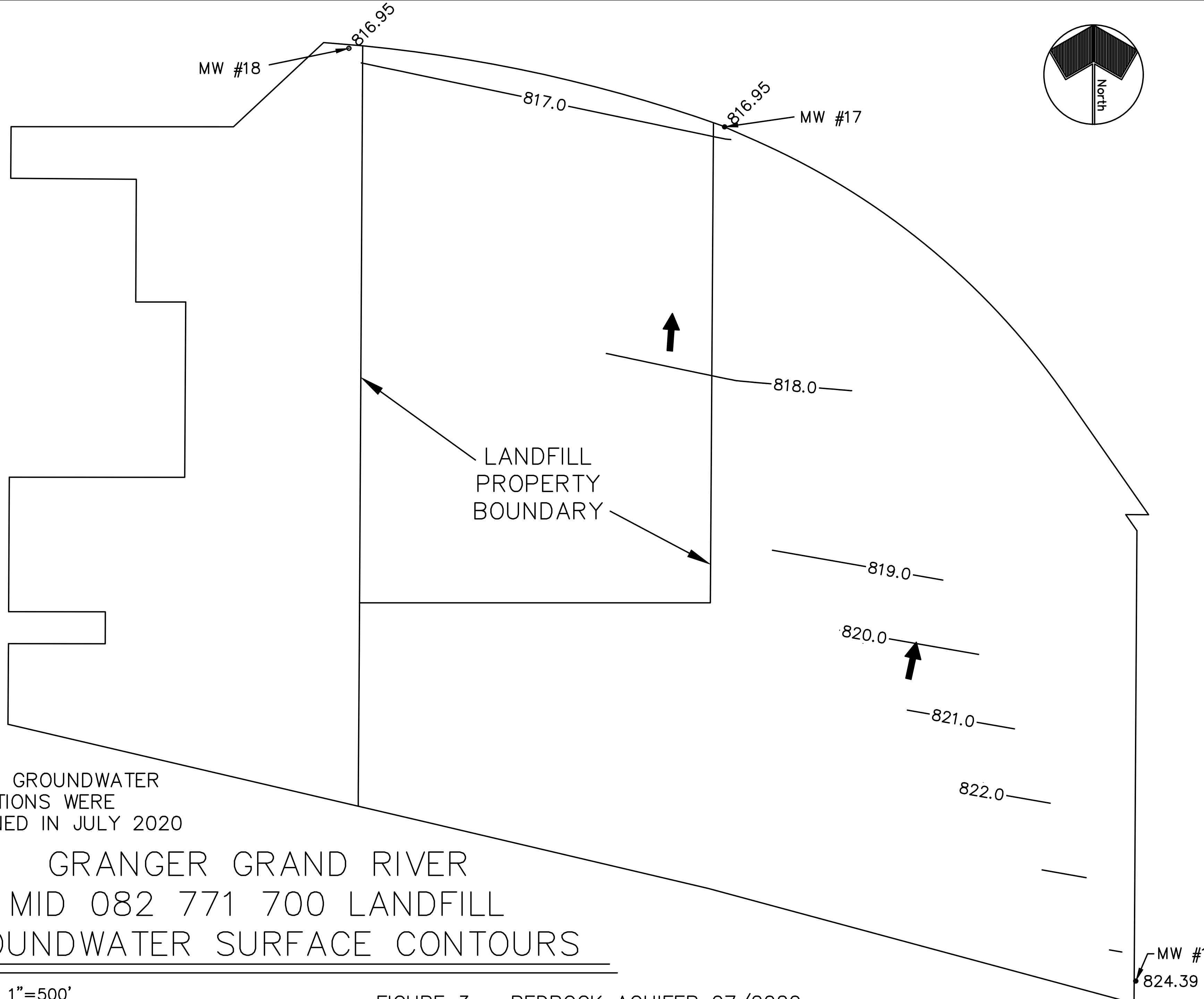


STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JANUARY 2020

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 2 – BEDROCK AQUIFER 01/2020

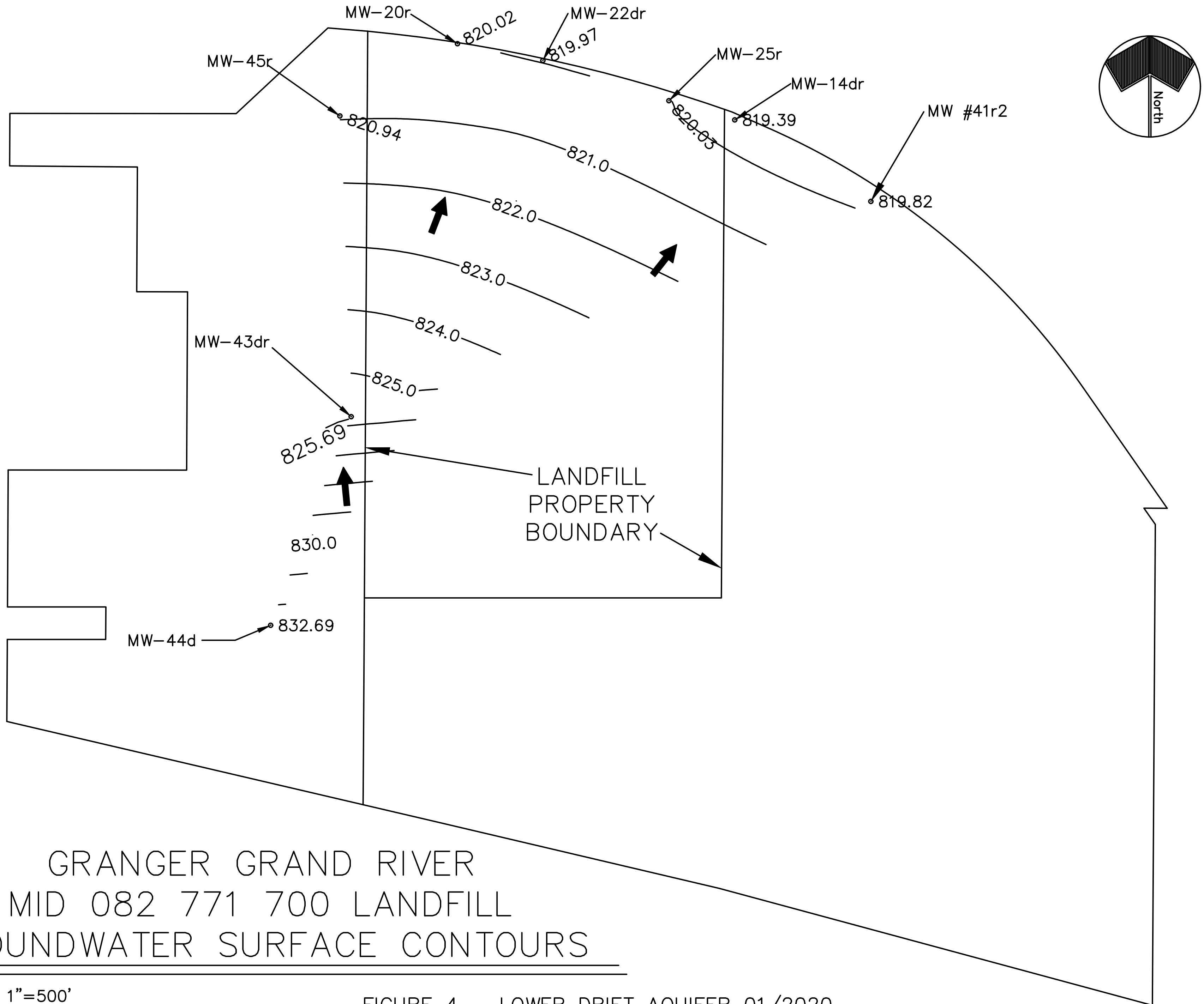


STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JULY 2020

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 3 – BEDROCK AQUIFER 07/2020



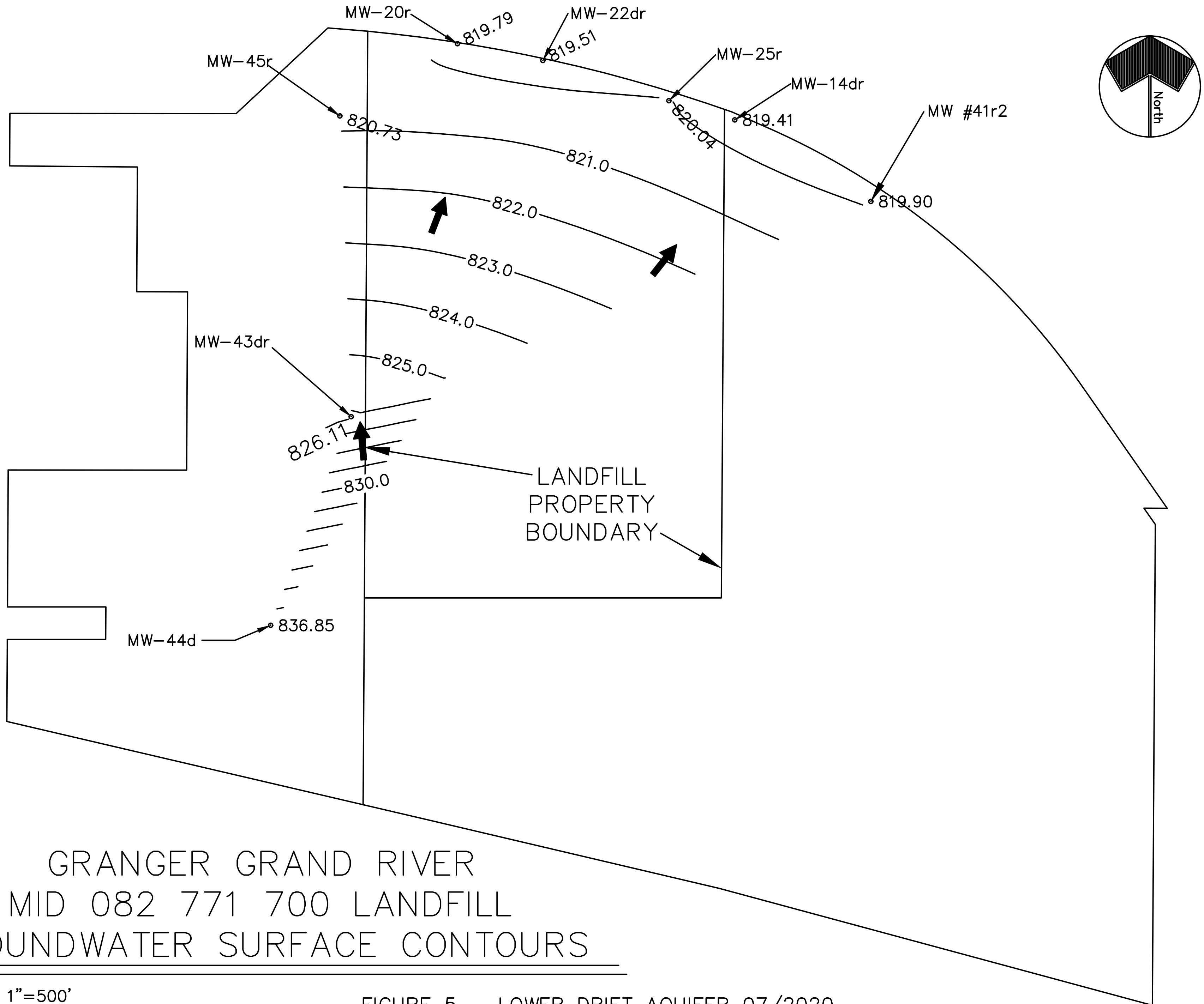
GRANGER GRAND RIVER

MID 082 771 700 LANDFILL

GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

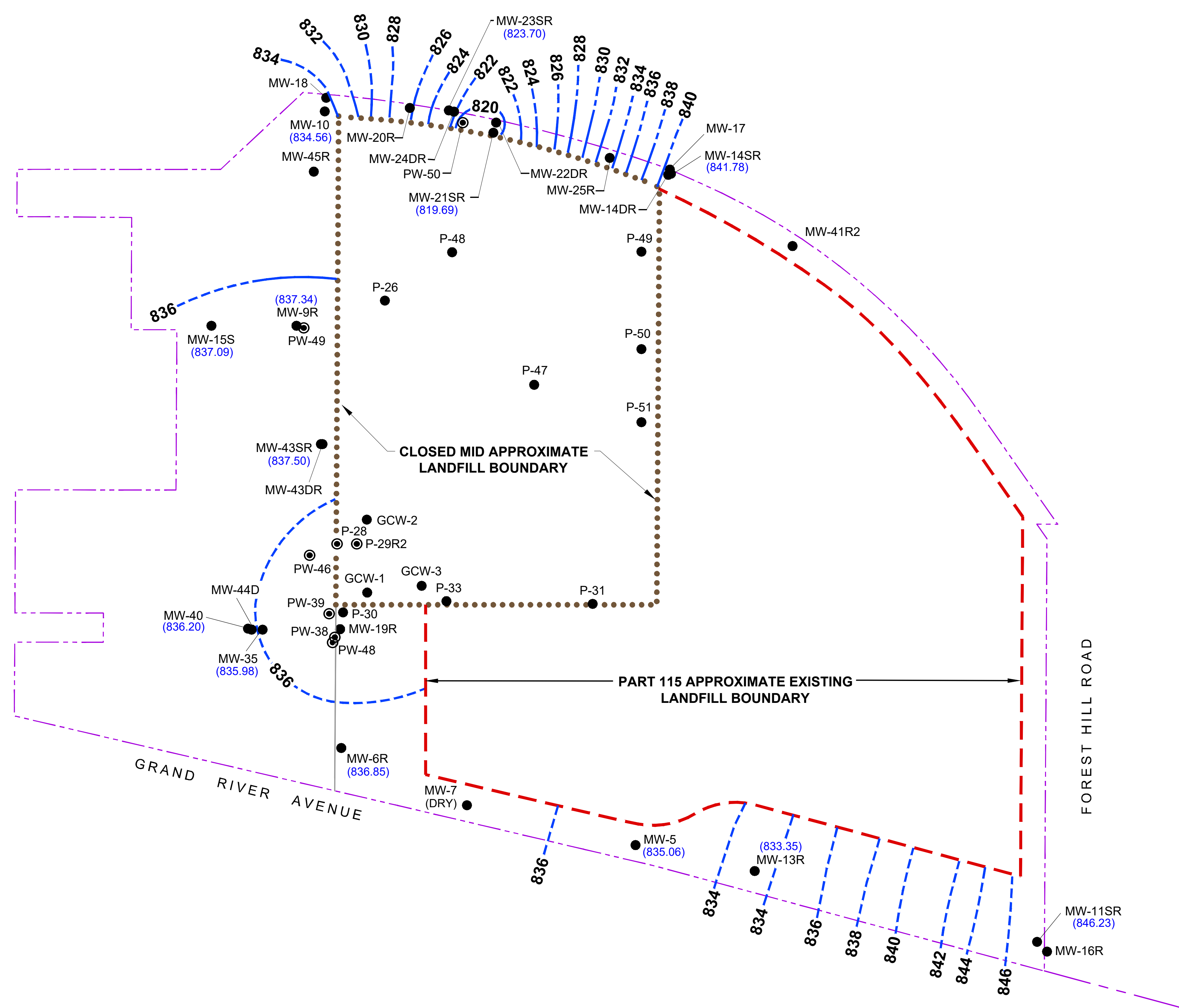
FIGURE 4 – LOWER DRIFT AQUIFER 01/2020



GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 5 – LOWER DRIFT AQUIFER 07/2020

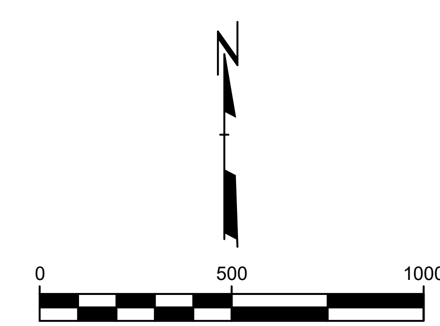


LEGEND

- MW-1 ● MONITORING WELL LOCATION AND NUMBER
- P-1 ● PIEZOMETER LOCATION AND NUMBER
- PW-39 ◉ PURGE WELL LOCATION AND NUMBER
- GCW-1 ● GAS COLLECTION WELL LOCATION AND NUMBER
- CLOSED MID APPROXIMATE LANDFILL BOUNDARY
- PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
- APPROXIMATE PROPERTY LINE
- 838 LINE OF EQUAL ELEVATION
- (840.34) GROUNDWATER ELEVATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER CO., DATED 05-04-2007, FIGURE 1 GENERAL LOCATIONS.DWG.
2. CONTOURS REPRESENT INTERPRETATIONS OF GROUNDWATER ELEVATION BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS.



PROJECT:	GRANGER GRAND RIVER MID 082 771 700 LANDFILL LANSING, MICHIGAN
TITLE:	GROUNDWATER CONTOURS SHALLOW GLACIAL AQUIFER JANUARY 2020
DRAWN BY: SJL / D.STEHLE	PROJ NO.: 382620.0002
CHECKED BY: K. LOWERY	FIGURE 6
APPROVED BY: S.HOLMSTROM	
DATE: FEBRUARY 2021	

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
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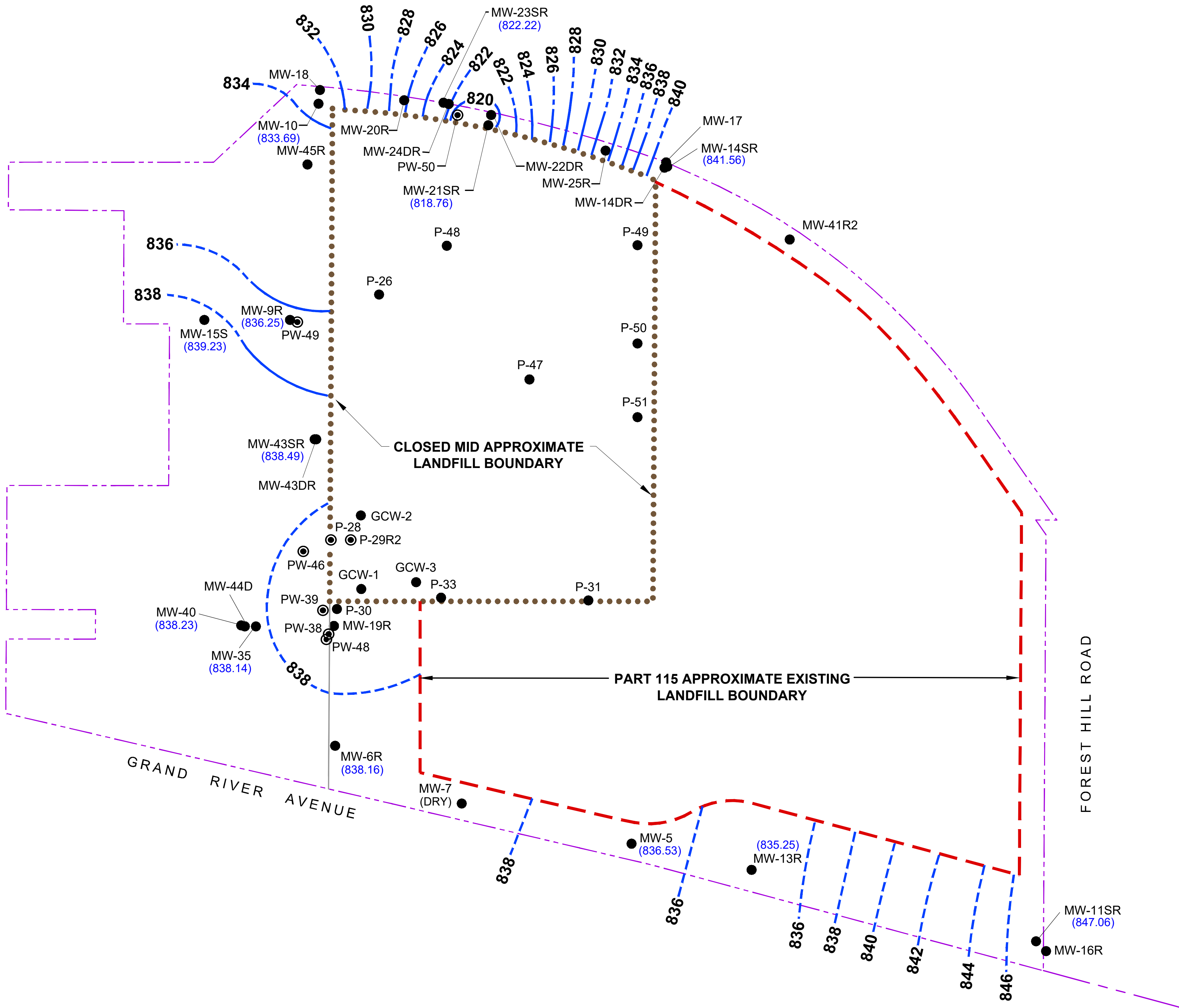
FILE NO.: 382620.0002.06 (002) 2020 AR.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES:
DRAWING NAME: \\Annarbor-fp2\cadd\PJT\00_TRC\Granger LF\382620\0002\01_2020 Annual Rpt\ 382620.0002.06 (002) 2020 AR.dwg --- PLOT DATE: February 15, 2021 - 3:10AM --- LAYOUT: FIG06 GW Contours Shallow 2020 Jan



LEGEND

MW-1 ● MONITORING WELL LOCATION AND NUMBER

P-1 ● PIEZOMETER LOCATION AND NUMBER

PW-39 ◎ PURGE WELL LOCATION AND NUMBER

GCW-1 ● GAS COLLECTION WELL LOCATION AND NUMBER

CLOSED MID APPROXIMATE LANDFILL BOUNDARY

PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY

APPROXIMATE PROPERTY LINE

838 LINE OF EQUAL ELEVATION

(840.34) GROUNDWATER ELEVATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER CO., DATED 05-04-2007, FIGURE 1 GENERAL LOCATIONS.DWG.
2. CONTOURS REPRESENT INTERPRETATIONS OF GROUNDWATER ELEVATION BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS.

N

0 500 1000

APPROXIMATE SCALE IN FEET

PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
GROUNDWATER CONTOURS
SHALLOW GLACIAL AQUIFER
JULY 2020

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	382620.0002
CHECKED BY:	K. LOWERY	FIGURE 7	
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2021		

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FILE NO.: 382620.0002.07 (002) 2020 AR.dwg

11x17 --- ATTACHED IMAGES: --- ATTACHED XREFS:
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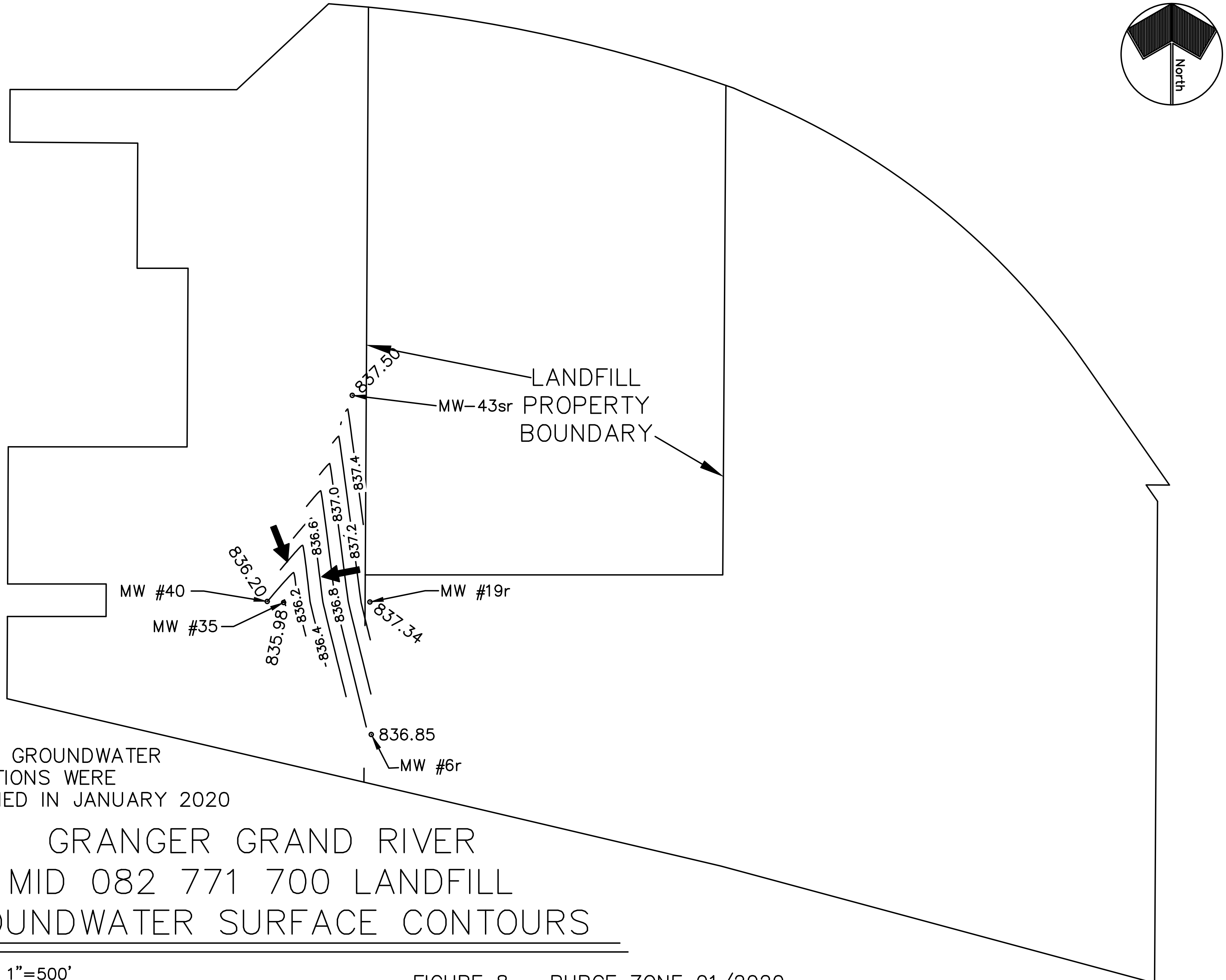
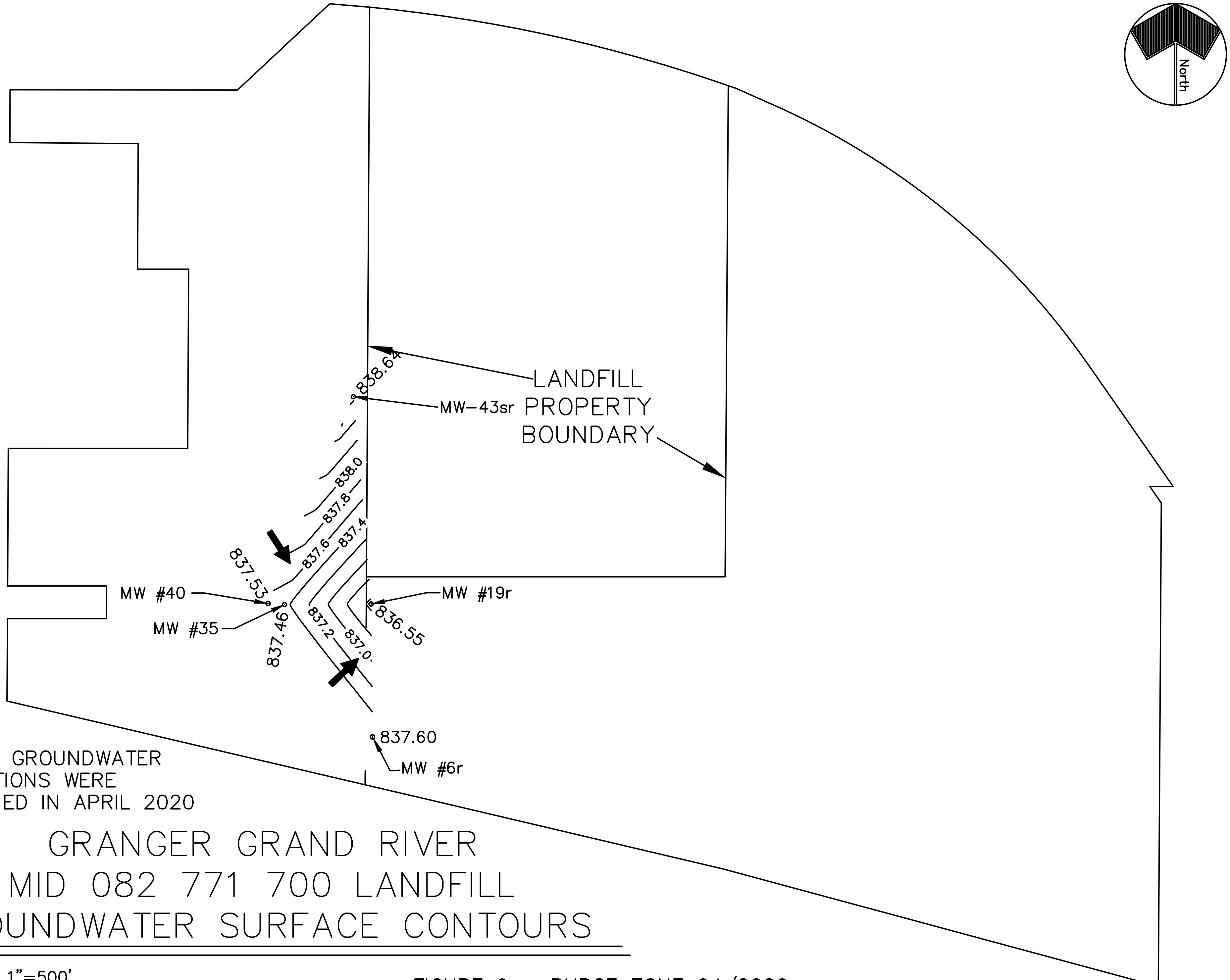


STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JANUARY 2020

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 8 – PURGE ZONE 01/2020

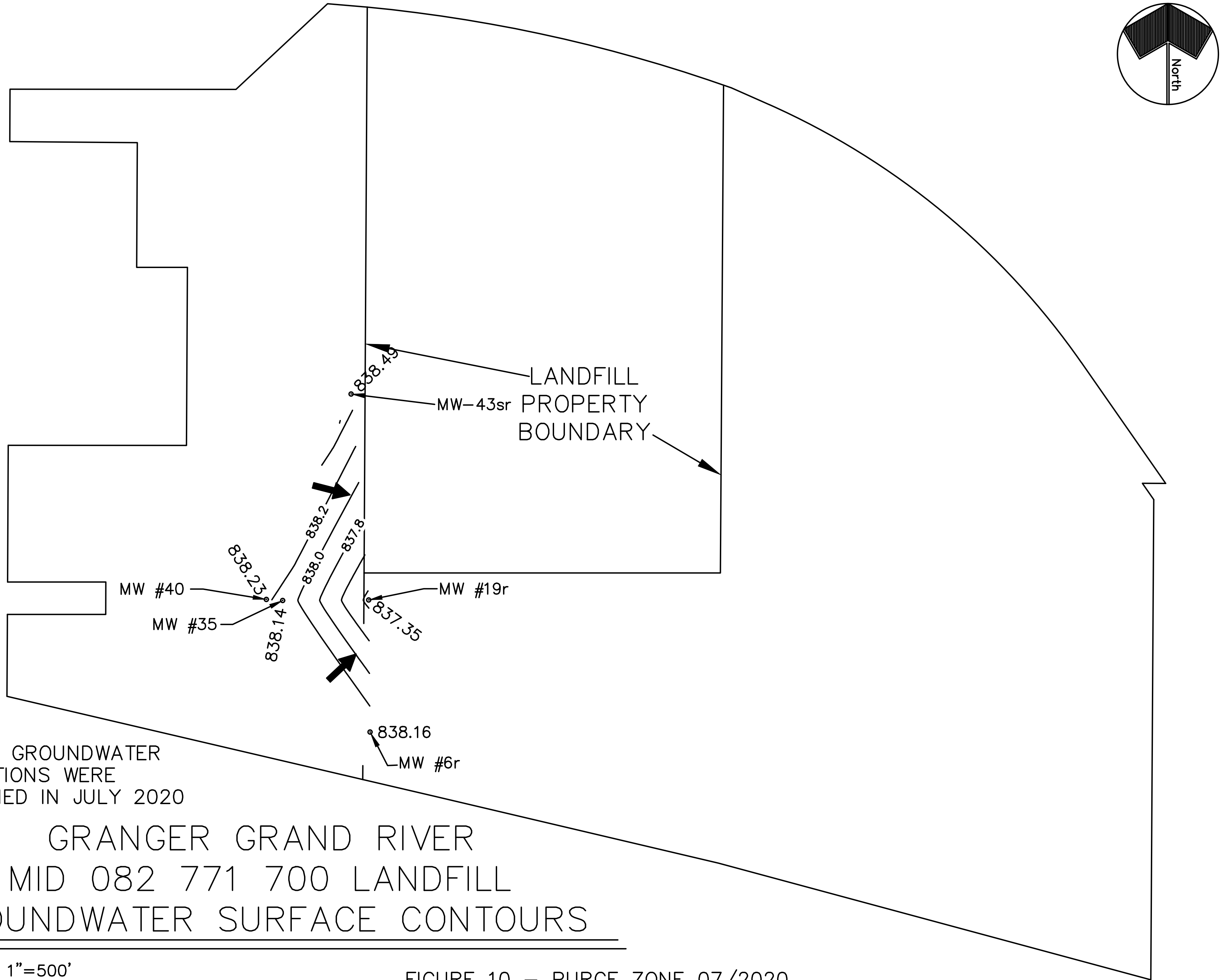


STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN APRIL 2020

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 9 – PURGE ZONE 04/2020

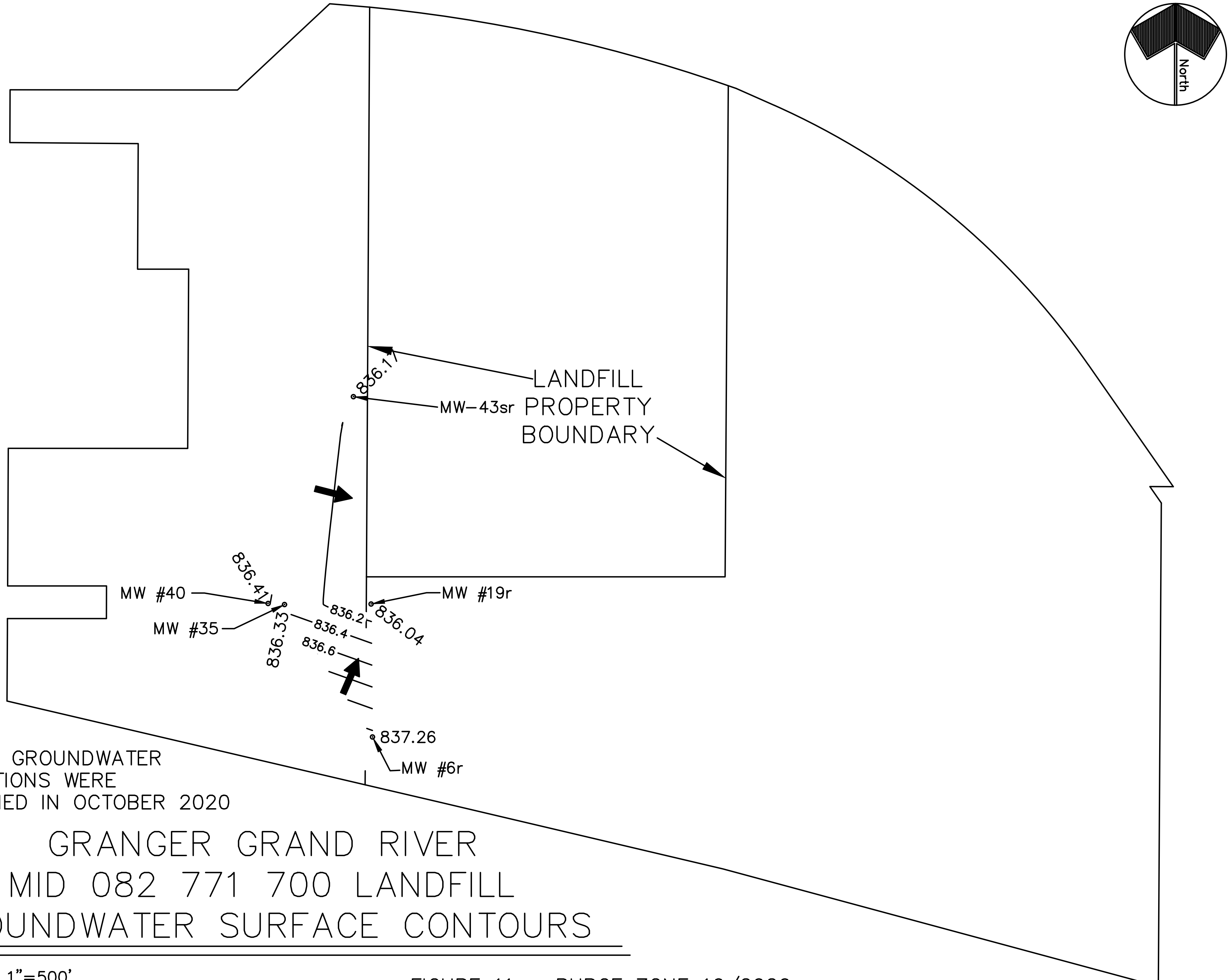


STATIC GROUNDWATER ELEVATIONS WERE OBTAINED IN JULY 2020

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 10 – PURGE ZONE 07/2020



STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN OCTOBER 2020

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 11 – PURGE ZONE 10/2020

APPENDIX F-2

Sampling and Analysis Plan

GRANGER MID 082 771 700 LANDFILL

SAMPLING AND ANALYSIS PLAN

MARCH 30, 2009

Revised
December 16, 2010

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Continued

ATTACHMENTS

1.0 INTRODUCTION

Federal, state and local regulations require the establishment of environmental monitoring programs at various facilities. The objective of the program is to assess the hydrogeologic conditions at the facility. The nature and extent of the investigative program is based upon site-specific criteria and may include sampling and analysis of soil, groundwater, surface water, wastewater and/or stormwater.

This site-specific plan has been prepared to outline the procedures that must be followed when performing sampling for environmental monitoring programs at facilities associated with Granger. The objective of the Sampling and Analysis Plan (SAP) is to obtain a sample that meets the requirements of the environmental investigative program and to ensure the integrity of the sample until it is ready to be analyzed. Therefore, samples must be collected which provide a representation of actual conditions and are handled in such a manner to avoid factors that could affect analytical results. This document has been written in accordance with guidelines provided by "RCRA Ground Water Monitoring Technical Enforcement Guidance Document', U.S. EPA, September, 1986 and "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846)" and "ASTM Standards on Ground Water and Vadose Zone Investigations," to ensure this degree of quality.

This SAP addresses each aspect of sample collection including:

- health and safety guidelines
- preparation, use and types of sampling equipment
- sample preservation, storage and handling
- sampling methodology
- documentation and record keeping,

The material presented in this SAP represents the standards to be maintained for sampling associated with environmental sampling and monitoring program. Increased levels of quality assurance/quality control may be instituted following internal review and approval.

2.0 HEALTH AND SAFETY PROGRAM

Personal Protective Equipment (PPE)

Persons performing water sampling must take appropriate precautions that will maximize personal protection and minimize the probability of sample contamination. The following procedures must be implemented by personnel during a sampling event to maintain these standards.

At a minimum, personnel are required to wear the following Personal Protection Equipment (PPE) during performance of duties:

- safety glasses or goggles;
- disposable gloves (non-powdered) or reusable gloves (decontaminated) manufactured of appropriate material;
- safety shoes;
- hard hats and hearing protection when in close proximity to heavy equipment

The presence of known hazardous contamination may require additional PPE or additional protective measures including, but not limited to, the following: a Tyvek suit, appropriate respirator, heavy duty gloves or other equipment. Field personnel will be informed of the known hazardous contaminants prior to the sampling event. The required equipment will be determined on a site-specific basis by the corporate health and safety officer.

At a minimum, the sampling personnel will have available for immediate emergency use:

- clean, potable water
- soap (Alconox, Liquinox)
- portable emergency eye wash
- basic first aid kit

<u>General Procedures</u>
Sampling personnel will wear protective gloves at all times when handling sampling equipment and sample containers. This will minimize direct contact with solids, liquids or equipment which may have been affected and will prevent cross-contamination of samples.

A clean, new pair of disposable gloves will be worn at each sample location to prevent cross contamination and will be replaced whenever their integrity has been compromised, such as by tears or contact with possible contaminants. Re-usable gloves must be thoroughly washed with soap (Alconox, Liquinox) and rinsed with deionized water before and after use at each sample point and must never be used for sampling purposes. Disposable gloves are the preferred gloves for sampling and will always be used when sampling soils, groundwater, surface water and leachate collection and/or secondary leachate collection samples.

If skin contact is made with leachate or equipment having been in contact with leachate, personnel will immediately and thoroughly wash and rinse the exposed area.

If skin or personal clothing contact is made with known hazardous material, the clothing should be removed immediately and affected skin areas thoroughly washed and/or rinsed as appropriate. Eye contact with liquids requires the use of potable eye wash and thorough, repeated rinsing.

Personnel who experience continued skin or eye irritation must seek medical attention immediately.

Personnel are to avoid hand to mouth contact at all times during sampling procedures. Smoking, eating and drinking during performance of sampling duties is strictly prohibited. Personnel will thoroughly wash and rinse hands and face, if appropriate, immediately following completion of facility sampling or whenever sampling is interrupted and prior to leaving the facility (where applicable).

Personnel will operate motorized vehicles in a safe manner consistent with site conditions, site requirements, and state motor vehicle operator rules and regulations.

Persons conducting sampling must receive health and safety training prior to conducting actual field activities. Training requirements are outlined in Section 3.0 of this manual.

3.0 TRAINING

Proper training of field sampling personnel is required by this program. This training will minimize risks to personal health and safety while ensuring accurate, high quality sampling events. These aspects are discussed in the following sections. Certification of training is required by all investigative field personnel including subcontractors.

3.1 Health and Safety:

Sampling personnel must be properly trained in the health and safety aspects of hydrogeologic investigations. The training must include the identification of possible sources of personal injury and contamination as well as the selection and use of specific personal protection procedures and equipment to reduce or eliminate these risks. Training must also include specific response procedures to be followed during emergency situations.

All personnel who conduct field activities must receive this training prior to actual field work. If sampling is conducted for hazardous materials, health and safety training and experience must comply with 29 CFR 1910.120, 29 CFR 1910.134 and 29 CFR 1910.1200

3.2 Sampling
Personnel engaged in sampling activities must be trained in the proper selection and use of sampling equipment, as well as sampling procedures and techniques that include requirements of regulatory agencies and this manual.

4.0 SAMPLE COLLECTION

The following section describes the procedures for soil, ground water, surface water, leachate, leachate detection, and/or secondary leachate collection and stormwater detention pond discharge samples. In general, samples should be obtained in the following order:

a. Ground water
b. Surface water
c. Leachate
d. Stormwater discharge

4.1 Preliminary Procedures
Prior to the sampling event, a number of preliminary tasks must be accomplished. These preliminary procedures include identifying the sampling locations and establishing the sampling order and preparing equipment. These preliminary procedures will ensure identification of all samples that are required to be sampled. These requirements will be specified in the site-specific work plan.

The first step in the program is to establish the sampling points. For ground water monitoring wells it is also necessary to establish well depth, top of casing elevation and ground surface elevations.

After identifying the sample location, the sampling order must be established. Monitoring wells must be sampled in order from wells installed up-gradient of the facility to wells installed down-gradient of the facility unless dedicated ground water sampling equipment is utilized. From sites having known contamination, wells must be sampled in order from least contaminated to most contaminated unless dedicated ground water sampling equipment is utilized. Surface water samples must be collected in upstream to downstream sequence. Leachate and other wastewater samples must be segregated from other environmental samples (i.e., ground water, soil, surface water, stormwater discharge). Under no circumstances will sample holding times be exceeded. Deviations from this established protocol are only allowed when authorized by the project coordinator.

All equipment necessary for the sampling event must be cleaned, checked and calibrated prior to going into the field. Equipment cleaning must be performed in accordance with manufacturers' specifications and industry standards in an area free of potential contaminants.

4.2 Ground Water Sampling Using Non-Dedicated Sampling Equipment

The following are the minimum procedures for the collection of ground water samples in order to protect samples and sampling locations from potential sources of contamination.

4.2.1 Well Condition

The condition of the well and surrounding area is to be observed and documented upon arrival at the well. The following information shall be noted on environmental monitoring field data sheet: condition of ground surface around the well; security (is the well locked; does the cap on the well casing seal the riser pipe properly); condition of the well including protective cover, lock, cap, casing and concrete pad; and evidence of potential contamination (well recently painted, animal or insect parts in well, vandalism, etc.).

Weather conditions, temperature and wind are to be noted on the environmental monitoring field data sheet.

If unusual conditions or problems exist with a given sampling point, notification is required to the project coordinator. Where possible, notification of the unusual conditions must be made prior to leaving the site during the particular sampling event.

4.2.2 Water Level Measurement

The static water level must be measured prior to purging and sampling at each ground water sampling location. All on-site static water level measurements for a given site must be obtained within a twenty-four (24) hour period. The measurement must be obtained no longer than 24 hours prior to purging the ground water monitoring well. The static groundwater measurements for each well will be taken from the north side of the casing. The north-side reference location has been utilized to identify the top of casing to the nearest 0.01 feet and referenced to mean sea level (MSL). All ground water monitoring wells will be clearly labeled and identified.

The measurement should be taken using an electronic water level meter capable of accuracy of 0.01 feet. The meter must be decontaminated with an approved detergent soap (i.e., Alconox, Liquinox) and rinsed completely with deionized water prior to each measurement. Minimum contact of the tape and probe/sounder and the water in the well is required to decrease the potential for cross contamination. Disposable latex gloves must be used while determining the static water level. The elevation of each ground water monitoring well shall be reported to the nearest 0.01 foot and can then be determined by the following equation:

GWE = TOC - DIW

Where: GWE - Ground water Elevation (ft. MSL)
TOC Top of Casing Elevation (ft. MSL)
DTW Depth to Water below TOC (ft.)

The depth to ground water and ground water elevation must be calculated and documented on the environmental monitoring field data sheet (Attachment 1). Ground water measurements for all sampling locations on a given site must be accomplished within a 24-hour period. The measurement must be compared in the field to historical data to ensure representative elevation data are obtained prior to sample collection.

The expandable plastic cap or galvanized screw-on cap must have a vent in order to ensure representative ground water elevations are obtained prior to purging the well.

4.2.3 Well Purging

The monitoring wells must be purged to ensure that a sample representative of the groundwater within the aquifer being monitored is collected. A minimum of three times the volume of standing water within the well must be evacuated. For wells in which the screens are placed in low yielding formations, they must be purged three volumes or until dry. If sufficient volume cannot be obtained within 24 hours of purging, the ground water monitoring well will be considered dry for the sampling-event. Groundwater monitoring wells must be sampled immediately after purging where recovery rates allow. Where wells are pumped dry during purging the ground water will be sampled as soon as sufficient recovery occurs to allow collection of the necessary volume.

The following equation should be used to determine the volume of water to purge:

PV = (TWD - DTW) x GFD x 3

Where:
PV - Purge Volume
TWD - Total Well Depth (ft)
DTW Depth To Water (ft)
GFD gallons per foot of depth
2-inch diameter well, GFD = 0. 163 gal/ft
4-inch diameter well, GFD = 0.653 gal/ft

The calculated volume is to be documented on the environmental monitoring field data sheet (Attachment 1)

After the purge volume is determined, the purge process can begin. Shallow wells (well depths <20 ft) should be purged using a disposable bailer. Deep wells (well depths >20 ft) should be purged using an electric submersible pump. Very low yield deep wells should also be purged utilizing a disposable weighted bailer. All rope utilized during the purging and sampling process must be disposable and not used for more than one sampling location. Wells that are purged on one day and sampled on the following day must use new rope and bailer for the following days sampling event. Vehicle engines must not be running, during purging and sampling activities.

An important concern while purging is to minimize the potential for cross contamination. Pumps must be decontaminated prior to insertion into the well by cleansing with an appropriate detergent soap (i.e., Alconox, Liquinox) and a thorough rinse with deionized water sufficient to remove all traces of detergent. If non-disposable type bailers are utilized on any sampling event at any facility, then the bailer must be of the type that can be 'dismantled' to further ensure that proper decontamination is accomplished. As a general rule, disposable bailers will be used when purging and sampling unless permission to use non-disposable bailers is obtained from the project coordinator prior to the sampling event or required, based on the analytical parameters being tested. During bailer insertion and removal in the monitoring well extreme care must be taken to prevent the bailer rope from contacting the ground or other sources of potential contamination. Necessary precautions must be taken to eliminate any contact of purging equipment with potential contaminants.

During purging, the extracted water must be collected to determine the volume of water purged. The purge volume must be documented on the environmental monitoring field data sheet (Attachment 1).

Purge water must be discharged at least 10 feet from the well footing. For wells having known ground water contamination, the purge water must be collected and disposed in the leachate collection system.

During purging, a minimum of three field measurements of specific conductance, pH and temperature will be made. Stabilized values will indicate that proper evacuation of the casing has been achieved. If, after a maximum of five (5) well volumes have been evacuated, the field measurements have not stabilize this must be noted on the environmental monitoring field data sheet (Attachment 1), and within the field report. All measurements must be recorded on the environmental monitoring field data sheet. At no time are these measurements to be obtained from bottles designated for laboratory analysis. The beaker/bottle being utilized for the measurement of the above three parameters must be cleaned and rinsed with deionized water between measurements.

4.2.4 Sample Collection

After purging the appropriate volume, the well can be sampled with the appropriate approved equipment. Prior to sampling (if non-disposable equipment is utilized), the equipment must be decontaminated by washing with an appropriate detergent soap (Alconox, Liquinox) and thoroughly rinsed with deionized water to remove all traces of detergent. Precautions should be taken to ensure that decontamination equipment does not come in contact with potential sources of contamination. No vehicle engines should be running during purging and sampling.

In general, shallow wells or very low yielding wells should be sampled with a disposable bailer. Disposable nylon bailer string should be used. Bailer string must be removed and properly disposed of, between sampling locations and care must be taken to ensure that the bailer string does not come into contact with potential sources of contamination.

Deep wells and wells requiring a large volume of water to be removed should be sampled using an electric submersible pump. The pump should be placed below the static water level head and, if possible, above the screened interval of the well. Care should be taken to ensure that the pump hose does not contact the ground surface. The submersible pump is not an appropriate sampling device for volatile organic compounds.

All samples being analyzed for volatile organic compounds (EPA Method 8021 or 8260) must be stored in containers which allow for zero head-space (i.e., 40 ml VOA vials) unless otherwise specified by SW-846 or by a U.S. EPA or State regulatory approved laboratory technique for the given analysis. Use of a preservative for volatile organic parameter analysis is allowed provided it is in accordance with SW-846, U.S. EPA, and state regulatory requirements.

Volatile organic compounds will be sampled with a disposable bailer prior to any other samples. In addition, an appropriate "VOC sampling" attachment must be used while filling the sample vials to prevent excessive agitation of the sample. The bailer must be lowered slowly into the well so as not to enhance chemical volatilization of the sample. Minimal sample contact with the air is required in order to ensure that representative samples are obtained.

Certain samples, in accordance with U.S. EPA and State regulatory requirements, will require field filtration. Filtration should be performed in the field immediately upon collection of the samples. When sampling with non-dedicated sampling equipment, it is preferred that all samples requiring field filtration be sampled with a submersible pump. A 0.45 micron membrane pressure filter should be attached at the end of the pump discharge hose to perform field filtration. The filter attachment must not be attached prior to the evacuation of the required purge volume. After filtration is complete, sample collected for dissolved metals analysis should be preserved to a pH of less than 2.0 with nitric acid. Other samples which may require filtration according to SW-846 should be preserved appropriately. Disposable filters must be disposed of properly after each sampling location.

If a bailer is used to collect samples requiring field filtration, the samples must be transferred directly or by using laboratory cleaned sample bottles to an appropriate field filtration device. Field filtering equipment should be cleansed with a HCL solution, in accordance with manufacturer's specifications, and thoroughly rinsed with deionized water to remove any metal contaminants from the filtering equipment. A minimum of 500 ml of deionized water should be used to rinse the filtering apparatus and equipment. In all cases the filters must be changed between each sampling point and they must be disposed of properly. If samples are obtained that are too silty for effective field filtration, and therefore the potential exists for the sample to be exposed to the atmosphere for extended periods of time, they may be filtered under laboratory conditions. Confirmation of field filtration should be noted on the environmental monitoring field data sheet (Attachment 1), chain-of-custody form, and field report. Filtration must be accomplished within 24 hours after sample collection.

If a monitoring well is screened in a very low yield formation, the well can be allowed to recharge 24 hours after purging. If there is insufficient water for sampling any parameter, then the well is considered dry for the sampling event and documented as such. If the volume available is insufficient for filling all of the sample containers, as many sample containers as possible should be filled. The priority of sample container filling is as follows:

- Volatile Organic Constituents (VOCS) (40 ml vials)
- Unpreserved bottles
- Preserved bottles

If samples are "split' among regulatory agency representatives, the minimum volume of sample, as specified in SW-846 or by the analytical laboratory must be placed in sample bottles destined for analysis by the analytical laboratory prior to dispersing any sample to those same representatives.

Documentation of sample collection procedures shall be noted on the environmental monitoring field data sheet (Attachment 1). Observations regarding the color, odor and turbidity of the samples are to be recorded. Sampling and handling procedures must be documented and followed (Sections 5.0 and 6.0). Samples must be immediately placed into a cooler and maintained at a temperature of 4 degrees Celsius upon collection until delivery to the laboratory. Chain-of-custody protocol must be strictly adhered to as described in Section 6.0.

<u>4.2.5. Groundwater Underdrains</u>

Groundwater underdrains are sampled by lowering a bailer or discreet water sampling apparatus (which is capable of sampling below the water surface) down an access manhole, or under the surface of the water. When using a bailer, a disposable bailer is required unless approved by the project coordinator (where feasible the discrete water sampler is the preferred method). If a "multiple" use discrete sampling apparatus is used to sample, the apparatus must be decontaminated in accordance with manufacturer's specification and, at a minimum, decontaminated by an appropriate detergent soap (i.e., Alconox, Liquinox) and thoroughly rinsed with deionized water to remove all traces of detergent. If the discrete sampling apparatus is utilized, it must be used for each sampling event in order to obtain consistent historical data. The discrete water sample must be obtained within the central portion of the column of water. <u>Under no conditions should personnel enter any access manhole</u>.

Where required by the site specific operating license, ground water underdrains can be sampled at the drain outlets. Sample collection will be consistent with Section 4.4.

Sample collection procedures must be documented on the environmental monitoring field data sheet (Attachment 1). Observations regarding the color, odor and turbidity of the samples must be recorded. Sample handling procedures must be followed in accordance with Section 5.0. Chain-of-custody protocol must be strictly adhered to as described in Section 6.0.

4.3 Sampling Collection Using Dedicated Sampling Equipment

The following are the minimum procedures for the collection of groundwater samples at facilities utilizing dedicated ground water sampling equipment (i.e., QED Well Wizard dedicated bladder pumps) in order to protect samples and sampling locations from potential sources of contamination.

All sampling crews that are sampling groundwater will be familiar with the operation and general maintenance of the dedicated QED Well Wizard sampling pumps and associated equipment. All crews must be trained to operate the equipment in a safe and efficient manner and be familiar with the Operations and Maintenance Manual. If technical problems are experienced in the field with respect to the dedicated ground water sampling equipment, notification to the project coordinator is required.

4.3.1 Well Condition

The condition of the well and surrounding area is to be observed and documented on the environmental monitoring field data sheet (Attachment 1) upon arrival at the well. As with ground water wells which are sampled with non-dedicated ground water sampling equipment, the steps that were specified in Section 4.2.1 also apply to sampling ground water with dedicated sampling equipment.

4.3.2 Water Level Measurement

The static water level must be measured at each ground water sampling location prior to purging and sampling. If a ground water monitoring well is equipped with a dedicated sampling pump and not with a pneumatic pressure transducer, the static water level measurement should be obtained through the access hole in the well cap. The static water level measurement must be obtained as specified in this Section.

For each well that is equipped with a pneumatic pressure transducer, the depth of water below the top-of-casing can be calculated by the following equation:

$$C = A - B$$

Where:

C = Depth of water below the top-of-casing.
A = Probe length measured during the time of pump installation.
B = Probe submergence measured in the field prior to well purging.

The top-of-casing reference point has been surveyed to the nearest 0. 0 1 feet prior to the installation of dedicated ground water sampling pumps.

The static ground water elevation of each ground water monitoring well shall be calculated in the field and compared to historical data to ensure that representative static water level data was obtained. The static water elevation must be reported at the nearest 0.01 foot and is to be reported as feet mean sea level (MSL). The equation for determining the static water elevation can be determined by the following equation:

$$GWE = TOC - DTW$$

Where:

GWE = Ground water Elevation (ft. MSL)
TOC = Top-of-Casing Elevation (ft.MSL)
DTW = Depth to Water below the TOC (ft.)

The depth to ground water and ground water elevation must be documented on the environmental monitoring field data sheet (Attachment 1). The measurement must be compared in the field to historical data to ensure a representative elevation is obtained. Ground water elevation measurements for all sampling locations on a given site must be accomplished during a 24 hour period.

All QED protective caps must have a vent in order to ensure representative ground water elevations are obtained prior to purging the well. Disposable non-powder latex gloves must be worn while determining the static water level.

4.3.3 Well Purging

The ground water monitoring wells must be purged to ensure that a representative sample of the ground water within the aquifer is collected. A minimum of 3 times the volume of standing water within the well must be evacuated. For wells in which the screens are placed in low yielding formations, they must be purged three volumes or until dry. The pump inlet for the dedicated sampling pump systems have been specifically located so that ground water monitoring wells in which screens are placed in low yielding formations can be purged dry (i.e., the pump inlet screen is within inches of bottom of the ground water monitoring well casing) to obtain the most representative samples possible.

The following equation should be used to determine the volume of water to purge:

PV = (TWD - DTW) x GFD x 3

Where: PV = Purge

Volume = Total Well Depth

DTW = Depth to Water

GFD = gallons per foot to depth

2 inch diameter well, GFD = 0. 163 gal/ft

4 inch diameter well, GFD = 0.653 gal/ft

The calculated volume is to be documented on the environmental monitoring field data sheet (Attachment 1).

After the purge volume is determined, the purge process can begin. Vehicle engines must not be running during purging and sampling activities. The Controller/Driver and air compressor unit must be placed the maximum distance allowed by the length of hose downwind of the ground water monitoring well during purging and sampling activities.

The gasoline can which the sampling crew utilizes for filling the compressor engine gasoline tank must be a DOT approved container and transported in accordance with state and federal guidelines. The gasoline container must be in good condition and stored in a manner as to not cause any spillage on, or contamination to, sample containers or sampling equipment. Refilling the compressor tank must not be accomplished in the proximity of any sample containers or sampling equipment or sampling points.

An important concern while purging is to minimize the potential for cross contamination. Necessary precautions (i.e., wearing, disposable latex gloves when handling any of the dedicated sampling equipment, Controller/Driver and Compressor) must be taken to eliminate any contact of purging equipment with potential contaminants.

During purging, the extracted water must be collected to determine the volume of water purged. To measure the volume of water being removed, a calibrated bucket or a container of known volume must be used. The purge volume must be documented on the environmental monitoring field data sheet (Attachment 1).

Purge water must be discharged at least 10 feet from the well footing. For wells having known ground water contamination, the purge water must be collected, stored, and disposed in accordance with applicable regulations. Storage and disposal of contaminated ground water will be coordinated by the project coordinator.

During purging, a minimum of three field measurements of specific conductance, pH and temperature will be made. Stabilized values will indicate that proper evacuation of the casing has been achieved. If the field measurements fail to stabilize after purging five (5) well volumes, it should be noted on the environmental monitoring field data sheet (Attachment 1) and in the field report. These measurements must be recorded on the environmental monitoring field data sheet (Attachment 1). At no time are these measurements to be obtained from bottles designated for laboratory analysis. Between measurements, the beaker/bottle being utilized for the measurement of the above three parameters must be rinsed with deionized water.

4.3.4 Sample Collection

After purging the appropriate volume, the well can be sampled. Precautions should be taken to ensure equipment does not come in contact with potential sources of contamination. No vehicle engines should be running during purging and sampling. The air compressor unit that drives the pump controller must be placed the maximum distance allowed by the length of hose downwind of the ground water monitoring well.

During sampling the Controller/Driver should be adjusted to lower the ground water discharge volume and flow rate to minimize volatilization of the ground water sample.

All samples being analyzed for volatile organic compounds (EPA Method 8021 or 8260) must be stored in containers which allow for zero headspace (i.e., 40 ml VOA vials) unless otherwise specified in SW-846 or by an EPA and State regulatory approved laboratory technique for the given analysis (must be approved by project coordinator). Use of a preservative for volatile organic parameter analysis is allowed provided it is in accordance with SW-846 requirements.

Certain samples, in accordance with U.S. EPA and State regulatory requirements, will require field filtration. Filtration should be performed in the field immediately upon collection of the samples. All samples requiring field filtration (i.e., dissolved metals) should be accomplished utilizing a 0.45 micron membrane pressure filter which should be attached at the end of the pump discharge hose to perform field filtration. The filter attachment must not be attached prior to the evacuation of the required purge volume. After filtration is complete, samples being collected for dissolved metals analysis should be preserved to a pH of less than 2.0 with nitric acid. Other samples which may require filtration according to SW 846 should be preserved appropriately. Disposable filters must be disposed of properly after each sampling location and these filters cannot be reused in subsequent sampling events.

If samples are obtained that are too silty for effective field filtration and therefore, the potential exists for the sample to be exposed to the atmosphere for extended periods of time, they may be filtered under laboratory conditions. Filtration must be accomplished within 24 hours after sample collection. Confirmation of field filtration should be noted on the environmental monitoring field data sheet (Attachment 1), chain-of-custody form, and the field report.

If a well is screened in a formation with very low yield, the well can be allowed to recharge 24 hours after purging unless otherwise specified by the project coordinator. If there is insufficient water for sampling any parameter, then the well is considered dry for the sampling event and documented as such. If the volume available is insufficient for filling all of the sample containers, as many sample containers as possible should be filled. Notation of insufficient sample volume should be placed on the environmental monitoring field data sheet (Attachment 1) and in the field report. The priority of sample container filling is as follows:

- VOCs (40 ml vials)
- Unpreserved bottles
- Preserved bottles

If samples are "split" among regulatory agency representatives, the minimum volume of samples, in accordance with SW-846 guidelines and specific analytical laboratory requirements, must be placed in sample bottles destined for analysis by the analytical laboratory prior to dispersing any sample to those same representatives.

Documentation of sample collection procedures shall be noted on the environmental monitoring field data sheet (Attachment 1). Observations regarding the color, odor and turbidity of the samples are to be recorded. Sampling and handling procedures must be documented and followed (Sections 5.0 and 6.0). Samples must be immediately placed into a cooler and maintained at a temperature of 4 degrees Celsius upon collection until delivery to the laboratory. Chain-of-custody protocol must be strictly adhered to as described in Section 6.0.

4.4 Surface Water Sampling

For surface water sampling of ditches, stormwater retention basins, or other surface water bodies, it is necessary to obtain a fresh, representative sample. Where possible, samples must be collected from the center of the body of water at mid-depth. Surface water samples must be collected in an upstream to downstream sequence. Handling of surface water samples must also be documented in accordance with Sections 5.0 and 6.0. If sampling occurs during flood/storm conditions, it should be so noted on the environmental monitoring field data sheet (Attachment 1) and the field report.

If samples are to be collected during flood/storm conditions, the samples should be obtained as close as practical to the appropriate sampling location without compromising the health and safety of sampling personnel.

Surface water samples must be collected, where possible, by dipping the appropriate sample container into the water. Unless the sample bottle contains preservatives, the sample container must be lowered into the water while capped, uncapped under water to allow the sample bottle to fill, and then recapped before removing from the water. The mouth of the sample bottle must face into the flow of the water. Containers must be lowered slowly into the water so as not to disturb the bottom sediment. If samples require preservation, samples shall be poured slowly into the bottles containing the preservatives from clean sample bottles.

A dipper, or the discrete water sampling apparatus, must be used when a surface water sample cannot be collected directly into the sample container. A dipper consists of a glass or Teflon beaker clamped to the end of an aluminum, fiber-lass or plastic pole. The dipper and pole must be decontaminated by an appropriate detergent solution and rinsed with deionized -water prior to sampling. Collected samples must be transferred directly from the dipper to the appropriate sample containers.

If during a sampling event, the surface water location is dry or frozen and no sample can be obtained, then this must be documented on the environmental monitoring field data sheet (Attachment 1) and in the field report.

Surface water samples must not be field filtered. If collected properly, the samples will not contain sufficient suspended solids to warrant filtration. If sufficient suspended solids are present, documentation should be provided as such on the environmental field data sheets (Attachment 1).

Documentation of sample collection procedures shall be noted on the environmental monitoring field data sheet (Attachment 1). Observations regarding the color, odor and turbidity of the samples should be recorded. Sampling and handling procedures must be documented and followed (Section 6.0). Samples must be immediately placed into a dedicated cooler and maintained at a temperature of 4 degrees Celsius upon collection. Chain-of-custody protocol must be strictly adhered to as described in Section 6.0.

<u>*4.5* Leachate Collection Sampling</u>

Leachate samples obtained from leachate wells, holding tanks, pump stations, or manholes must be collected using a disposable high density polyethylene (HDPE) bailer or via the leachate collection pump station. Rubber gloves and other appropriate PPE must be worn whenever handling leachate samples. <u>Under no condition should personnel enter an access manhole</u>.

Documentation of sample collection procedures shall be noted on the environmental monitoring field data sheet (Attachment 1). Observations regarding the color, odor and turbidity of the samples should be recorded. Sampling and handling procedures must be documented and followed (Section 5.0). Samples must be immediately placed into a dedicated cooler and maintained at a temperature of 4 degrees Celsius upon collection. Chain-of-custody protocol must be strictly adhered to as described in Section 6.0.

4.5.1 Leachate Collection Sampling With Non-Dedicated Sampling Devices

As specified above, leachate samples from leachate holding tanks and leachate manholes should be sampled with disposable HDPE bailers. Nylon disposable bailer string must be used. Care must be taken to ensure that the bailer string does not come in contact with potential sources of contamination (i.e., manhole covers and manholes) or personal clothing.

Volatile organic compounds will be sampled with a disposable bailer prior to any other samples. In addition, an appropriate "VOC sampling" attachment must be attached while filling the sample vials to prevent excessive agitation of the sample. The bailer must be lowered slowly into the well so as not to enhance chemical volatilization of the sample. Minimal contact with the air is required in order to ensure that a representative sample is obtained.

No filtration, purging or water level measurements are required unless specified in the Site Specific Work Plan.

Once the sampling is complete, the disposable bailer and string must be disposed of properly. Equipment used for leachate monitoring and sampling must not be used for any other type of monitoring.

4.5.2 Leachate Collection Sampling From leachate Collection Pump Discharge

Leachate samples collected from leachate collection pump discharge points (i.e., outlets from submersible pumps) or sampling ports should be collected directly into the respective sample bottles in a manner that will cause minimal agitation, and volatilization of the sample (i.e., if possible, lower the pump discharge rate, and hold the bottle at an angle). Care must be taken not to allow any leachate to flow freely onto the ground's surface.

No filtration, purging, or water level measurements are required unless specified in the Site Specific Work Plan.

4.6 Secondary Leachate Detection Collection

Secondary Leachate Detection Collection sumps will be equipped with dedicated sampling equipment such as submersible Grundfos or Leachator pumps. Samples shall be obtained by collecting the samples directly into the respective sample container unless field filtration is required.

Documentation of sample collection procedures shall be noted on the environmental monitoring field data sheet (Attachment 1). Observations regarding the color, odor and turbidity of the samples should be recorded. Sampling and handling procedures must be documented and followed (Section 5.0). Samples must be immediately placed into a dedicated cooler, segregated from other environmental samples and maintained at a temperature of 4 degrees Celsius upon collection. Chain-of-custody protocol must be strictly adhered to as described in Section 6.0.

4.7 Storm Water Sampling

Due to the large numbers of variables affecting stormwater discharges, sampling protocol will develop on a site-specific basis. This information will normally consist of, at a minimum: 1) number of outfall locations, 2) type of outfall structure (i.e., pipe, channel, trough, weir, etc.) physical characteristics, (i.e. construction, size, slope, condition, etc.) and analytical testing requirements. It is expected that sampling at this site will be limited to the collection of a sample at the ditch on the north side leading to the Openlander Drain. Specific criteria for the sampling are provided in Section 4.4 "Surface Water Sampling".

4.8 Field Measurements

Field measurements for temperature, pH and specific conductivity must be collected as required at each sampling point using the appropriate field probe or meter. A clean bottle or beaker must be used for these measurements. The measurements must be documented on the environmental monitoring field data sheet (Attachment 1). Containers and probes must be properly cleansed between sample locations.

Probes must be calibrated at the beginning of each sampling day and every four hours thereafter using, fresh standards. Calibration standards must be of value similar to those values expected at the sampling location. Calibration must be in accordance with the manufacturer's specification for each probe. Calibration results must be recorded in a field log book.

5.0 SAMPLE CONTAINERS, PRESERVATION AND HANDLING

Sample containers, preservations and handling procedures are dependent upon the type of laboratory analysis requested. Attachment 2 provides a list of the sample container types and methods of preservation by the type of laboratory analysis. The list has been prepared according to U.S. EPA and State regulatory requirements.

Glass sample containers will be pre-cleaned by the laboratory in accordance with SW-846 procedures. Plastic containers may not be reused. The standard operating, procedure for cleaning of sample containers should consist of, at a minimum, the items discussed in Attachment 2.

Collected samples will be transported to the laboratory via shipping coolers. Internal cooler temperature must be maintained at 4 degrees Celsius.

6.0 CHAIN-OF-CUSTODY PROTOCOL

Chain-of-custody protocol is necessary to ensure the integrity of samples from the time of collection to data reporting. Chain-of-custody protocol includes proper sample labeling, sample sealing, sample storage and the chain-of-custody record.

6.1 Sample Labeling

Specific sample labeling procedures are necessary to prevent misidentification of samples. Sample labeling may include project name, project number, sample location, sample identification number, name of sampler, parameter to be analyzed, preservative, sampling date and sampling time.

6.2 Chain-of-Custody

Chain-of-custody records are completed to document sample possession. A written record of sample container possession and transfer must be documented using the chain-of-custody record provided in Attachment 3.

The chain-of-custody form must be signed, including date and time, when the following activities occur:

- samples are transferred to the responsibility of another person;
- samples are submitted to the laboratory for analysis.

Samples and/or sample containers must be in the custody of an assigned sampler. The samples must be in sight of the sampler or locked in a tamper proof location, and secured with a tamper proof seal. Failure to complete the chain-of-custody form for any sampling event will render the data suspect.

7.0 LABORATORY ANALYSIS

Collected samples will be submitted to the laboratory for analysis. Each site will have provided a list of the sampling points, parameters, analytical methods and detection limits to the respective facility.

8.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality assurance/quality control (QA/QC) procedures are performed to document the accuracy and precision of the sampling analysis. QA/QC procedures include both field and laboratory programs. Duplicates, field blanks, trip blanks, and decontamination blanks are essential features of a QA/QC program.

8.1 Field Program

QA/QC procedures implemented during sampling include decontamination water blanks, trip blanks, and field/equipment blanks.

Decontamination Water Blank - A sample of the deionized water which is used during decontamination procedures must be collected. The sample must be submitted to the laboratory with collected samples, but not immediately analyzed. The sample must be retained by the laboratory until the results for the sampling event are received and verified. If there is a discrepancy in the analytical results and the integrity of the decontamination water is questioned, the sample must be analyzed for the particular parameter in question, providing the holding time for the decontamination water blank has not been exceeded. Decontamination water blanks shall be collected at the end of the sampling event.

Trip Blank - One trip blank is collected for each sampling event to detect any contamination due to the sampling containers or sample transport. Trip blanks are utilized and analyzed whenever VOCs are sampled. A trip blank involves filling the sample container with reagent grade water and transporting the blank with the sample containers used for field sampling. Trip blanks must be prepared by the analytical laboratory prior to the sampler picking up the sample containers. Trip blanks are never opened in the field. Trip blanks are analyzed for volatile organic compounds.

Field/Equipment Blanks - One field/equipment blank is collected during each sampling event to detect any contamination from the sampling equipment. A field/equipment blank involves passing reagent grade water through each type (except dedicated) of sampling device and into sample bottles in the field. The field/equipment blank can be collected at any time after the first field sample is obtained. The blank is submitted with collected samples for laboratory analysis. A minimum of one field/equipment blank is required for each sampling event even if disposable sampling equipment is used unless otherwise specified.

Duplicates - A duplicate is required on a daily basis to determine the variability of a particular sample point. The duplicate is collected at the same time and location of one of the sampling locations. If possible, the duplicate sample is collected from the same bailer sample as the regular sample. Time and sample locations are not recorded on the chain-of-custody or sample label in order to mask the sample location from which the duplicate was obtained. One duplicate per sampling event is required. A minimum of one duplicate will be analyzed for the same parameters for ground water monitoring requirements as described in the site specific sampling and analyses plan.

If sample contamination from sampling methodology or equipment decontamination is suspected through review of analytical results, blanks will be sampled in the following order (if holding times have not been exceeded):

a. Trip blank
b. Decontamination blank

8.2 Laboratory Program

A contract laboratory must adhere to a strict QA/QC program developed to meet or exceed those requirements suggested by the U.S. EPA "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans". Daily QA/QC practices must include performing method blank analysis, 10 % sample duplicates, 10% matrix spike evaluations and known reference sample analysis for each parameter sample set.

9.0 REPORT PREPARATION

9.1 Field and Analytical Reports

A complete report of field activities which will summarize the events that took place during the sampling event must be submitted to the Project Coordinator for review. At a minimum, the report should include methods used in purging and sampling for each well location, order of sampling, method of field filtration, location where duplicates were obtained and other information pertinent to the field activity. This report will consist of, at a minimum, environmental monitoring field data sheets (Attachment 1), sample chain-of-custody (Attachment 3) and field testing results.

Unless specified, a summary table of field measured data will be included in the report which will include sample location, top-of-casing, elevation depth to water, ground water elevation (referenced to USGS datum), volume of water in casing, volume purged, sampling method, temperature, specified conductivity and pH.

10.0 CONFIDENTIALITY AGREEMENT

The following procedures cover all verbal and/or written correspondence with regulatory personnel, or any third party, regarding site activities:

All consultants will hold confidential all business or technical information obtained or generated in the performance of services for this project. Consultants will not disclose project related information without Granger consent except to the extent required for: 1) compliance with any court order or governmental directive; 2) compliance with professional standards of conduct for preservation of safety, health and welfare; and or 3) protection of the consultant against claims or liability arising from the performance of services under this agreement.

Again, disclosure shall not be made without first notifying Granger as to the necessity.

ATTACHMENT 1

ENVIRONMENTAL MONITORING FIELD DATA SHEET

STRATA ENVIRONMENTAL SERVICES, INC.

GROUND WATER MONITORING FIELD DATA SHEET

SITE LOCATION: **MID Site**

Well Number:

Period of Sampling: ______

Facility: **Granger #2**

Address: **Grand River** **Watertown Twp.** **MI**

Street Number (PO Box) City State Zip

Contact: **Dr. Charles Annett** (Name) **372-2800** (Telephone)

Personnel Present: ______

WELL DATA:

Well Secure Upon Arrival: **Yes** ☐ **No** ☐

TOC Survey Mark: **North**

Well Conditions: **Good** ☐ **Fair** ☐ **Poor** ☐

Casing Material: **Galvanized Steel**

Casing Diameter: **2"**

Concrete Pad: **Yes** ☐ **No** ☐

Screen: **—**

Frost Heave: **Yes** ☐ **No** ☐

TOC Elevation:

Static Water Level (ft.) ______

Ground Water Elevation: ______ **feet**

Well Depth:TOC Reference:

Standing Water: **Yes** ☐ **No** ☐

Secured Upon Departure: **Yes** ☐ **No** ☐

Well ID Present/Readable: **Yes** ☐ **No** ☐

PURGING DATA:

Date of Purge: ______

Time of Purge: ______

Volume of Water in Casing: ______ **gals.**

Purge Volume **3X** ☐ **5X** ☐ **Other** ☐ ______ **gals.**

Purge Water Appearance:

Fate of Purge Water: ☐ ☐ ☐ **Ground 10'+ Contained**

Purge Method: ☐ **Disposable Bailer**

Purge Method: ☐ **S.S. Submersible Pump**

Purge Method: ☐ **Peristaltic Pump**

Decon: **Yes** ☐ **No** ☐

Type: **Liquinox & Water Wash** ☐ **Water Rinse** ☐ **Distilled Rinse** ☐

SAMPLING DATA:

Date of Sampling: ______

Time of Sampling: ______

Field Filtration?: **Yes** ☐ **No** ☐

Weather: ______

Sample Appearance: ______

Sampling Method: ☐ **Bailer** ☐ **Pump**

Decon?: **Yes** ☐ **No** ☐

Sp. Conductance: ______

Temperature °C: ______

pH: ______

PURGE DATA:

Volume Removed	pH	Temperature °C	Specific Conductance micro Siemons
___ gal.			
___ gal.			
___ gal.			
___ gal.			
___ gal.			
___ gal.			
___ gal.			
___ gal.			

COMMENTS:

ATTACHMENT 2

SAMPLE CONTAINERS, PRESERVATION METHODS AND HOLDING TIMES

SAMPLE HANDLING GUIDE

Inorganic and Conventional Parameters

Parameters	EPA Method*	Container	Recommended Quantity (mL)	Preservative	Holding Time
Specific Conductance	120.1, 9050	P,G	100	4°C	28 days
Sulfate	300.0, 375.1, 375.3, 375.4, 9035/36, 9038, 9056	P,G	200	4°C	28 days
Sulfide	376.1, 376.2, 9030, 9031, 9215	P,G	500	4°C, Zn acetate, NaOH to pH > 9	7 days
Sulfite	377.1	P,G	200	None	Immediately
Surfactants (MBAS)	425.1	P,G	250	4°C	48 hours
Total Organic Carbon (TOC)	415.1, 415.2, 9060	P,G	100	4°C, H_2SO_4 or H_3PO_4 to pH < 2	28 days
Total Organic Halides (TOX)	9020	G-TLC (amber)	100	4°C, H_2SO_4 to pH < 2	28 days
Total Petroleum Hydrocarbon (TPH)	418.1, 1664, 8440	G-TLC	1000	4°C, H_2SO_4 or HCl to pH < 2	28 days
Turbidity	180.1	P,G	100	4°C	48 hours

Organic Parameters

Parameters	EPA Method*	Container	Minimum Quantity (mL)	Preservative	Holding Time
Purgeable Halocarbons	601, 8021	G-TLS	2 x 40	4°C	14 days
…rgeable Aromatics	602, 8021	G-TLS	2 x 40	4°C, HCl to pH < 2	14 days
…latile Organics	524, 624, 8260, CLP	G-TLS	2 x 40	4°C, H_2SO_4, HCl or $NaHSO_4$ to pH < 2	14 days 10 days for CLP
Pesticides (Organochlorine or Organophosphorous) and PCBs	608, 8081, 8082, 8141	G-TLC (amber)	1000	4°C, pH 5-8	7/40 days
Chlorinated Herbicides	615, 8151	G-TLC (amber)	1000	4°C	7/40 days
Semivolatile Organics (BNA), Polynuclear Aromatics	525, 625, 8270, 8310, CLP	G-TLC (amber)	1000	4°C	7/40 days 5/35 days for CLP

TCLP Parameters

Parameters	Holding Time from Collection to TCLP Extraction (days)	Holding Time from TCLP Extraction to Preparative Extraction (days)	Holding Time from TCLP/Preparative Extraction to Analysis (days)	Total Elapsed Time (days)
Volatiles	14	Not Applicable	14	28
Semivolatiles	14	7	40	61
Mercury	28	Not Applicable	28	56
Metals	180	Not Applicable	180	360

References: 40CFR Part 136 Tables IA, IB, IC, ID & IE and Table II, and others.

*The methods listed are for typical EPA references, except for SM, which refers to Standard Methods for the Examination of Water and Wastewater (18th Edition)

For bacteriological and organic parameters, add sodium thiosulfate if residual chlorine is present. Soil samples should be collected in 4-8 oz glass containers with a Teflon®-lined cap and preserved at 4°C. No preservative required for waste samples except 4°C for volatiles. Teflon® is a registered trademark of E I du Pont

…nymn Definitions:

…	Polyethylene	G-TLS	Glass with Teflon®-lined septum
G	Glass	PTFE	Fluoropolymer Resin / Teflon®
G-TLC	Glass with Teflon®-lined cap	CLP	EPA Contract Laboratory Program

SAMPLE HANDLING GUIDE

Inorganic and Conventional Parameters

Parameters	EPA Method	Container	Recommended Quantity (mL)	Preservative	Holding Time
Acidity	305.1	P,G	100	4°C	14 days
Alkalinity	310.1, 310.2	P,G	100	4°C	14 days
Ammonia	350.1, 350.2, 350.3	P,G	500	4°C, H_2SO_4 to pH <2	28 days
Biochemical Oxygen Demand (BOD)	405.1, SM 5210	P,G	1000	4°C	48 hours
Boron	200.7, 212.3	P, PTFE, Quartz	200	HNO_3 to pH <2	6 months
Bromide	300.0, 320.1, 9056, 9211	P,G	200	None	28 days
Chemical Oxygen Demand (COD)	410.1, 410.2, 410.3, 410.4, Hach 8000	P,G	100	4°C H_2SO_4 to pH <2	28 days
Chloride	300.0, 325.1, 325.2, 325.3, 9056, 9212, 9250/51, 9253	P,G	200	None	28 days
Chlorine, Residual	330.1, 330.2, 330.3, 330.4, 330.5	P,G	200	None	Immediately
Chromium VI	218.4, 7195, 7196, 7197, 7198, 7199	P,G	250	4°C	24 hours
Coliform, Fecal/Total	SM 9221, 9222	P,G (sterile)	100	4°C	6 hours
Color	110.1, 110.2, 110.3	P,G	100	4°C	48 hours
Cyanide	335.2, 335.3, 9010, 9012, 9013, 9213	P,G	1000	4°C, ascorbic acid, NaOH to pH > 12	14 days
Fluoride	300.0, 340.1, 340.2, 340.3, 9056, 9214	P	500	None	28 days
Hardness	130.1, 130.2	P,G	100	HNO_3 or H_2SO_4 to pH < 2	6 months
Iodide	345.1	P,G	200	4°C	24 hours
Metals	6010, 200, 7000 series	P,G	500	HNO_3 to pH < 2	6 months
Mercury	245.1, 245.2, 7470, 7471, 7472	P,G	500	HNO_3 to pH < 2	28 days
Nitrogen, Kjeldahl (TKN)	351.1, 351.2, 351.3, 351.4	P,G	500	4°C, H_2SO_4 to pH < 2	28 days
Nitrate	300.0, 352.1, 9056, 9210	P,G	100	4°C	48 hours
Nitrite	300.0, 354.1, 9056	P,G	100	4°C	48 hours
Nitrate + Nitrite	353.1, 353.2, 353.3	P,G	200	4°C, H_2SO_4 to pH < 2	28 days
Oil and Grease	413.1, 1664, 9070	G	1000	4°C, H_2SO_4 or HCl to pH < 2	28 days
Phenols	420.1, 420.2, 9065, 9066, 9067	G	1000	4°C, H_2SO_4 to pH < 2	28 days
Phosphorus, Total	365.1, 365.2, 365.3, 365.4, 6010	P,G	200	4°C, H_2SO_4 to pH < 2	28 days
Phosphate, Ortho	300.0, 365.1, 365.2, 365.3	P,G	200	4°C	48 hours
PH	150.1, 9040, 9045	P,G	100	None	Immediately
Radiochemistry Alpha, Beta, Radium Tritium Radon I-131	900 & 9000 series	P G (amber) G P, G	2000 100 3 x 40 1000	HNO_3 to pH < 2 None None NaOH to pH>8	6 months 6 months 4 days 16 days
Silica	370.1, 200.7, SM1311D	P, PTFE, Quartz	100	4°C	28 days
Solids, Dissolved (TDS)	160.1	P,G	100	4°C	7 days
Solids, Suspended (TSS)	160.2	P,G	500	4°C	7 days
Solids, Volatile (TVS)	160.4	P,G	100	4°C	7 days
Solids, Total (TS)	160.3	P,G	100	4°C	7 days

Sampling and Analysis Plan

Laboratory QA/QC Information

Fibertec Environmental Services

The following information identifies the details of the Quality Control Requirements of Fibertec Environmental Services. This information is provided for inclusion with the Sampling and Analysis Plan (Section 8.2) which has been included as Appendix 8-A of the Application.

3.4 *Essential Quality Control Requirements*

Decisions about how much data to collect and the criteria for decision making are established during the DQO process of the field project ultimately found in the QAPP. This process consists of developing qualitative and quantitative statements that help specify the quality of data required to support decisions during field activities. Data of known or acceptable precision, accuracy, completeness, representativeness, and comparability are necessary for the construction of defensible decisions. The Method Blank, Lab Control Sample, Matrix Spike, Matrix Spike Duplicate indicate levels of precision and accuracy from the samples.

Completeness, representativeness and comparability is within the control of the field project manager who can verify sufficient samples, representing the sampling area, were taken and submitted to the laboratory without contamination.

The following section defines the required quality control that must be performed with each analytical batch. These quality control indicators serve as the basis for confidence in the accuracy, precision, and validity of test results.

Laboratory policy is to complete the quality control requirements for each test method, recognizing that the nature of some tests prevent the measurement of certain elements (i.e., reagent blank for pH analysis). Therefore, the laboratory will define the required quality control indicators for all tests, and delineate them in the method manual. In addition, test method manuals shall contain method-specific corrective action guidelines to follow in the event of unacceptable results for quality control indicators.

3.4.1 Control of Nonconforming Work

A laboratory staff member may recognize the need for a departure from an approved procedure due to client request, sample related issue or other extenuating circumstance. The staff member then obtains a "departure from SOP" form from the QA Office and documents the project, sample(s), date, applicable SOP, client identification, reason for departure from standard procedure, describe the departure. The form is then approved by a laboratory manager and QA Officer. The client then is notified of the need to depart from standard procedure and is informed of the potential impact the change will have in the results generated. The client approval, date and time is recorded. The completed form is kept with the project folder.

During the review of data, quality control sample results, performance samples, internal or external audit, if the Quality Control Officer detects any analytical system, analyst or technician unable to produce acceptable analytical results, the Quality Control Officer, at his discretion, may halt work until the analytical system, analyst or technician is brought into compliance with current acceptance criterion.

If impacted data has lead to reports that have left the lab before a problem has been recognized, the client is notified within 24 hours of the recognition and verification of the problem.

3.4.2 Basic Control Parameters

The following is from: National Environmental Laboratory Accreditation Conference, "Quality Systems", Revision 15, Will 2001, Appendix D – Essential Quality Control Requirements, Sections D.1 through D.1.6.

D.1 CHEMICAL TESTING

D.1.1 Positive and Negative Controls

a) Negative Control – Method Performance

Purpose: The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. The method blank shall be processed along with and under the same conditions as the associated samples to include all steps of the analytical procedure. Procedures shall be in place to determine of the method blank is contaminated. Any affected samples associated with a contaminated method blank shall be reprocessed for analysis or the results reported with the appropriate data qualifying codes.

Frequency: The method blank shall be analyzed at a minimum of 1 per preparation batch. In those instances for which no separate preparation batch is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Composition: The method blank shall consist of a matrix that is similar to the associated samples and is known to be free of the analytes of interest.

Evaluation Criteria and Corrective Action: While the goal is to have no detectable contaminants, each method blank must be critically evaluated as to the nature of the interference and the effect on the analysis of each sample within the batch. The source of contamination shall be investigated and measures taken to minimize or eliminate the problem and affected sample reprocessed or data shall be appropriately qualified if:

1. The concentration of a targeted analyte in the blank is at or above the reporting limit as

established by the test method or by regulation, AND is greater than 1/10 of the amount of any measured sample.

2. The blank contamination otherwise affects the sample results as per the test method requirements or the individual project data quality objectives.

b) Positive Control - Method Performance

1) Laboratory Control Sample (LCS)

Purpose: The LCS is used to evaluate the performance of the total analytical system, including all preparation and analytical steps. Results of the LCS are compared to established criteria and, if found to be outside of these criteria, indicates that the analytical system is "out of control". Any affected samples associated with an out of control LCS shall be reprocessed for re-analysis or the results reported with appropriate data qualifying codes.

Frequency: The LCS shall be analyzed at a minimum of 1 per preparation batch. Exceptions would be for those analytes for which no spiking solutions are available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples. If there is insufficient sample to include a MS/MSD in the preparation batch, prepare a second LCS to assess batch precision.

Composition: The LCS is a controlled matrix, known to be free of the analytes of interest, spiked with known and verified concentrations of analytes. NOTE: the matrix spike will be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. Alternatively, the LCS will consist of a media containing known and verified concentrations of analytes or as Certified Reference Material (CRM). All analyte concentrations shall be within the calibration range of the methods. The following shall be used in choosing components for the spike mixtures:

The components to be spiked shall be as specified by the mandated test method or other regulatory requirement as requested by the client. In the absence of specified spiking components the laboratory shall spike for the following:

For those components that interfere with an accurate assessment such as spiking simultaneously with technical Chlordane, Toxaphene and PCBs, the spike must be chosen that represents the chemistries and elution patterns of the components to be reported.

For those test methods that have extremely long lists of analytes, a representative number will be chosen. The analytes selected should be representative of all analytes reported. The following criteria shall be used to determine the minimum number of analytes to be spiked. However, the laboratory shall insure that all targeted components are included in the spike mixture over a 2 year period.

a) For methods that include 1-10 targets, spike all components;

b) For methods that include 11-20 targets, spike at least 10 or 80%, whichever is greater;

c) For methods with more than 20 targets, spike at least 16 components.

Evaluation Criteria and Corrective Action: The results of the individual batch LCS are calculated in percent recovery. The laboratory shall document the calculation for percent recovery.

The individual LCS is compared to the laboratory established acceptance criteria or utilize client specified assessment criteria. If these criteria do not exist, use criteria as published in the mandated test method.

A LCS that is determined to be within the criteria effectively establishes that the analytical system is in control and validates system performance for the samples in the associated batch. Samples analyzed along with a LCS determined to be "out of control" must be considered suspect and the samples reprocessed and re-analyzed or the data reported with appropriate data qualifying codes. If the LCS indicates a potential high bias and the associated samples "non-detect", the samples will be reported without flags.

c) **Sample Specific Controls**

The laboratory must document the procedures for determining the effect of the sample matrix on method performance. These procedures relate to the analysis of matrix specific Quality Control (QC) samples and are designed as data quality indicators for a specific sample using the designated test method. These controls alone are not used to judge laboratory performance.

Examples of the matrix specific QC include: Matrix Spike (MS); Matrix Spike Duplicate (MSD); sample duplicates; and surrogate spikes. The laboratory shall have procedures in place for tracking, managing, and handling matrix specific QC criteria including spiking appropriate components at appropriate concentrations, calculating recoveries and relative percent difference, evaluating and reporting results based on performance of the QC samples.

Matrix Spike; Matrix Spike Duplicates

Purpose: Matrix specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch.

Frequency: The frequency of the analysis of matrix specific samples shall be determined as part of a systematic planning process (e.g. Data Quality Objectives) or as specified by the required mandated test method. If sufficient sample is available, a MS/MSD pair is prepared at least once every 20 samples.

Composition: The components to be spiked shall be as specified by the mandated test method. Any permit specified analytes, as specified by regulation or client requested analytes shall also be included. If there are no specified components, the laboratory shall spike per the following:
For those components that interfere with an accurate assessment such as spiking simultaneously with technical chlordane, Toxaphene and PCBs, the spike must be chosen that represents the chemistries and elution patterns of the components to be reported.

For those test methods that have extremely long lists of analytes, a representative number will be chosen. The analytes selected should be representative of all analytes reported. The following criteria shall be used to determine the minimum number of analytes to be spiked. However, the laboratory shall insure that all targeted components are included in the spike mixture over a 2 year period.

a) For methods that include 1-10 targets, spike all components;

b) For methods that include 11-20 targets, spike at least 10 or 80%, whichever is greater;

c) For methods with more than 20 targets, spike at least 16 components.

Evaluation Criteria and Corrective Action: The results from matrix spike/matrix spike duplicate are primarily designed to assess the precision and accuracy of analytical results in a given matrix and are expressed as percent recovery (%R) and relative percent difference (RPD). The laboratory shall document the calculation for relative percent difference.

Results are compared to the laboratory established acceptance criteria, or client specified criteria. If these criteria do not exist, use criteria as published in the mandated test method. For matrix spike results outside established criteria corrective action shall be documented or the data reported with appropriate data qualifying flags.

d) **Matrix Duplicates**

Purpose: Matrix duplicates are defined as replicate aliquots of the same sample taken through the entire analytical process. The results from this analysis indicate the precision of the results and for the specific sample using the selected method. The matrix duplicate provides a usable measure of precision only when target analytes are found in the sample chosen for duplication.

Frequency:	The frequency of the analysis of matrix duplicates will be determined as part of a systematic planning process (e.g. Data Quality Objectives) or as specified by the required mandated test method.
Composition:	Matrix duplicates are performed on replicate aliquots of actual samples. The composition is usually not known.
Evaluation Criteria and Corrective Action:	The results from matrix duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD) or other statistical treatment (e.g., absolute differences). The laboratory shall document the calculation for relative percent difference or other statistical treatments. Results are compared to the laboratory established acceptance criteria. Where there are no established criteria, the laboratory shall use method specified acceptance ranges. For matrix duplicates results outside established criteria corrective action shall be documented or the data reported with appropriate data qualifying flags.

e) Surrogate Spikes

Purpose:	Surrogates are used most often in chromatographic test methods and are chosen to reflect the chemistries of the targeted components of the method. Added prior to sample preparation/extraction, they provide a measure of recovery for every sample matrix.
Frequency:	Except where the matrix precludes its use or when not available, surrogate compounds must be added to all samples, standards, and blanks for all appropriate test methods.
Composition:	Surrogate compounds are chosen to represent the various chemistries of the target analytes in the method. They are often specified by the mandated method and are deliberately chosen for their being unlikely to occur as an environmental contaminant. Often this is accomplished by using deuterated analogs of selected compounds.
Evaluation Criteria and Corrective Action:	The results are compared to the laboratory established acceptance criteria. Where there are no established criteria, the laboratory will determine internal criteria and document the method used to establish the limits. Surrogates outside the acceptance criteria must be evaluated for the effect indicated for the individual sample results. The appropriate corrective action will be guided by the data quality objectives or other site specific requirements. Results reported from analyses with surrogate recoveries outside the acceptance criteria should include appropriate data qualifiers.

D.1.2 Detection Limits

The laboratory shall utilize a test method that provides a detection limit that is appropriate and relevant for the intended use of the data. Detection limits shall be determined by the protocol in the mandated test method or applicable regulation, e.g., Method Detection Limit (MDL). If the protocol for determining detection limits is not specified, the selection of the procedure must reflect instrument limitations and the intended application of the test method.

a) A detection limit study is not required for any component for which spiking solutions or quality control samples are not available such as temperature.

b) The detection limit shall be initially determined for the compounds of interest in each test method in a matrix in which there are not target analytes nor interferences at a concentration that would impact the results or the detection limit must be determined in the matrix of interest (see definition of matrix).

c) Detection limits must be determined each time there is a change in the test method that affects how the test is performed, or when a change in instrumentation occurs that affects the sensitivity of the analysis.

d) All sample processing steps of the analytical method shall be included in the determination of the detection limit.

e) All procedures used must be documented. Documentation must include the matrix type. All supporting data must be retained.

f) The laboratory must have established procedures to relate detection limits with quantitation limits.

g) The test method's reporting limits must be established and must be above the detection limits.

D.1.3 Data Reduction

The procedures for data reduction, such as the use of linear regression shall be documented.

D.1.4 Quality of Standards and Reagents

a) The source of standards shall comply with 6.3. Calibration is verified with standards from a second source or lot number.

b) Reagent Quality, Water Quality and Checks

1) Reagents – In methods where the purity of reagents is not specified, analytical reagent grade shall be used. Reagents of lesser purity than those specified by the test method shall not be used. The labels on the container must be checked to verify that the purity of the reagents meets the requirements of the particular test method. Such information shall be documented.

2) Water – The quality of water sources shall be monitored and documented and shall meet method specified requirements. Conductivity is evaluated every work day and the reagent water is used for Method Blanks when ever batches are prepared.

3) The laboratory will verify the concentration of titrants in accordance with written laboratory procedures.

D.1.5 Selectivity

a) Absolute retention time and relative retention time aid in the identification of components in chromatographic analyses and to evaluate the effectiveness of a column to separate constituents. The laboratory shall develop and document acceptance criteria for retention time windows.

b) A confirmation shall be performed to verify the compound identification when positive results are detected on a sample from a location that has not been previously tested by the laboratory. Such confirmations shall be performed on organic tests such as pesticides, herbicides, or acid extractable or when recommended by the analytical test method except when the analysis involves the use of a mass spectrometer. Confirmation is required unless stipulated in writing by the client. All confirmation shall be documented.

c) The laboratory shall document acceptance criteria for mass spectral tuning.

D.1.6 Constant and Consistent Test Conditions

a) The laboratory shall assure that the test instruments consistently operate within the specifications required of the application for which the instrument is used.

b) Glassware Cleaning – Glassware shall be cleaned to meet the sensitivity of the test method.

d) Any cleaning and storage procedures that are not specified by the test method shall be documented in laboratory records and SOPs.

The preceding sections are from the NELAC standard and provide guidance to the laboratory regarding routine analytical procedure. Additional method requirements or client requirements will supersede or add to this guidance. The following are additional requirements.

1 For VAP projects, Method Blank at or above the reporting limit will require re-preparation and re-analysis if sufficient sample is available, depending on client requirement. If insufficient sample was supplied for re-preparation, the results are reported with appropriate flag.
2 For VAP projects, all client targets will be spiked in the LCS and evaluated.
3 For VAP (Ohio) projects, the MS/MSD must not be used to replace a failed LCS in the batch. The corrective action for failed LCS targets is re-preparing and reanalyzing the associated samples if sufficient sample is available. Otherwise, the failed parameters are clearly flagged in the final report.

ATTACHMENT 3

CHAIN-OF-CUSTODY FORM

STRATA ENVIRONMENTAL SERVICES, INC.
585 Jewett Road • Mason, Michigan 48854
Phone (517) 676-6900 Fax (517) 676-8834

CHAIN OF CUSTODY

Air	A
Drinking Water	D
Groundwater	W
Soil	S
Sludge	L
Oil	O
Other	X

Client:

Project Name:

Project #:

Send Results to:

Sampling Personnel:

Lab Use	Sample Information					Preservative						Analysis Requested														
Lab Sample ID #	Date	Time	Sample Description and Location (e.g. MW-1)	PID	MATRIX	None	H2SO4	HNO3	HC1	NaOH	Other															

Comments:

Relinquished by Signature:	Date	Time	Received by: (Signature)	Date	Time	Relinquished by Signature:	Date	Time	Received by: (Signature)	Date	Time
Relinquished by Signature:	Date	Time	Received by: (Signature)	Date	Time	Method of Shipment:			Bill of Lading:		
Received for Laboratory by:	Date	Time	Data Package Relinquished by:	Date	Time	Data Received by:	Date	Time			

APPENDIX F-3

Post-Closure Groundwater Statistical Evaluation Program

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Ann Arbor, MI 48108-2771
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Post Closure Groundwater Statistical Evaluation Program

Granger Grand River Landfill
Hazardous Waste Management Unit
MID 082-771-700

Watertown Township, Michigan

Original – July 2000
Revision 01 – January 2004
Revision 02 – November 2005
Revision 03 – January 2006

Prepared For
Granger Land Development Company

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Project Manager

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Hydrogeologist

RMT, Inc., Michigan
Rev. 03 Final
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Section 1 Introduction

This *Post-Closure Groundwater Statistical Evaluation Program (Program)* was prepared by RMT, Inc., Michigan (RMT) on behalf of the Granger Land Development Company (Granger) for the closed regulated hazardous waste management unit referred to as the Granger Grand River MID 082-771-700 (regulated unit), located in T5N, R3W, Watertown Township, Section 29, Clinton County, Michigan. The regulated unit currently performs post closure monitoring under Part 111.

Granger retained RMT to assist in implementing Condition E of the Hazardous Waste Management Facility Post-Closure Operating License dated September 30, 1999, and the outcome of a meeting held between Granger, RMT, and the Michigan Department of Environmental Quality (MDEQ), Waste and Hazardous Materials Division (W&HMD) on December 2, 1999 regarding statistical evaluation of groundwater data for the regulated unit.

Based on the December 2, 1999 meeting, it was agreed that intra-well statistical procedures would be appropriate for the shallow drift aquifer because of the known effects of the purge well system and the lack of a uniform upgradient to downgradient hydrogeologic relationship. However, it was necessary to perform analysis on the deep drift and bedrock aquifers to determine the degree of spatial variability as outlined in Condition E (1) of the operating license.

Condition E (1) stipulates that the first phase of the evaluation was to evaluate existing groundwater data for statistical distribution to be submitted within 120 days from license issuance. The purpose of determining the distribution of the data was to ascertain whether the degree of spatial variability between groundwater monitoring wells at the site is significant, thus determining whether intra-well or inter-well statistical procedures are appropriate for detection monitoring.

Granger submitted the Evaluation of Groundwater Spatial Variance (RMT, January 2000) to fulfill Condition E (1) of the September 30, 1999 operating license. The W&HMD responded on May 9, 2000, and concurred with the conclusions of the Evaluation of Groundwater Spatial Variance. Therefore, this Program is the second of two submittals and fulfills Condition E (2) of the September 30, 1999 operating license, consisting of a statistical program that provides specific details regarding the statistical approach chosen for the site. This Program was originally submitted to MDEQ in July 2000. The MDEQ Waste and Hazardous Materials Division

(W&HMD) provided a review and comment of the Program in a letter dated October 20, 2003. This revised Program (Revision 01, January 14, 2004) addresses MDEQ comments.

The MDEQ responded to the January 2004 revision in their July 5, 2005 email. This revision is a response to their July 2005 comments.

This Program was prepared by RMT utilizing the guidelines outlined in the 1988 Interim Final Guidance of the Statistical Analysis of Groundwater Data at RCRA Facilities (Interim Final Guidance), and the 1992 Addendum to the Statistical Analysis of Groundwater Data at RCRA Facilities (Addendum). The procedures proposed herein are generally accepted procedures that have gained both State and Federal regulatory acceptance.

The objective of this Program is to provide a statistical Program that is capable of determining statistically significant changes in groundwater chemistry and will assist Granger in ascertaining whether the regulated unit is impacting groundwater quality. This Program was prepared to fulfill a portion of the post closure plan requirements outlined in Part 111, and the requirements for post-closure plans as outlined in 40 CFR 264.118. This document is not intended to serve as a groundwater detection monitoring program but provides detail as to how groundwater data collected as part of the groundwater detection monitoring program will be statistically evaluated.

This Program is intended to be a dynamic document, and as such, modifications to this Program will be prepared and submitted to the MDEQ according to applicable regulations, when data becomes available that necessitates such revisions.

Section 2
Statistical Methods and Programs

2.1 Selection of Statistical Methods

The goal of this Program is to provide a basis for evaluating a large volume of groundwater data to determine if changes in chemistry are occurring at the site. In order to accomplish this goal, the facility history must be evaluated so that the statistical methods utilized do not result in an improper balance between false indications that the regulated unit is causing background values to be exceeded, or that the procedures will fail to indicate that background values or concentrations are being exceeded. This goal can be accomplished very effectively by evaluating whether groundwater chemistry is changing at a particular well using intra-well comparisons.

Intra-well comparisons are superior to upgradient to downgradient comparisons because they effectively reduce the largest variable in detection monitoring by reducing the effect of spatial variability on the evaluation. Intra-well statistical approach is especially effective at sites that have a limited number of regulatory acceptable upgradient "background" wells. Inter-well statistical tests are not recommended for the regulated unit statistical evaluation program because only one regulatory acceptable upgradient well is established for the deep drift and bedrock aquifers as compared to the large volume of downgradient compliance wells. In these cases, spatial variability, which commonly comprises the highest percentage of total population variability, is totally unaccounted for in inter-well procedures.

Intra-well methods are the statistical test of choice based upon the following factors:

- Because of the inability to find regulatory acceptable locations for additional monitoring wells upgradient of the regulated unit upgradient-to-downgradient comparisons (inter-well) are not recommended. Potential upgradient locations are suspected as being impacted by off-site activities including agricultural impacts and road de-icing. Additionally, the presence of the on-site VOC impacted groundwater limited to a small area of the shallow drift aquifer, the presence of a slurry wall, and a groundwater extraction system support the use of intra-well procedures.
- According to reviewed reports, thickness of the soils that represent the upper drift aquifer and lower drift aquifer vary from several feet up to 30 feet. Because of the lack of uniform thickness, spatial variability is anticipated to be relatively high.
- A groundwater recovery and treatment system is operating in the southwestern corner of the site to recover volatile organic constituents (VOCs) identified in a limited area of the

shallow drift in the 1980s. The location of the VOCs is presumed to be hydraulically upgradient of the landfill in the shallow drift aquifer.

2.2 Groundwater Recovery System Effectiveness Monitoring

Granger maintains a groundwater recovery system in the southwestern corner of the site. The groundwater recovery system is designed to hydraulically control and recover groundwater that contains low level VOCs from the granular deposits which comprise the upper drift aquifer. In general, the recovery system-monitoring program consists of groundwater samples obtained quarterly for EPA Method 8260 parameters from wells MW-19, P-28, P-29, PW-38, PW-39, PW-46, and PW-48. Additionally, a trend analysis will also be conducted whereby detected VOCs will be evaluated quarterly and graphically plotted on an annual basis.

2.3 Parametric and Non-Parametric Intra-Well Statistical Evaluations

Intra-well procedures will be utilized in the shallow drift, deep drift, and bedrock aquifers. Parametric prediction limits will be used for constituents that do not have excessive proportions of non-detect data points, where the data are determined to be normally distributed, or where data can be reasonably transformed to a normal distribution. Constituents with high proportions of non-detects will be statistically analyzed using non-parametric prediction limits. These methods will be employed assuming data evaluations indicate that the assumptions of the proposed methods are not violated.

2.4 Total Non-Detect Data Populations

For VOC data populations that consist of 100 percent non-detect in a given data set, statistical evaluation will not be performed on the data per the requirements of the September 30, 1999 operating license. The detection limit is considered the background standard for these wells and parameters. For these data, analytical results that are reported above the detection limits are considered triggers for confirmation resample events.

Section 3
Groundwater Detection Monitoring

The following provides a brief discussion of the groundwater detection monitoring program as specified in the Operating License (September 30, 1999) which should be referenced for detailed information regarding site geology, hydrogeology, and operational history.

3.1 Site Geology and Hydrogeology

Based upon review of site information, there have been a number of hydrogeologic investigations conducted during the period between 1976 through 1996. These studies have provided a relatively comprehensive understanding of site geology and hydrogeology. As described in these investigative reports, site geology generally consists of the following stratigraphic units at increasing depth:

- A surficial granular deposit, which varies in thickness from several feet up to 30 feet. Portions of this deposit have been excavated in some of the areas of the landfill and have been hydraulically separated through the construction of a low permeable clay barrier system and a slurry wall.
- A silty clay deposit characterized as a till which acts as a hydraulic barrier to varying degrees across the site. The deposit is considered a confining layer in the southern portion of the site and a leaky confining layer in northern portions.
- A lower granular deposit which varies in thickness between several feet up to 30 feet.
- A lower silty clay characterized as a till.
- Sandstone bedrock consisting of the Saginaw Formation.

Within these stratum (hydrostratographic units), three water bearing zones capable of yielding water sufficient for the purposes of groundwater sampling have been identified and consist of:

- A shallow drift aquifer, which is present in the near surface granular deposit. A groundwater recovery system is also modifying groundwater flow in these deposits.
- A deep drift aquifer, which is present in the lower granular deposit between the two till sequences. The groundwater flow in this unit appears to vary but generally flows from the southwest to northeast.
- A sandstone bedrock aquifer.

3.2 Groundwater Detection Monitoring Network

During the implementation of the subsurface investigations, numerous monitoring wells and piezometers have been installed to obtain an understanding of groundwater movement. The wells that are selected to serve as detection monitoring wells for the regulated unit include the following:

- **Shallow Glacial Detection Monitoring Wells**

MW-9	MW-14S	MW-21S
MW-23S	MW-40	MW-43S

- **Deep Glacial Detection Monitoring Wells**

MW-44	MW-14D	MW-20
MW-22D	MW-24D	MW-25
MW-41	MW-43D	MW-45

- **Bedrock Detection Monitor Wells**

MW-16	MW-17	MW-18

- **Recovery Area Monitoring Program**

MW-19	P-28	P-29
PW-38	PW-39	PW-46
PW-48		

3.3 Groundwater Monitoring Parameters

Five (5) categories of parameters have been established for detection monitoring purposes. Some categories require statistical evaluation while others provide information regarding recovery system effectiveness and geochemical information useful in evaluation of possible statistical exceedances.

3.3.1 Recovery System Monitoring Program Parameters

The groundwater monitoring well/recovery well parameters will consist of VOCs tested according to EPA method 8260. A list of the parameters and detection limits for the parameters included as part of the EPA Method 8260 analysis is included in Appendix A. No statistical evaluation will be conducted on these parameters. Trend analysis will be performed on the detected 8260 parameters, when appropriate.

3.3.2 Primary Parameters

The primary parameter list currently consists of the 8260 VOCs (Appendix A). This list may be modified in the future (with MDEQ approval) to include only the VOCs detected in discrete leachate samples obtained from the regulated unit. The shortened 8260 list will significantly reduce the facility-wide false positive rate and increase the statistical power of the program. A list of the current primary parameters, test methods, and detection levels are included in Appendix A. These parameters will not be statistically evaluated. A detection of any one of these parameters in groundwater samples will trigger a resample event as discussed in Section 6.1.1.

3.3.3 Secondary Parameters

These inorganic parameters are commonly found to be naturally occurring at varying concentrations in groundwater and their presence in groundwater alone is not an indication of a release from the regulated unit. The secondary parameters, test methods, and detection levels are included in Appendix A. The secondary parameters consist of mainly inorganic indicator parameters that exhibit a high contrast between leachate in the regulated unit and groundwater. However, these secondary parameters should also exhibit a high degree of statistical sensitivity. For example, parameters can exhibit a relatively high groundwater/leachate contrast but exhibit a high degree of variability in the background groundwater data set. This variability will result in higher standard deviations than those parameters that exhibit lesser degrees of variability. Higher standard deviations can reduce the ability for the parameter to become an effective monitoring parameter. For this reason, the secondary parameters should be evaluated and chosen based upon good groundwater/leachate contrasts, and based upon the statistical sensitivity of the parameter. However, the secondary parameters are prescribed in the Operating License, and require statistical evaluation without regards to sensitivity or leachate comparisons.

3.3.4 Tertiary Parameters

Granger will use tertiary parameters to provide information regarding general chemistry and to assist in determining if groundwater chemistry is being affected by factors other than releases from the regulated unit (i.e., well seal failure, grout contamination). A list of the parameters, test methods and detection levels are included in Appendix A. These parameters will not be statistically evaluated because they presumably lack the degree of leachate to groundwater contrasts or sensitivity in determining impacts on groundwater chemistry. Tertiary parameters will also assist in determining if prediction limits should be updated based upon non-release factors such as natural variability.

3.3.5 Field Parameters

Field parameters are those parameters measured in the field during sample collection, mainly for demonstrating that groundwater quality has stabilized and that representative groundwater samples are being obtained. These parameters will not be statistically evaluated.

3.4 Groundwater Monitoring Frequency

Background will be established on a quarterly basis for all of the primary, secondary, tertiary, and field parameters until the necessary background data set is established. Once background has been established for a given parameter or location, groundwater will be sampled semiannually from the shallow drift wells, deep drift wells, and the bedrock well monitoring programs.

Groundwater samples will be obtained quarterly from the recovery system monitoring program wells for 8260 VOCs.

3.5 Collection and Evaluation of Background Data

The purpose of obtaining adequate background groundwater data is to approximate the true range of concentrations of targeted compounds in the groundwater flow system being monitored. In other words, background groundwater quality should eliminate, to the extent possible, all potential causes of statistically significant changes in groundwater chemistry not attributable to the monitored unit. Representative background data that accurately approximate the true range of variability are obtained by monitoring a sufficient number of wells upgradient of the monitored unit (for inter-well comparisons), or wells downgradient of the monitored unit not previously impacted by the unit (for intra-well comparisons).

Three major considerations must be appropriately evaluated to successfully achieve the goals of obtaining background samples that reasonably approximate ambient concentrations:

1. Collecting the minimum number of samples that satisfy the requirements of the statistical methods being used (e.g. that result in adequate statistical sensitivity).
2. Incorporating seasonal or temporal variability into the background data set. This can only be accomplished through the collection of data over a duration of time that sufficiently incorporates these components of variability into the data set and is directly linked to the hydrogeologic properties of the groundwater unit being monitored. Arbitrary frequencies based upon regulatory requirements often do not allow for these components to be accounted for in the background data set. Oftentimes, it is necessary to supplement the

existing data set with additional data so that these components can be accounted for in the background population.

3. Incorporating the spatial component of variability into the background data set (i.e., the variability that comes with obtaining samples from different locations from the same groundwater monitoring zones). The spatial component of variability constitutes a large percentage of the overall variability within environmental statistics. Eliminating the spatial component of variability (through the use of intra-well comparisons), or by adequately incorporating it into the background data set (through the use of multiple upgradient wells in inter-well comparisons) is critical in developing an effective monitoring program.

Due to the lack of a sufficient number of regulatory acceptable background groundwater monitoring well locations, inter-well statistics is not proposed. Because of the site history and the operation of the groundwater recovery system, data will be evaluated during implementation of the statistical program to verify that the background data used in the intra-well statistical calculations is not impacted by the regulated unit.

3.6 Background Database

RMT evaluated the groundwater database to determine if at least eight (8) background samples were available for each parameter before that well's data should be used for making determinations of statistical exceedances for the given parameter. Sufficient background is not available for all of the parameters identified in Section 3.3 at all locations. Granger is in the process of determining the presence of additional pre-existing groundwater data. Recent revisions to the detection monitoring program means that new wells have insufficient data to proceed with the statistical evaluation. Also, more than eight (8) background samples may be necessary if the initial samples from an existing or new well indicate residual effects or instabilities resulting from well installation.

Currently the MDEQ requires that if data is obtained to complete background, it should be conducted at a minimum frequency of quarterly. This frequency implies that background would be established over a two-year period if eight (8) background measurements were necessary. Granger has elected to comply with this frequency, but experience at the Granger Act 641 site, and groundwater data at other sites in Michigan have concluded that two years to establish background is commonly insufficient duration to account for the natural variability in groundwater. Data collected over a two-year period will be compared to compliance data (data collected after the background events). If it is determined that the duration of background was insufficient, Granger will petition the MDEQ to allow for the recalculation of statistical limits to incorporate the additional data, as long as it can be demonstrated that the data requested to be incorporated into background is not being impacted by the regulated unit.

3.7 Updating Statistical Limits

It will be necessary to periodically calculate the statistical limits to include the parameters and locations where background data are currently insufficient. These updates will be provided to the MDEQ with the next monitoring report submitted subsequent to the collection of each of the events once sufficient background data are established for a given parameter or well.

In accordance with the prediction limit statistical method, it is necessary to recalculate prediction limits at pre-determined intervals. Granger has chosen to utilize prediction limits that take into account the next four sampling events. Therefore, as the sampling schedule is semi-annual, Granger will update prediction limits every two years. Prior to updating the prediction limits, Granger will compare the background data (from which the prediction limits are calculated) to the data collected after background was established. The analysis will compare the two data sets to determine if they are from the same, or different populations. If the data sets are determined to be from the same population, then Granger will proceed with updating the prediction limits. If the data sets are determined to be from different populations, then Granger will confer with the MDEQ WHMD prior to proceeding with further statistical analyses.

In the event that groundwater quality shows a significant change which can be attributed to factors other that the regulated unit, a petition may be submitted by Granger to the MDEQ to re-establish background and update prediction limits at an alternate time.

Section 4
Data Review and Evaluation

4.1 Evaluation of Existing Data and Distribution Analysis

In accordance with the Evaluation of Groundwater Spatial Variance (RMT, January 2000), based on the knowledge of site history, and because there is a statistical evaluation program successfully being implemented under Part 115 at the Granger Grand River 641 site, intra-well prediction limits are most appropriate.

Once compiled into the database, RMT evaluated the available data as a first step in a step-wise process, prior to making final statistical method decisions, and statistical limit calculations. We also conducted data evaluations in order to observe trends in data, reviewed distributional assumptions, identified any data that appeared to be outliers, ensured that the data did not violate the statistical methods assumptions, and generally determined that the data were sufficient to continue with the statistical evaluation. RMT performed data evaluation using ChemStat® software (Appendix B).

4.1.1 Time Concentration Trend Analysis

Initially, time concentration trends were plotted to provide an overview of the data. The data were reviewed and compared to identify any unusual outliers, trends, or otherwise unusual observations. This was accomplished prior to further in-depth review of the data sets to identify any obvious field or laboratory anomalies, and obvious non-normal data sets. Typically, outliers are constituted of anomalous data (or detection limits in the case of non-detect data) that are at least one order of magnitude above background concentrations. The inclusion of unusual outliers would lead to variable standard deviations and increased prediction limits. Outliers removed from the data set and the basis for removal are summarized on Table 1.

4.1.2 Percentage of Non-Detect Data

Data summaries were prepared for each parameter and each well. Only the parameters having eight rounds of data will undergo further evaluation. The data sets were reviewed for total number of non-detects per constituent per location, and the percentage of non-detects. The percentage of non-detects was used to aid in the determination of which statistical method and the types of normality tests were used.

4.1.3 Coefficient of Skewness

RMT calculated the Coefficient of Skewness in accordance with the procedures outlined in the Addendum to indicate to what degree the data are skewed. Normal distributions have a Skewness Coefficient of zero, and asymmetric data have a positive or negative Skewness Coefficient. A Skewness Coefficient of greater than one, or less than negative one, indicates that normal based tests are less powerful.

4.1.4 Probability Plots

Probability Plots are recommended in the Addendum and were reviewed for normality and identification of outliers if the skewness coefficient indicated further evaluation was necessary. Probability Plots can visually illustrate departures from normality and identify the location of the non-normal data occurrence. These locations could be in the middle of the distributional range, or at extreme tails.

If the normal distributional assumptions are not valid, then the parameter was considered a candidate for non-parametric statistical evaluation.

Section 5
Parametric and Non Parametric Prediction Limit Calculations

5.1 Prediction Limits Defined

Prediction limits or intervals are constructed to contain the next sample value from a population within a specified probability. In other words, after establishing a background population, a prediction limit is constructed utilizing the background population that will contain the next sample(s) within a specified probability. Essentially, prediction limits predict the results of a future event(s) based upon a background data set, assuming there is no change in the distribution of the data.

There are two types of prediction limits - parametric and nonparametric. Prediction limits were calculated using generally accepted statistical procedures for data that exhibit a wide range in censorship. Parametric prediction limits should be used with data which is or can be transformed (log, ln, etc.) to have a distribution that is not too far from normal. Nonparametric prediction limits are effective for data consisting entirely, or to a large degree, of non-detects, or when data sets are not normal, or can not be transformed to a normal distribution.

Data evaluation was conducted to determine the percentage of censored (non-detected) data to ascertain the appropriate statistical method for a given data set. Several different criteria for performing statistical evaluations and dealing with non-detect data were applied to the data sets based upon the degree of data censorship:

- For the 0-15% non-detects, parametric methods were utilized.
- For the 16-50% non-detects, Aichison's Adjustment was performed on the mean and standard deviation, followed by the calculation of parametric limits.
- For the 51-99% non-detects, nonparametric limits were utilized.
- For the 100% non-detects, no statistical method will be applied and the detection limit will be utilized for determination of exceedances.

5.2 Parametric Prediction Limits

The prediction limit was calculated to include the next observation from the same population with a 95 percent confidence as recommended in the Addendum, or a 5 percent chance that the next observation is above the prediction limit. The prediction limits were constructed utilizing normally or log-normally distributed data, as detailed above.

The prediction limit (PL) calculations for intra-well comparisons were calculated utilizing the guidelines outlined in the Addendum using Chemstat® software (Appendix B). The mean (Mn) and the standard deviation (SD) of the data set were calculated. The "K" value is derived from the tables provided in the Interim Final Guidance. The choice of "K" value from the Interim Final Guidance is based upon the following calculation:

$$K = \nu_{(n-1)} \text{ at } 95\% \text{ confidence}$$

where:

ν = degrees of freedom
n = background observations

The prediction limit calculation is as follows:

$$PL = Mn + SD \times K(1/m + 1/n)^{0.5}$$

where:

PL = Prediction Limit
Mn = Mean of Data Set
SD = Standard Deviation of Data Set
m = Mean of observation to compare to PL (for intra-well comparisons, m=1)
n = number of background observations

The prediction limits were calculated using the transformed data, and subsequently un-transformed to normal units on the Prediction Limit summary table (Table 2).

The prediction limit calculation and choice of "K" value was selected so that the site maintains a 5 percent false positive rate. In accordance with maintaining a 5 percent false positive rate, it is likely that false positives may occur. However, this does not necessarily indicate groundwater impact from regulated units, and although a deviation from the prediction limit should be reported in accordance with procedures in this Program, a confirmation sequential sample will take place to confirm the result reported above the prediction limit.

5.3 Non-Parametric Prediction Limits

Parameters that inherently consist of mainly non-detect data usually violate the assumptions needed for normal based parametric prediction intervals. Therefore, as detailed in the Addendum, the non-parametric prediction limit method is chosen.

The data were reviewed to ensure that the assumptions required for non-parametric analyses are valid. To calculate the non-parametric prediction limit, it must be valid to assume that all observations are independently and identically distributed. There must be no spatial or systematic temporal variability, and furthermore, there must be no evidence of prior contamination.

The aim of the non-parametric prediction limit, as with the parametric prediction limit, is to meet the 5% false positive rate. Chemstat® calculates the confidence level and false positive rate by the following equations:

- False Positive Rate = 1 – [n/(n + k)]

- Confidence Level = n/(n + k)

where:
- n = number of background observations
- k = number of comparisons

The intra-well non-parametric prediction limit compares a selected number of future samples to a specified number of historical baseline samples from the same well. This method requires a relatively large number of historical samples to achieve a reasonable statistical power. To achieve a 95% confidence level and therefore to meet the 5% false positive rate, approximately 20 historical samples are required for each future sample to be compared. Currently the groundwater database for each parameter at each well varies from less than eight data points, to greater than 20 data points.

Therefore, a five percent false positive rate can not be maintained during sampling events for all constituents without allowing for the collection of sequential samples, which will reduce the false positive rate to acceptable levels.

5.4 Total Non-Detect Data Populations

For data populations that consist of 100 percent non-detect in a given data set, they are considered zero threshold parameters (ZTP). The detection limit is the background standard for these wells and parameters. For these data, analytical results reported above the detection limits are considered triggers for a confirmation resample event as described in Section 6.

5.5 Definition of Initial Exceedances

As with most statistical methods used to evaluate environmental data, prediction limit calculations typically conclude that a five percent false positive rate can not be maintained during sampling events without allowing for the collection of sequential samples. This is typically a function of the 1) amount of background data available at current detection limits, 2) the large amount of parameters that are typically required to be statistically analyzed, and 3) the numerous wells typically included in a detection monitoring program. Even if the facility-wide false positive rate is controlled at 0.05 as recommended in the Addendum, there will be exceedances of the prediction intervals based upon statistical probability (up to 5 per every 100 measurements). For example, if Granger samples 20 wells per quarter for 10 constituents, conceivably there could be up to 10 exceedances per event just based upon statistical probability of chance. These exceedances will occur in addition to possible exceedances due to variability in laboratory and sampling activities, effects from off-site land use, and natural variability not represented in the background data set, among other factors.

Because of these factors, and to meet the recommended false positive rates, the first occurrence of a secondary parameter reported above the prediction interval, or the first occurrence of a primary parameter above the detection level will be defined as an initial exceedance. It will be necessary to collect a sequential sample to reduce the frequency of these chance occurrences and confirm the initial exceedance. The collection of sequential samples and reporting the results of the initial exceedances are described in Section 6.1.

Section 6
Evaluating and Reporting Results of Statistical Evaluations

6.1 Data Evaluation Procedures

Granger will follow the procedures detailed below in declaring and reporting the presence of statistical exceedances. These procedures are summarized from the Operating License for the MID Landfill site. The purpose of this section is to describe what will be conducted by Granger to identify, confirm, and report statistically significant exceedances in groundwater data. This section does not describe assessment monitoring protocols, which are described in the Operating License.

6.1.1 Primary Parameters

Routine Comparisons and Initial Exceedances

Within 60 days of completion of each sampling event, Granger will determine if a detection of any of the primary parameters has occurred in any monitoring well listed in this Program, with the exception of the wells in the "purge well" category.

If a primary parameter is detected, Granger will:

- Notify the Director within one working day by calling the Chief of the W&HMD or the appropriate W&HMD District Supervisor, and
- Arrange a resample as soon as possible to confirm the detection. Resampling will include collecting a minimum of four replicate samples at the affected well(s) for the primary parameter(s) in question.

Confirmed Exceedances

If Granger confirms that a detection has occurred for any primary parameter once the resampling data are evaluated, Granger will:

- Notify the Director within one working day by calling the Chief of the W&HMD or the appropriate W&HMD District Supervisor, or in the event of unavailability, the MDEQ PEAS at 1-800-292-4706.
- Follow up in writing to the Chief of the W&HMD within seven calendar days of the telephone call and indicate:

- What parameters or constituents have shown confirmed detections, and
- The well(s) in which the changes have occurred.
- As soon as possible, sample the groundwater in facility monitoring wells within 500 feet of the affected well in all aquifers for primary, secondary, and tertiary parameters, and determine the concentration of all constituents identified in Appendix IX of 40 CFR Part 261, or a modified Appendix IX list approved by the Chief of the W&HMD. Granger shall also establish background values of Appendix IX or modified Appendix IX list constituents.
- Immediately take steps to determine the cause of the confirmed change, and begin procedures to control the source of the discharge.
- Within 90 days of the determination, submit an application for a license modification to the Chief of the W&HMD in accordance with Operating License Part IV A. 8. (e) that establishes compliance monitoring and a corrective action program to include the following:
  - An identification of the concentration of all Appendix IX constituents found in groundwater.
  - Proposed changes to the groundwater monitoring system at the facility to meet the requirements of Rule 299.9612.
  - Proposed changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical procedures.
- Within 180 days, submit to the Chief of the W&HMD a description of the corrective action and a schedule of implementation.
- Prior to a license modification described above, Granger shall provide the Chief of the W&HMD (or designee) with weekly telephone updates and written reports every two weeks. The schedule may be adjusted by the Chief if appropriate.

■ If Granger determines that the increase is not due to the licensed facility, Granger will:
  - Notify the Chief of the W&HMD within 7 days of the confirmed detection that it intends to make a demonstration.
  - Within 90 days of the detection submit a report to the Chief of the W&HMD that demonstrates that a source other than the licensed facility solely caused the increase, or that the increase was caused by error in sampling, analysis, or evaluation.

- Within 30 days of W&HMD approval of the demonstration, Granger will submit to the Chief of the W&HMD an application for a license modification to make any appropriate changes to the groundwater monitoring program at the facility.
- Continue to monitor groundwater in compliance with the license.

6.1.2 Secondary Parameters

Routine Comparisons and Initial Exceedances

Within 60 days of completion of each sampling event, Granger will determine if a statistically significant initial increase has occurred compared to background levels for each secondary parameter. If a statistically significant initial increase is reported for any secondary parameter, Granger will:

- Notify the Director within one working day by calling the Chief of the W&HMD or the appropriate W&HMD District Supervisor.
- Resample for both primary and secondary parameters from the affected well(s), taking not less than four samples at each well.
- Redetermine if a statistically significant result has occurred for the replicate samples, and notify the Chief of the W&HMD within one working day of the determination.
- If no statistically significant result is confirmed, routine detection monitoring will continue.

Confirmed Exceedances

If Granger confirms that a statistically significant increase has occurred for a secondary parameter, once the resampling data are evaluated, Granger will:

- Determine if the confirmed exceedance is due to the licensed facility. If Granger determines the confirmed exceedance is due to the licensed facility, they will:
  - Immediately take steps to determine the cause of the statistically significant increase, and begin procedures to control the source of the discharge; and
  - Within 60 days of the determination, submit a report to the Chief of the W&HMD detailing the chronology of events, investigative methods, lab analyses, calculations, field sheets, and findings and conclusions; or
  - Determine if the increase is not due to the licensed facility. If Granger determines the increase is not due to the licensed facility, they will, within 60 days of the confirmed exceedance, submit a report to the Chief of the W&HMD that demonstrates that a source other than the licensed facility

caused the increase, or that the increase was caused by error in sampling, analysis, or evaluation.

6.2 Annual Reports – Statistical Reporting Requirements

Granger will submit an annual groundwater monitoring report to the MDEQ by March 1 for the previous calendar year's activities. The results of the statistical evaluations will be included in the report along with groundwater quality data, isochems, data graphs of trend analysis, data tables, statistical analyses, and identification of any confirmed statistically significant increases.

Section 7
References

Department of Environmental Quality, Waste Management Division. September 30, 1999. Granger Grand River Landfill (MID 082 771 700) Hazardous Waste Management Facility Post-Closure Operating License.

Department of Environmental Quality, Waste Management Division. May 9, 2000. Granger Land Development Company, January 2000 Statistical Evaluation Report Review, MID 082 771 700.

Davis, Charles B. and Roger J. McNichols. 1994. Groundwater monitoring statistics update: Part II: Non-Parametric prediction limits, *Groundwater Monitoring and Remediation*, vol. 14, no. 3.

USEPA. 1989. Statistical analysis of ground water data at RCRA facilities: interim final guidance. *Washington DC, Office of Solid Waste, USEPA.*

USEPA. 1992. Statistical analysis of ground water data at RCRA facilities: addendum to the interim final guidance. *Washington DC, Office of Solid Waste, USEPA.*

Tables

Table 1
Granger Grand River Landfill
MID 082 771 700
Summary of Outliers Removed

Monitoring Well	Sample Date	Outlier Concentration (mg/L)	Basis for Removal of Outlier
Arsenic, dissolved			
MW-17	07/27/01	0.01	Anomalously high lab result relative to background - one order of magnitude too high
MW-21SR	07/25/01	0.01	Anomalously high lab result relative to background - one order of magnitude too high
MW-25	01/20/03	0.01	Anomalously high lab result relative to background - one order of magnitude too high
Cadmium, dissolved			
MW-17	07/17/02	0.00513	Anomalously high lab result relative to background - one order of magnitude too high
MW-20R	01/12/01	0.00959	Anomalously high lab result relative to background - one half order of magnitude too high
MW-22DR	01/25/05	0.028	Anomalously high lab result relative to background - one order of magnitude too high
MW-23DR	01/12/01	0.0206	Anomalously high lab result relative to background - one order of magnitude too high
MW-24DR	01/12/01	0.0332	Anomalously high lab result relative to background - one order of magnitude too high
MW-45	07/25/01	0.0075	Anomalously high lab result relative to background - one order of magnitude too high
Chromium, dissolved			
MW-17	07/17/02	0.018	Anomalously high lab result relative to background - one order of magnitude too high
MW-20R	01/12/01	0.012	Anomalously high lab result relative to background - one order of magnitude too high
MW-23SR	01/12/01	0.036	Anomalously high lab result relative to background - one half order of magnitude too high
MW-24DR	01/12/01	0.098	Anomalously high lab result relative to background - one order of magnitude too high
MW-25	01/20/03	0.031	Anomalously high lab result relative to background - one order of magnitude too high
MW-41	07/26/01	0.04	Anomalously high lab result relative to background - one order of magnitude too high
Lead, dissolved			
MW-17	07/27/01	0.04	Anomalously high lab result relative to background - one order of magnitude too high
MW-17	07/17/02	0.105	Anomalously high lab result relative to background - two orders of magnitude too high
MW-18	07/18/02	0.025	Anomalously high lab result relative to background - one order of magnitude too high
MW-20R	01/12/01	0.024	Anomalously high lab result relative to background - one order of magnitude too high
MW-21SR	07/08/03	0.029	Anomalously high lab result relative to background - one order of magnitude too high
MW-23SR	01/12/01	0.068	Anomalously high lab result relative to background - one order of magnitude too high
MW-24DR	01/05/00	0.048	Anomalously high lab result relative to background - one order of magnitude too high
MW-24DR	07/06/00	0.08	Anomalously high lab result relative to background - one order of magnitude too high
MW-24DR	01/12/01	0.07	Anomalously high lab result relative to background - one order of magnitude too high
MW-41	01/16/01	0.018	Anomalously high lab result relative to background - one order of magnitude too high

Table 2
Granger Grand River Landfill
MID 082 771 700
Summary of Prediction Limits
Secondary Indicator Parameters

Monitoring Well	Secondary Indicator Parameters				
	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Lead (mg/L)
MW-6/R	n < 8	n < 8	n < 8	n < 8	n < 8
MW-9/R	0.001	0.71	0.0011	0.005	0.005
MW-14D/R	0.006	0.08	0.0006	0.004	0.003
MW-14S/R	0.004	0.12	0.0089	0.056	0.009
MW-16	0.018	0.10	0.0010	0.007	0.013
MW-17	0.004	0.14	0.0012	0.008	0.004
MW-18	0.004	0.11	0.0010	0.007	0.004
MW-19	0.002	0.21	0.0003	0.027	0.001
MW-20/R	0.006	0.19	0.0009	0.005	0.002
MW-21S/R	n < 8	0.24	0.0030	0.010	0.001
MW-22D/R	0.002	0.17	0.0051	0.010	0.003
MW-23S/R	0.007	0.14	0.0019	0.016	0.006
MW-24D/R	0.009	0.31	0.0011	0.006	0.003
MW-25	0.003	0.08	0.0029	0.008	0.004
MW-40	0.001	0.08	0.0022	0.009	0.009
MW-41	0.006	0.10	0.0038	0.007	0.004
MW-43D	0.011	0.08	0.0013	0.007	0.001
MW-43S	0.001	0.09	0.0039	0.033	0.004
MW-44	0.001	0.08	0.0026	0.006	0.002
MW-45	0.004	0.08	0.0012	0.006	0.001

Appendix A
Analytical Parameters, Test Methods, and Detection Limits

Attachment I

Groundwater Monitoring Parameter List

Primary Parameters	Analytical Method	Detection Limit (ug/l)
Bromodichloromethane	8260	1
Bromoform	8260	1
Carbon Tetrachloride	8260	1
Chlorobenzene	8260	1
Chloroethane	8260	1
Chloroform	8260	1
Dibromochloromethane	8260	1
o-dichlorobenzene	8260	1
p-dichlorobenzene	8260	1
1,1-dichloroethane	8260	1
1,2-dichloroethene	8260	1
1,1-dichloroethene	8260	1
cis-1,2-dichloroethene	8260	1
trans-1,2-dichloroethene	8260	1
1,2-dichloropropane	8260	1
cis-1,3-dichloropropene	8260	1
trans-1,3-dichloropropene	8260	1
Methyl Bromide	8260	5
Methyl Chloride	8260	5
Methylene Bromide	8260	1
Methylene Chloride	8260	5
Methyl Iodide	8260	1
1,1,1,2-tetrachloroethane	8260	1
1,1,2,2-tetrachloroethane	8260	1
Tetrachloroethene	8260	1
1,1,1-Trichloroethane	8260	1
1,1,2-Trichloroethane	8260	1
Trichloroethene	8260	1
Trichlorofluoromethane	8260	5
1,2,3-trichloropropane	8260	1
Vinyl Chloride	8260	5
Benzene	8260	1
Ethyl benzene	8260	1
Styrene	8260	1
Toluene	8260	1
Xylenes	8260	1

Attachment I—Continued

Groundwater Monitoring Parameter List

Secondary Parameters	Analytical Method	Detection Limit (ug/l)
*Dissolved Cadmium	6010B	5
*Dissolved Chromium	6010B	20
*Dissolved Lead	6010B	1
*Dissolved Boron	6010B	20
*Dissolved Arsenic	6010B	1

Tertiary Parameters	Analytical Method	Detection Limit (ug/l)
Ammonia Nitrogen	450-NH_3-g	10
Nitrate Nitrogen	4500-NO_3-f	10
Alkalinity	310.1	20,000
Bicarbonate Alkalinity	Calculate	5,000
Carbonate Alkalinity	Calculate	20,000
Chloride	4500-Cl-B	1,000
Sulfate	4500-SO_4-e	2,000
*Dissolved Sodium	6010B	1,000
*Dissolved Potassium	6010B	100
Chemical Oxygen Demand	5220d	5,000
*Dissolved Calcium	6010B	1,000
*Dissolved iron	6010B	20
*Dissolved Magnesium	6010B	1,000
*Dissolved Manganese	6010B	5
*Dissolved Zinc	6010B	4

Field Parameters	Analytical Method	Detection Limit (ug/l)
pH (Field)	4500-H-B	pH units
Specific Conductance	2510	umhos/cm
Temperature		

* Additionally, metals samples from the bedrock aquifer shall be analyzed for total metals annually.

Appendix B
Data Evaluation and Prediction Limit Calculations

Outlier Evaluation

Concentrations (mg/L)

Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Measurements: 327
Total Non-Detect: 122
Percent Non-Detects: 37.3089%
Total Background Measurements: 327
There are 20 background locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-06/R	4	4 (100%)	7/10/2003	ND<0.001	ND<0.001
			7/30/2004	ND<0.001	ND<0.001
			7/30/2004	ND<0.001	ND<0.001
			7/7/2005	ND<0.001	ND<0.001
MW-09/R	29	28 (96.5517%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	ND<0.001	ND<0.001
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			1/5/1998	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/16/2001	ND<0.001	ND<0.001
			7/26/2001	ND<0.001	ND<0.001
			7/18/2002	ND<0.001	ND<0.001
			1/17/2003	0.001	0.001
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/21/2004	ND<0.001	ND<0.001
			7/27/2004	ND<0.001	ND<0.001
			7/8/2005	ND<0.001	ND<0.001
			7/8/2005	ND<0.001	ND<0.001
MW-14D/R	11	4 (36.3636%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	ND<0.001	ND<0.001
			7/26/2001	ND<0.001	ND<0.001
			1/17/2002	0.001	0.001
			7/17/2002	0.002	0.002
			1/17/2003	0.004	0.004
			7/9/2003	0.004	0.004
			1/22/2004	0.001	0.001

			1/20/2004	0.0027	0.0027
			7/30/2004	0.0042	0.0042
			7/7/2005	0.0045	0.0045
MW-25	30	3 (10%)	6/7/1995	0.002	0.002
			9/8/1995	0.002	0.002
			10/23/1995	0.002	0.002
			11/27/1995	0.002	0.002
			1/22/1996	0.002	0.002
			3/6/1996	0.002	0.002
			4/24/1996	0.002	0.002
			6/4/1996	0.002	0.002
			7/15/1996	0.002	0.002
			9/1/1996	0.002	0.002
			12/1/1996	0.002	0.002
			1/1/1997	0.002	0.002
			7/1/1997	0.002	0.002
			1/5/1998	0.002	0.002
			7/1/1998	0.002	0.002
			1/5/1999	0.001	0.001
			7/6/1999	0.002	0.002
			1/5/2000	0.002	0.002
			7/6/2000	0.002	0.002
			1/15/2001	0.001	0.001
			7/26/2001	ND<0.001	ND<0.001
			1/17/2002	0.002	0.002
			7/17/2002	0.002	0.002
			1/20/2003	0.01	0.01
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/22/2004	0.003	0.003
			7/26/2004	0.0028	0.0028
			7/11/2005	0.0027	0.0027
			7/11/2005	0.0031	0.0031
MW-40	18	17 (94.4444%)	6/4/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			1/5/1998	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	ND<0.001	ND<0.001
			7/25/2001	ND<0.001	ND<0.001
			1/16/2002	ND<0.001	ND<0.001
			7/18/2002	ND<0.001	ND<0.001
			1/15/2003	0.001	0.001
			7/8/2003	ND<0.001	ND<0.001
			1/21/2004	ND<0.001	ND<0.001
			7/29/2004	ND<0.001	ND<0.001
			7/12/2005	ND<0.001	ND<0.001
MW-41	30	3 (10%)	6/7/1995	0.002	0.002
			9/8/1995	0.001	0.001
			10/23/1995	0.002	0.002

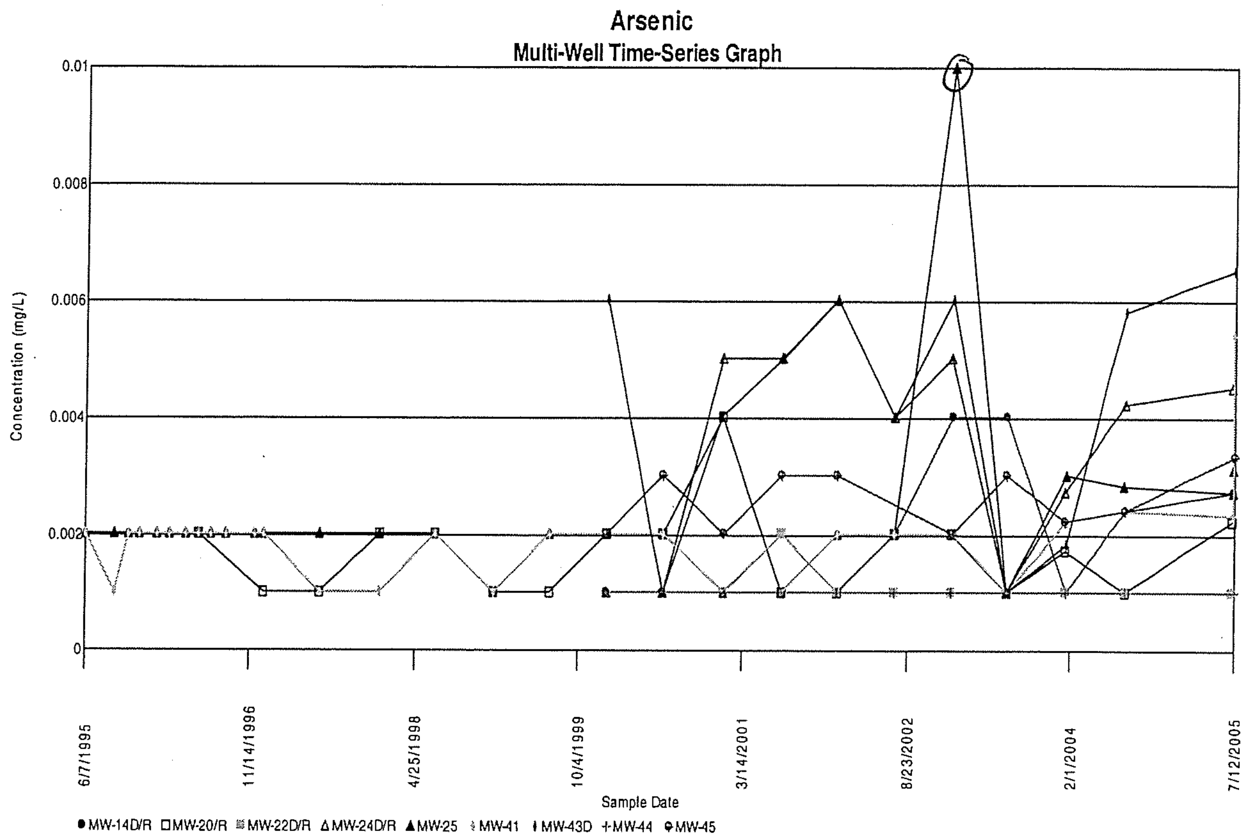
			7/18/2002	ND<0.001	ND<0.001
			1/15/2003	ND<0.001	ND<0.001
			7/8/2003	ND<0.001	ND<0.001
			1/21/2004	ND<0.001	ND<0.001
			7/29/2004	ND<0.001	ND<0.001
			7/12/2005	ND<0.001	ND<0.001
MW-45	10	0 (0%)	1/5/2000	0.002	0.002
			7/6/2000	0.003	0.003
			1/15/2001	0.002	0.002
			7/25/2001	0.003	0.003
			1/16/2002	0.003	0.003
			1/17/2003	0.002	0.002
			7/9/2003	0.003	0.003
			1/20/2004	0.0022	0.0022
			7/29/2004	0.0024	0.0024
			7/12/2005	0.0033	0.0033

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original



Arsenic
Multi-Well Time-Series Graph
Concentration (mg/L)
0.01
0.008
0.006
0.004
0.002
0
6/7/1995
11/14/1996
4/25/1998
10/4/1999
3/14/2001
8/23/2002
2/1/2004
7/12/2005
Sample Date
MW-14D/R
MW-20/R
MW-22D/R
MW-24D/R
MW-25
MW-41
MW-43D
MW-44
MW-45

Concentrations (mg/L)

Parameter: Boron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Measurements: 245
Total Non-Detect: 72
Percent Non-Detects: 29.3878%
Total Background Measurements: 245
There are 20 background locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-06/R	5	0 (0%)	7/10/2003	0.036	0.036
			7/30/2004	0.041	0.041
			7/30/2004	0.083	0.083
			1/19/2005	0.066	0.066
			7/7/2005	0.051	0.051
MW-09/R	14	1 (7.14286%)	1/5/2000	0.055	0.055
			7/6/2000	ND<0.05	ND<0.05
			1/16/2001	0.071	0.071
			7/26/2001	0.09	0.09
			7/18/2002	0.114	0.114
			1/17/2003	0.079	0.079
			7/9/2003	0.129	0.129
			7/9/2003	0.132	0.132
			1/21/2004	0.17	0.17
			7/27/2004	0.36	0.36
			1/20/2005	0.47	0.47
			1/20/2005	0.46	0.46
			7/8/2005	0.51	0.51
			7/8/2005	0.49	0.49
MW-14D/R	11	4 (36.3636%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/15/2001	0.019	0.019
			7/26/2001	0.024	0.024
			1/17/2002	ND<0.01	ND<0.01
			7/17/2002	0.023	0.023
			1/17/2003	ND<0.01	ND<0.01
			7/9/2003	0.052	0.052
			1/22/2004	0.036	0.036
			7/29/2004	0.053	0.053
			7/11/2005	0.043	0.043
MW-14S/R	10	4 (40%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/15/2001	ND<0.01	ND<0.01
			7/26/2001	0.034	0.034
			1/17/2002	0.02	0.02
			1/17/2003	ND<0.01	ND<0.01
			7/9/2003	0.057	0.057
			1/22/2004	0.041	0.041
			7/29/2004	0.1	0.1
			7/11/2005	0.047	0.047

			7/18/2002	0.093	0.093
			1/15/2003	0.093	0.093
			7/10/2003	0.102	0.102
			1/21/2004	0.16	0.16
			7/29/2004	0.14	0.14
			1/20/2005	0.14	0.14
			7/12/2005	0.16	0.16
MW-20/R	12	6 (50%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/12/2001	ND<0.01	ND<0.01
			7/25/2001	0.018	0.018
			1/16/2002	0.015	0.015
			7/16/2002	0.021	0.021
			1/16/2003	ND<0.01	ND<0.01
			7/8/2003	0.108	0.108
			1/20/2004	0.029	0.029
			7/30/2004	0.038	0.038
			1/25/2005	ND<0.05	ND<0.05
			7/7/2005	ND<0.02	ND<0.02
MW-21SR	9	1 (11.1111%)	1/12/2001	0.054	0.054
			7/25/2001	0.074	0.074
			1/16/2002	0.028	0.028
			7/16/2002	ND<0.01	ND<0.01
			1/15/2003	0.044	0.044
			7/8/2003	0.124	0.124
			7/30/2004	0.12	0.12
			1/25/2005	0.169	0.169
			7/7/2005	0.13	0.13
MW-22D/R	10	0 (0%)	1/16/2001	0.043	0.043
			7/25/2001	0.082	0.082
			1/16/2002	0.042	0.042
			7/16/2002	0.014	0.014
			1/15/2003	0.028	0.028
			7/8/2003	0.14	0.14
			1/20/2004	0.073	0.073
			7/30/2004	0.096	0.096
			1/25/2005	0.079	0.079
			7/7/2005	0.077	0.077
MW-23S/R	11	2 (18.1818%)	7/6/2000	ND<0.05	ND<0.05
			1/12/2001	0.101	0.101
			7/25/2001	0.048	0.048
			1/16/2002	0.013	0.013
			7/16/2002	ND<0.01	ND<0.01
			1/16/2003	0.042	0.042
			7/8/2003	0.096	0.096
			1/20/2004	0.057	0.057
			7/30/2004	0.062	0.062
			1/25/2005	0.059	0.059
			7/7/2005	0.072	0.072
MW-24D/R	12	2 (16.6667%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/12/2001	0.11	0.11

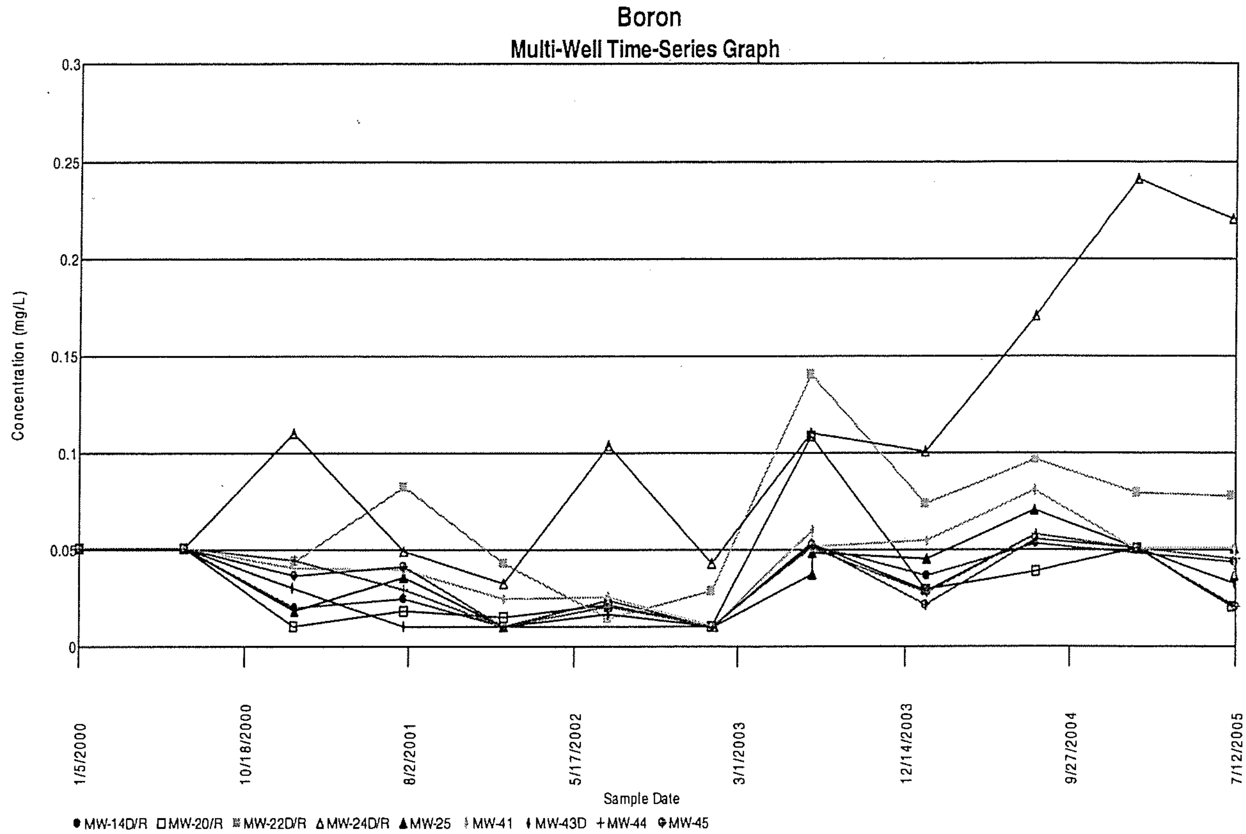
Loc.	Meas.	ND	Date	Conc.	Original
			1/10/2001	0.03	0.03
			7/27/2001	0.01	0.01
			1/16/2002	ND<0.01	ND<0.01
			7/17/2002	0.016	0.016
			1/17/2003	ND<0.01	ND<0.01
			7/8/2003	0.053	0.053
			1/21/2004	0.028	0.028
			7/29/2004	0.057	0.057
			1/25/2005	ND<0.05	ND<0.05
			7/11/2005	0.032	0.032
MW-43S	12	4 (33.3333%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/15/2001	0.039	0.039
			7/25/2001	0.06	0.06
			1/16/2002	0.011	0.011
			7/17/2002	0.017	0.017
			1/17/2003	ND<0.01	ND<0.01
			7/8/2003	0.054	0.054
			1/21/2004	0.037	0.037
			7/29/2004	0.053	0.053
			1/20/2005	ND<0.05	ND<0.05
			7/11/2005	0.036	0.036
MW-44	12	5 (41.6667%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/15/2001	0.044	0.044
			7/25/2001	0.029	0.029
			1/16/2002	ND<0.01	ND<0.01
			7/18/2002	0.02	0.02
			1/15/2003	ND<0.01	ND<0.01
			7/8/2003	0.05	0.05
			1/21/2004	0.027	0.027
			7/29/2004	0.057	0.057
			1/20/2005	ND<0.05	ND<0.05
			7/12/2005	0.045	0.045
MW-45	12	6 (50%)	1/5/2000	ND<0.05	ND<0.05
			7/6/2000	ND<0.05	ND<0.05
			1/15/2001	0.036	0.036
			7/25/2001	0.041	0.041
			1/16/2002	ND<0.01	ND<0.01
			1/17/2003	ND<0.01	ND<0.01
			7/9/2003	0.052	0.052
			1/20/2004	0.021	0.021
			1/20/2004	0.021	0.021
			7/29/2004	0.055	0.055
			1/25/2005	ND<0.05	ND<0.05
			7/12/2005	ND<0.02	ND<0.02

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original



Boron
Multi-Well Time-Series Graph
Concentration (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
1/5/2000
10/18/2000
8/2/2001
5/17/2002
3/1/2003
12/14/2003
9/27/2004
7/12/2005
Sample Date
MW-14D/R
MW-20/R
MW-22D/R
MW-24D/R
MW-25
MW-41
MW-43D
MW-44
MW-45

Concentrations (mg/L)

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Measurements: 359
Total Non-Detect: 237
Percent Non-Detects: 66.0167%
Total Background Measurements: 359
There are 20 background locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-06/R	5	1 (20%)	7/10/2003	ND<0.0002	ND<0.0002
			7/30/2004	0.00026	0.00026
			7/30/2004	0.00024	0.00024
			1/19/2005	0.001	0.001
			7/7/2005	0.00051	0.00051
MW-09/R	31	17 (54.8387%)	6/7/1995	0.0006	0.0006
			9/8/1995	0.0003	0.0003
			10/23/1995	ND<0.0002	ND<0.0002
			11/27/1995	ND<0.0002	ND<0.0002
			1/22/1996	0.0002	0.0002
			3/6/1996	0.0002	0.0002
			4/24/1996	0.0005	0.0005
			6/4/1996	0.0004	0.0004
			7/15/1996	0.0002	0.0002
			9/1/1996	0.0011	0.0011
			12/1/1996	ND<0.0002	ND<0.0002
			1/1/1997	ND<0.0002	ND<0.0002
			7/1/1997	0.0007	0.0007
			1/5/1998	ND<0.0002	ND<0.0002
			7/1/1998	ND<0.0002	ND<0.0002
			1/5/1999	ND<0.0002	ND<0.0002
			7/6/1999	ND<0.0002	ND<0.0002
			1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/16/2001	0.00103	0.00103
			7/26/2001	0.00084	0.00084
			7/18/2002	ND<0.0002	ND<0.0002
			1/17/2003	0.00056	0.00056
			7/9/2003	ND<0.0002	ND<0.0002
			7/9/2003	ND<0.0002	ND<0.0002
			1/21/2004	ND<0.0002	ND<0.0002
			7/27/2004	0.00033	0.00033
			1/20/2005	0.00039	0.00039
			1/20/2005	ND<0.0002	ND<0.0002
			7/8/2005	ND<0.0002	ND<0.0002
			7/8/2005	ND<0.0002	ND<0.0002
MW-14D/R	11	7 (63.6364%)	1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/15/2001	0.0004	0.0004
			7/26/2001	0.00023	0.00023
			1/17/2002	0.00057	0.00057
			7/17/2002	ND<0.0002	ND<0.0002

			7/15/1996	ND<0.0002	ND<0.0002
			9/1/1996	ND<0.0002	ND<0.0002
			12/1/1996	ND<0.0002	ND<0.0002
			7/1/1997	ND<0.0002	ND<0.0002
			7/1/1998	ND<0.0002	ND<0.0002
			7/6/1999	ND<0.0002	ND<0.0002
			1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/11/2001	ND<0.0002	ND<0.0002
			7/27/2001	0.00121	0.00121
			7/27/2001	ND<0.0002	ND<0.0002
			7/17/2002	0.00513	0.00513
			7/17/2002	0.00038	0.00038
			1/20/2003	0.00065	0.00065
			7/9/2003	ND<0.0002	ND<0.0002
			7/9/2003	ND<0.0002	ND<0.0002
			1/20/2004	0.00033	0.00033
			1/20/2004	0.00033	0.00033
			7/26/2004	0.00029	0.00029
			1/24/2005	ND<0.0002	ND<0.0002
			7/8/2005	ND<0.0002	ND<0.0002
			7/8/2005	ND<0.0002	ND<0.0002
MW-18	30	24 (80%)	6/7/1995	ND<0.0002	ND<0.0002
			9/8/1995	ND<0.0002	ND<0.0002
			10/23/1995	ND<0.0002	ND<0.0002
			11/27/1995	ND<0.0002	ND<0.0002
			1/22/1996	ND<0.0002	ND<0.0002
			3/6/1996	ND<0.0002	ND<0.0002
			4/24/1996	ND<0.0002	ND<0.0002
			6/4/1996	ND<0.0002	ND<0.0002
			7/15/1996	ND<0.0002	ND<0.0002
			9/1/1996	ND<0.0002	ND<0.0002
			12/1/1996	ND<0.0002	ND<0.0002
			7/1/1997	ND<0.0002	ND<0.0002
			7/1/1998	ND<0.0002	ND<0.0002
			7/6/1999	ND<0.0002	ND<0.0002
			1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/10/2001	ND<0.0002	ND<0.0002
			7/27/2001	ND<0.0002	ND<0.0002
			7/27/2001	ND<0.0002	ND<0.0002
			7/18/2002	0.0008	0.0008
			7/18/2002	ND<0.0002	ND<0.0002
			1/14/2003	0.00099	0.00099
			7/9/2003	0.000262	0.000262
			7/9/2003	ND<0.0002	ND<0.0002
			1/20/2004	0.00051	0.00051
			1/20/2004	0.00051	0.00051
			7/28/2004	0.00082	0.00082
			1/24/2005	ND<0.0002	ND<0.0002
			7/7/2005	ND<0.0002	ND<0.0002
			7/7/2005	ND<0.0002	ND<0.0002
MW-19	12	10 (83.3333%)	1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/15/2001	0.0003	0.0003

			7/16/2002	0.00106	0.00106
			1/16/2003	0.00079	0.00079
			7/8/2003	ND<0.0002	ND<0.0002
			1/20/2004	0.00055	0.00055
			7/30/2004	ND<0.0002	ND<0.0002
			1/25/2005	0.00065	0.00065
			7/7/2005	0.00039	0.00039
MW-24D/R	12	7 (58.3333%)	1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	0.0002	0.0002
			1/12/2001	0.0332	0.0332
			7/25/2001	0.00105	0.00105
			1/16/2002	0.00086	0.00086
			7/16/2002	ND<0.0002	ND<0.0002
			1/16/2003	ND<0.0002	ND<0.0002
			7/8/2003	ND<0.0002	ND<0.0002
			1/20/2004	0.00047	0.00047
			7/30/2004	ND<0.0002	ND<0.0002
			1/25/2005	ND<0.0002	ND<0.0002
			7/7/2005	ND<0.0002	ND<0.0002
MW-25	32	25 (78.125%)	6/7/1995	ND<0.0002	ND<0.0002
			9/8/1995	ND<0.0002	ND<0.0002
			10/23/1995	ND<0.0002	ND<0.0002
			11/27/1995	ND<0.0002	ND<0.0002
			1/22/1996	ND<0.0002	ND<0.0002
			3/6/1996	ND<0.0002	ND<0.0002
			4/24/1996	ND<0.0002	ND<0.0002
			6/4/1996	ND<0.0002	ND<0.0002
			7/15/1996	ND<0.0002	ND<0.0002
			9/1/1996	ND<0.0002	ND<0.0002
			12/1/1996	ND<0.0002	ND<0.0002
			1/1/1997	ND<0.0002	ND<0.0002
			7/1/1997	ND<0.0002	ND<0.0002
			1/5/1998	ND<0.0002	ND<0.0002
			7/1/1998	ND<0.0002	ND<0.0002
			1/5/1999	ND<0.0002	ND<0.0002
			7/6/1999	ND<0.0002	ND<0.0002
			1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/15/2001	0.00291	0.00291
			7/26/2001	0.00181	0.00181
			1/17/2002	ND<0.0002	ND<0.0002
			7/17/2002	0.00051	0.00051
			1/20/2003	ND<0.0002	ND<0.0002
			7/9/2003	0.000801	0.000801
			7/9/2003	0.000942	0.000942
			1/22/2004	0.00026	0.00026
			7/26/2004	0.0009	0.0009
			1/24/2005	ND<0.0002	ND<0.0002
			1/24/2005	ND<0.0002	ND<0.0002
			7/11/2005	ND<0.0002	ND<0.0002
			7/11/2005	ND<0.0002	ND<0.0002
MW-40	21	10 (47.619%)	11/27/1995	ND<0.0002	ND<0.0002
			6/4/1996	ND<0.0002	ND<0.0002
			12/1/1996	0.0003	0.0003

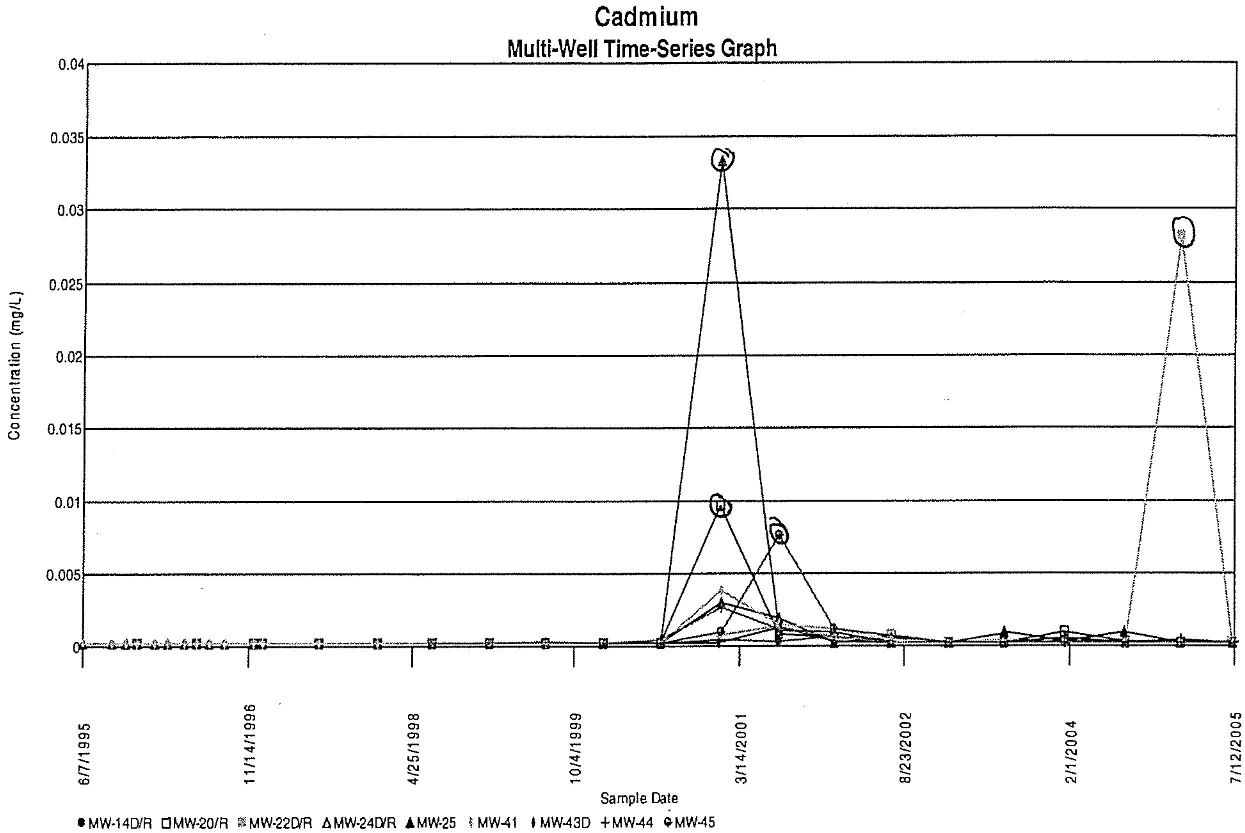
			7/17/2002	ND<0.0002	ND<0.0002
			1/17/2003	ND<0.0002	ND<0.0002
			7/8/2003	ND<0.0002	ND<0.0002
			1/21/2004	0.00045	0.00045
			7/29/2004	ND<0.0002	ND<0.0002
			1/25/2005	0.00037	0.00037
			7/11/2005	ND<0.0002	ND<0.0002
MW-43S	12	6 (50%)	1/5/2000	0.0002	0.0002
			7/6/2000	0.0005	0.0005
			1/15/2001	0.00389	0.00389
			7/25/2001	0.00128	0.00128
			1/16/2002	ND<0.0002	ND<0.0002
			7/17/2002	0.0002	0.0002
			1/17/2003	ND<0.0002	ND<0.0002
			7/8/2003	ND<0.0002	ND<0.0002
			1/21/2004	0.00022	0.00022
			7/29/2004	ND<0.0002	ND<0.0002
			1/20/2005	ND<0.0002	ND<0.0002
			7/11/2005	ND<0.0002	ND<0.0002
MW-44	15	9 (60%)	7/1/1998	ND<0.0002	ND<0.0002
			1/5/1999	ND<0.0002	ND<0.0002
			7/6/1999	0.0003	0.0003
			1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	0.0004	0.0004
			1/15/2001	0.00259	0.00259
			7/25/2001	0.00107	0.00107
			1/16/2002	0.000545	0.000545
			7/18/2002	ND<0.0002	ND<0.0002
			1/15/2003	ND<0.0002	ND<0.0002
			7/8/2003	ND<0.0002	ND<0.0002
			1/21/2004	ND<0.0002	ND<0.0002
			7/29/2004	ND<0.0002	ND<0.0002
			1/20/2005	ND<0.0002	ND<0.0002
			7/12/2005	0.00026	0.00026
MW-45	12	9 (75%)	1/5/2000	ND<0.0002	ND<0.0002
			7/6/2000	ND<0.0002	ND<0.0002
			1/15/2001	0.00093	0.00093
			7/25/2001	0.0075	0.0075
			1/16/2002	0.00116	0.00116
			1/17/2003	ND<0.0002	ND<0.0002
			7/9/2003	ND<0.0002	ND<0.0002
			1/20/2004	ND<0.0002	ND<0.0002
			1/20/2004	ND<0.0002	ND<0.0002
			7/29/2004	ND<0.0002	ND<0.0002
			1/25/2005	ND<0.0002	ND<0.0002
			7/12/2005	ND<0.0002	ND<0.0002

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original



Cadmium
Multi-Well Time-Series Graph
Concentration (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
6/7/1995
11/14/1996
4/25/1998
10/4/1999
3/14/2001
8/23/2002
2/1/2004
7/12/2005
Sample Date
MW-14D/R
MW-20/R
MW-22D/R
MW-24D/R
MW-25
MW-41
MW-43D
MW-44
MW-45

Concentrations (mg/L)

Parameter: Chromium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Measurements: 361
Total Non-Detect: 221
Percent Non-Detects: 61.2188%
Total Background Measurements: 361
There are 20 background locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-06/R	5	1 (20%)	7/10/2003	ND<0.001	ND<0.001
			7/30/2004	0.0035	0.0035
			7/30/2004	0.0016	0.0016
			1/19/2005	0.0024	0.0024
			7/7/2005	0.0086	0.0086
MW-09/R	32	24 (75%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	ND<0.001	ND<0.001
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			1/5/1998	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/16/2001	ND<0.001	ND<0.001
			7/26/2001	0.001	0.001
			7/18/2002	ND<0.001	ND<0.001
			1/17/2003	0.001	0.001
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/21/2004	0.0027	0.0027
			7/27/2004	ND<0.001	ND<0.001
			1/20/2005	0.0018	0.0018
			1/20/2005	0.0013	0.0013
			4/15/2005	ND<0.001	ND<0.001
			4/15/2005	0.0014	0.0014
			7/8/2005	0.0048	0.0048
			7/8/2005	0.0051	0.0051
MW-14D/R	11	6 (54.5455%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	ND<0.001	ND<0.001
			7/26/2001	0.002	0.002
			1/17/2002	0.001	0.001

			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/11/2001	ND<0.001	ND<0.001
			7/27/2001	0.007	0.007
			7/27/2001	0.003	0.003
			7/17/2002	0.018	0.018
			7/17/2002	ND<0.001	ND<0.001
			1/20/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/20/2004	0.0061	0.0061
			1/20/2004	0.0061	0.0061
			7/26/2004	0.001	0.001
			1/24/2005	0.001	0.001
			7/8/2005	0.0076	0.0076
			7/8/2005	0.0052	0.0052
MW-18	30	23 (76.6667%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	ND<0.001	ND<0.001
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/10/2001	ND<0.001	ND<0.001
			7/27/2001	ND<0.001	ND<0.001
			7/27/2001	0.002	0.002
			7/18/2002	0.007	0.007
			7/18/2002	0.002	0.002
			1/14/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/20/2004	0.0063	0.0063
			1/20/2004	0.0063	0.0063
			7/28/2004	ND<0.001	ND<0.001
			1/24/2005	ND<0.001	ND<0.001
			7/7/2005	0.0044	0.0044
			7/7/2005	0.0053	0.0053
MW-19	12	7 (58.3333%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001

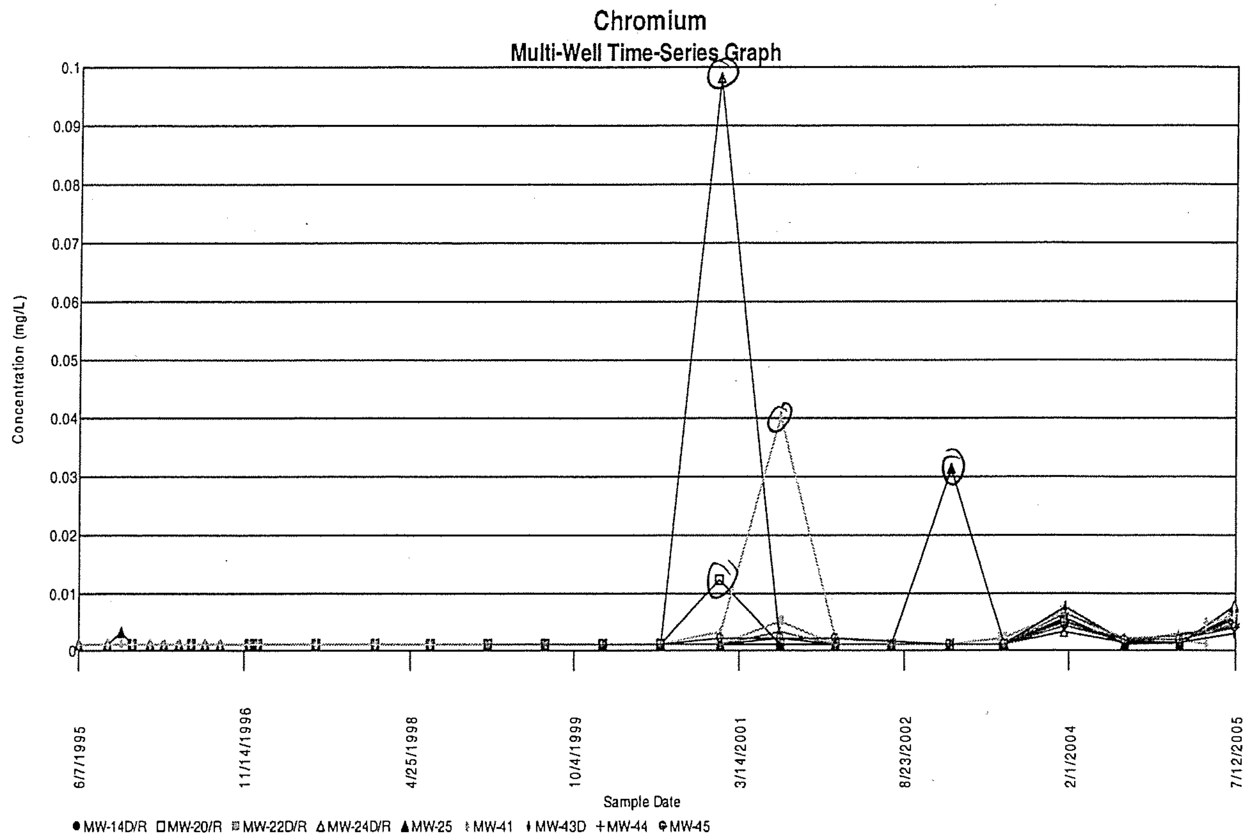
			1/16/2002	0.001	0.001
			7/16/2002	ND<0.001	ND<0.001
			1/16/2003	0.001	0.001
			7/8/2003	ND<0.001	ND<0.001
			1/20/2004	0.0067	0.0067
			7/30/2004	0.0012	0.0012
			1/25/2005	0.0011	0.0011
			7/7/2005	0.0034	0.0034
MW-24D/R	12	7 (58.3333%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/12/2001	0.098	0.098
			7/25/2001	ND<0.001	ND<0.001
			1/16/2002	ND<0.001	ND<0.001
			7/16/2002	ND<0.001	ND<0.001
			1/16/2003	ND<0.001	ND<0.001
			7/8/2003	ND<0.001	ND<0.001
			1/20/2004	0.003	0.003
			7/30/2004	0.0011	0.0011
			1/25/2005	0.0011	0.0011
			7/7/2005	0.0058	0.0058
MW-25	32	25 (78.125%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	0.003	0.003
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			1/5/1998	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	ND<0.001	ND<0.001
			7/26/2001	0.001	0.001
			1/17/2002	ND<0.001	ND<0.001
			7/17/2002	ND<0.001	ND<0.001
			1/20/2003	0.031	0.031
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/22/2004	0.0054	0.0054
			7/26/2004	ND<0.001	ND<0.001
			1/24/2005	0.0013	0.0013
			1/24/2005	ND<0.001	ND<0.001
			7/11/2005	0.0075	0.0075
			7/11/2005	0.0072	0.0072
MW-40	21	12 (57.1429%)	11/27/1995	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001

			1/10/2001	ND<0.001	ND<0.001
			7/27/2001	0.002	0.002
			1/16/2002	ND<0.001	ND<0.001
			7/17/2002	ND<0.001	ND<0.001
			1/17/2003	ND<0.001	ND<0.001
			7/8/2003	ND<0.001	ND<0.001
			1/21/2004	0.0073	0.0073
			7/29/2004	0.0014	0.0014
			1/25/2005	0.0013	0.0013
			7/11/2005	0.0027	0.0027
MW-43S	12	4 (33.3333%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.002	0.002
			7/25/2001	0.003	0.003
			1/16/2002	0.001	0.001
			7/17/2002	0.003	0.003
			1/17/2003	ND<0.001	ND<0.001
			7/8/2003	ND<0.001	ND<0.001
			1/21/2004	0.0073	0.0073
			7/29/2004	0.002	0.002
			1/20/2005	0.01	0.01
			7/11/2005	0.0044	0.0044
MW-44	14	8 (57.1429%)	1/5/1999	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.001	0.001
			7/25/2001	0.003	0.003
			1/16/2002	ND<0.001	ND<0.001
			7/18/2002	ND<0.001	ND<0.001
			1/15/2003	ND<0.001	ND<0.001
			7/8/2003	ND<0.001	ND<0.001
			1/21/2004	0.0062	0.0062
			7/29/2004	0.0021	0.0021
			1/20/2005	0.0022	0.0022
			7/12/2005	0.0043	0.0043
MW-45	12	4 (33.3333%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.002	0.002
			7/25/2001	0.002	0.002
			1/16/2002	0.002	0.002
			1/17/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/20/2004	0.0045	0.0045
			1/20/2004	0.0045	0.0045
			7/29/2004	0.0017	0.0017
			1/25/2005	0.0016	0.0016
			7/12/2005	0.0038	0.0038

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations


Chromium
Multi-Well Time-Series Graph
Concentration (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
6/7/1995
11/14/1996
4/25/1998
10/4/1999
3/14/2001
8/23/2002
2/1/2004
7/12/2005
Sample Date
MW-14D/R
MW-20/R
MW-22D/R
MW-24D/R
MW-25
MW-41
MW-43D
MW-44
MW-45

Concentrations (mg/L)

Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Measurements: 358
Total Non-Detect: 289
Percent Non-Detects: 80.7263%
Total Background Measurements: 358
There are 20 background locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-06/R	5	5 (100%)	7/10/2003	ND<0.001	ND<0.001
			7/30/2004	ND<0.001	ND<0.001
			7/30/2004	ND<0.001	ND<0.001
			1/19/2005	ND<0.001	ND<0.001
			7/7/2005	ND<0.001	ND<0.001
MW-09/R	30	27 (90%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	ND<0.001	ND<0.001
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			1/5/1998	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/16/2001	0.005	0.005
			7/26/2001	0.002	0.002
			7/18/2002	ND<0.001	ND<0.001
			1/17/2003	0.001	0.001
			7/9/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/21/2004	ND<0.001	ND<0.001
			7/27/2004	ND<0.001	ND<0.001
			1/20/2005	ND<0.001	ND<0.001
			1/20/2005	ND<0.001	ND<0.001
			7/8/2005	ND<0.001	ND<0.001
			7/8/2005	ND<0.001	ND<0.001
MW-14D/R	11	8 (72.7273%)	1/5/2000	0.002	0.002
			7/6/2000	0.003	0.003
			1/15/2001	ND<0.001	ND<0.001
			7/26/2001	ND<0.001	ND<0.001
			1/17/2002	ND<0.001	ND<0.001
			7/17/2002	ND<0.001	ND<0.001
			1/17/2003	ND<0.001	ND<0.001

			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/11/2001	ND<0.001	ND<0.001
			7/27/2001	0.04	0.04
			7/27/2001	ND<0.001	ND<0.001
			7/17/2002	0.105	0.105
			7/17/2002	0.001	0.001
			1/20/2003	ND<0.001	ND<0.001
			7/9/2003	0.004	0.004
			7/9/2003	ND<0.001	ND<0.001
			1/20/2004	ND<0.001	ND<0.001
			1/20/2004	ND<0.001	ND<0.001
			7/26/2004	0.0016	0.0016
			1/24/2005	ND<0.001	ND<0.001
			7/8/2005	ND<0.001	ND<0.001
			7/8/2005	ND<0.001	ND<0.001
MW-18	30	26 (86.6667%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	ND<0.001	ND<0.001
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/10/2001	ND<0.001	ND<0.001
			7/27/2001	0.004	0.004
			7/27/2001	0.001	0.001
			7/18/2002	0.025	0.025
			7/18/2002	ND<0.001	ND<0.001
			1/14/2003	ND<0.001	ND<0.001
			7/9/2003	0.001	0.001
			7/9/2003	ND<0.001	ND<0.001
			1/20/2004	ND<0.001	ND<0.001
			1/20/2004	ND<0.001	ND<0.001
			7/28/2004	ND<0.001	ND<0.001
			1/24/2005	ND<0.001	ND<0.001
			7/7/2005	ND<0.001	ND<0.001
			7/7/2005	ND<0.001	ND<0.001
MW-19	12	7 (58.3333%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.001	0.001
			7/26/2001	0.001	0.001

			1/16/2003	0.001	0.001
			7/8/2003	0.006	0.006
			1/20/2004	0.001	0.001
			7/30/2004	ND<0.001	ND<0.001
			1/25/2005	ND<0.001	ND<0.001
			7/7/2005	ND<0.001	ND<0.001
MW-24D/R	12	8 (66.6667%)	1/5/2000	0.048	0.048
			~~7/6/2000~~	~~0.08~~	~~0.08~~
			~~1/12/2001~~	~~0.07~~	~~0.07~~
			7/25/2001	ND<0.001	ND<0.001
			1/16/2002	ND<0.001	ND<0.001
			7/16/2002	ND<0.001	ND<0.001
			1/16/2003	ND<0.001	ND<0.001
			7/8/2003	0.003	0.003
			1/20/2004	ND<0.001	ND<0.001
			7/30/2004	ND<0.001	ND<0.001
			1/25/2005	ND<0.001	ND<0.001
			7/7/2005	ND<0.001	ND<0.001
MW-25	32	28 (87.5%)	6/7/1995	ND<0.001	ND<0.001
			9/8/1995	ND<0.001	ND<0.001
			10/23/1995	ND<0.001	ND<0.001
			11/27/1995	ND<0.001	ND<0.001
			1/22/1996	ND<0.001	ND<0.001
			3/6/1996	ND<0.001	ND<0.001
			4/24/1996	ND<0.001	ND<0.001
			6/4/1996	ND<0.001	ND<0.001
			7/15/1996	ND<0.001	ND<0.001
			9/1/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001
			7/1/1997	ND<0.001	ND<0.001
			1/5/1998	ND<0.001	ND<0.001
			7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.004	0.004
			7/26/2001	ND<0.001	ND<0.001
			1/17/2002	ND<0.001	ND<0.001
			7/17/2002	ND<0.001	ND<0.001
			1/20/2003	ND<0.001	ND<0.001
			7/9/2003	0.004	0.004
			7/9/2003	0.003	0.003
			1/22/2004	0.0024	0.0024
			7/26/2004	ND<0.001	ND<0.001
			1/24/2005	ND<0.001	ND<0.001
			1/24/2005	ND<0.001	ND<0.001
			7/11/2005	ND<0.001	ND<0.001
			7/11/2005	ND<0.001	ND<0.001
MW-40	21	15 (71.4286%)	11/27/1995	0.001	0.001
			6/4/1996	ND<0.001	ND<0.001
			12/1/1996	ND<0.001	ND<0.001
			1/1/1997	ND<0.001	ND<0.001

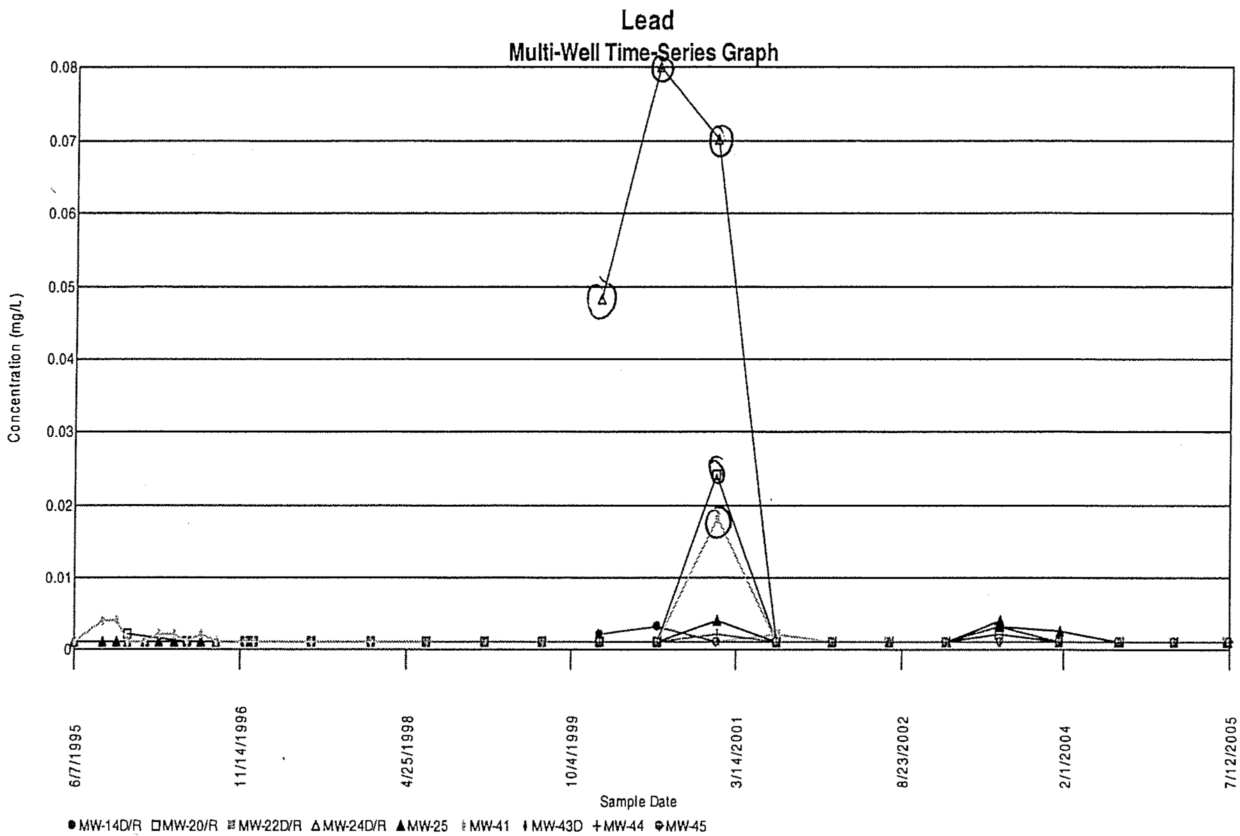
			1/17/2003	ND<0.001	ND<0.001
			7/8/2003	ND<0.001	ND<0.001
			1/21/2004	ND<0.001	ND<0.001
			7/29/2004	ND<0.001	ND<0.001
			1/25/2005	ND<0.001	ND<0.001
			7/11/2005	ND<0.001	ND<0.001
MW-43S	12	9 (75%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.001	0.001
			7/25/2001	0.001	0.001
			1/16/2002	ND<0.001	ND<0.001
			7/17/2002	ND<0.001	ND<0.001
			1/17/2003	ND<0.001	ND<0.001
			7/8/2003	0.004	0.004
			1/21/2004	ND<0.001	ND<0.001
			7/29/2004	ND<0.001	ND<0.001
			1/20/2005	ND<0.001	ND<0.001
			7/11/2005	ND<0.001	ND<0.001
MW-44	15	12 (80%)	7/1/1998	ND<0.001	ND<0.001
			1/5/1999	ND<0.001	ND<0.001
			7/6/1999	ND<0.001	ND<0.001
			1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.002	0.002
			7/25/2001	0.001	0.001
			1/16/2002	ND<0.001	ND<0.001
			7/18/2002	ND<0.001	ND<0.001
			1/15/2003	ND<0.001	ND<0.001
			7/8/2003	0.001	0.001
			1/21/2004	ND<0.001	ND<0.001
			7/29/2004	ND<0.001	ND<0.001
			1/20/2005	ND<0.001	ND<0.001
			7/12/2005	ND<0.001	ND<0.001
MW-45	12	11 (91.6667%)	1/5/2000	ND<0.001	ND<0.001
			7/6/2000	ND<0.001	ND<0.001
			1/15/2001	0.001	0.001
			7/25/2001	ND<0.001	ND<0.001
			1/16/2002	ND<0.001	ND<0.001
			1/17/2003	ND<0.001	ND<0.001
			7/9/2003	ND<0.001	ND<0.001
			1/20/2004	ND<0.001	ND<0.001
			1/20/2004	ND<0.001	ND<0.001
			7/29/2004	ND<0.001	ND<0.001
			1/25/2005	ND<0.001	ND<0.001
			7/12/2005	ND<0.001	ND<0.001

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original



Lead
Multi-Well Time-Series Graph
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Concentration (mg/L)
6/7/1995
11/14/1996
4/25/1998
10/4/1999
3/14/2001
8/23/2002
2/1/2004
7/12/2005
Sample Date
MW-14D/R
MW-20/R
MW-22D/R
MW-24D/R
MW-25
MW-41
MW-43D
MW-44
MW-45

Outlier List

Arsenic

MW-17	7/27/2001	0.01
MW-21SR	7/25/2001	0.01
MW-25	1/20/2003	0.01

Cadmium

MW-20/R	1/12/2001	0.00959
MW-22D/R	1/25/2005	0.028
MW-23S/R	1/12/2001	0.0206
MW-24D/R	1/12/2001	0.0332
MW-45	7/25/2001	0.0075

Chromium

MW-17	7/17/2002	0.018
MW-20/R	1/12/2001	0.012
MW-23S/R	1/12/2001	0.036
MW-24D/R	1/12/2001	0.098
MW-25	1/20/2003	0.031
MW-41	7/26/2001	0.04

Lead

MW-17	7/27/2001	0.04
MW-17	7/17/2002	0.105
MW-18	7/18/2002	0.025
MW-20/R	1/12/2001	0.024
MW-21SR	7/8/2003	0.029
MW-23S/R	1/12/2001	0.068
MW-24D/R	1/5/2000	0.048
MW-24D/R	7/6/2000	0.08
MW-24D/R	1/12/2001	0.07
MW-41	1/16/2001	0.018

Distribution Analysis

Basic Statistics

Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Measurements	325
Total Non-Detects	122 (37.5385%)
Pooled Mean	0.002292
Pooled Std Dev	0.00230394
Compliance Meas.	0
Compliance Mean	0
Compliance Std Dev	0
Background Meas.	325
Background Mean	0.002292
Background Std Dev	0.00230394

Background Locations

There are 20 background location

Location	Meas.	Non-Detects	% ND	Total
MW-06/R	4	4	100	0.004
MW-09/R	29	28	96.5517	0.029
MW-14D/R	11	4	36.3636	0.0211
MW-14S/R	10	7	70	0.0163
MW-16	29	2	6.89655	0.2074
MW-17	28 27?	5	17.8571	0.0487
MW-18	28	4	14.2857	0.0682
MW-19	11	7	63.6364	0.0124
MW-20/R	18	4	22.2222	0.0299
MW-21SR	7	3	42.8571	0.0121
MW-22D/R	9	6	66.6667	0.01
MW-23S/R	10	0	0	0.0202
MW-24D/R	11	2	18.1818	0.0394
MW-25	29	3	10.3448	0.0566
MW-40	18	17	94.4444	0.018
MW-41	30	3	10	0.0563
MW-43D	11	2	18.1818	0.0471
MW-43S	11	10	90.9091	0.0113
MW-44	11	11	100	0.011
MW-45	10	0	0	0.0259

Location	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-06/R	0.001	0	0	246	61.5
MW-09/R	0.001	6.62036e-019	0	1845	63.6207
MW-14D/R	0.00191818	0.00120733	0	1719	156.273
MW-14S/R	0.00163	0.00115089	0	1141.5	114.15
MW-16	0.00715172	0.00435518	0	7894	272.207
MW-17	0.00173929	0.00170649	0	4091.5	146.125
MW-18	0.00243571	0.000737972	0	6022	215.071
MW-19	0.00112727	0.000296954	0	1078.5	98.0455
MW-20/R	0.00166111	0.000769369	0	2813	156.278
MW-21SR	0.00172857	0.000939351	0	1075.5	153.643
MW-22D/R	0.00111111	0.000333333	0	843	93.6667
MW-23S/R	0.00202	0.00121179	0	1921	192.1

Basic Statistics

Parameter: Boron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Measurements	245
Total Non-Detects	72 (29.3878%)
Pooled Mean	0.0617673
Pooled Std Dev	0.0683638
Compliance Meas.	0
Compliance Mean	0
Compliance Std Dev	0
Background Meas.	245
Background Mean	0.0617673
Background Std Dev	0.0683638

Background Locations

There are 20 background location

Location	Meas.	Non-Detects	% ND	Total
MW-06/R	5	0	0	0.277
MW-09/R	14	1	7.14286	3.18
MW-14D/R	11	4	36.3636	0.37
MW-14S/R	10	4	40	0.419
MW-16	17	8	47.0588	0.676
MW-17	16	1	6.25	1.136
MW-18	16	5	31.25	0.741
MW-19	12	1	8.33333	1.179
MW-20/R	12	6	50	0.419
MW-21SR	9	1	11.1111	0.753
MW-22D/R	10	0	0	0.674
MW-23S/R	11	2	18.1818	0.61
MW-24D/R	12	2	16.6667	1.276
MW-25	15	7	46.6667	0.579
MW-40	12	4	33.3333	0.454
MW-41	15	6	40	0.669
MW-43D	12	5	41.6667	0.396
MW-43S	12	4	33.3333	0.467
MW-44	12	5	41.6667	0.442
MW-45	12	6	50	0.416

Location	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-06/R	0.0554	0.0192172	0	783	156.6
MW-09/R	0.227143	0.184152	0	2934.5	209.607
MW-14D/R	0.0336364	0.0169663	0	979	89
MW-14S/R	0.0419	0.0265391	0	1001	100.1
MW-16	0.0397647	0.0220781	0	1585	93.2353
MW-17	0.071	0.0256047	0	2864.5	179.031
MW-18	0.0463125	0.0198048	0	1787.5	111.719
MW-19	0.09825	0.0423022	0	2301.5	191.792
MW-20/R	0.0349167	0.0276486	0	918	76.5
MW-21SR	0.0836667	0.0541387	0	1554.5	172.722
MW-22D/R	0.0674	0.0368245	0	1691	169.1
MW-23S/R	0.0554545	0.028609	0	1579	143.545

Basic Statistics

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Measurements	354
Total Non-Detects	237 (66.9492%)
Pooled Mean	0.0003985
Pooled Std Dev	0.000533289
Compliance Meas.	0
Compliance Mean	0
Compliance Std Dev	0
Background Meas.	354
Background Mean	0.0003985
Background Std Dev	0.000533289

Background Locations

There are 20 background location

Location	Meas.	Non-Detects	% ND	Total
MW-06/R	5	1	20	0.00221
MW-09/R	31	17	54.8387	0.01075
MW-14D/R	11	7	63.6364	0.00282
MW-14S/R	10	3	30	0.00686
MW-16	31	26	83.871	0.00775
MW-17	30	23	76.6667	0.01292
MW-18	30	24	80	0.008692
MW-19	12	10	83.3333	0.00263
MW-20/R	20	15	75	0.00593
MW-21SR	9	2	22.2222	0.009289
MW-22D/R	9	4	44.4444	0.004162
MW-23S/R	10	3	30	0.006285
MW-24D/R	11	7	63.6364	0.00398
MW-25	32	25	78.125	0.013133
MW-40	21	10	47.619	0.009143
MW-41	32	28	87.5	0.01227
MW-43D	12	8	66.6667	0.0039
MW-43S	12	6	50	0.00749
MW-44	15	9	60	0.006965
MW-45	11	9	81.8182	0.00389

Location	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-06/R	0.000442	0.000334843	0	1243	248.6
MW-09/R	0.000346774	0.000256468	0	6001	193.581
MW-14D/R	0.000256364	0.000119689	0	1909	173.545
MW-14S/R	0.000686	0.000799642	0	2450	245
MW-16	0.00025	0.000162706	0	4514	145.613
MW-17	0.000430667	0.000909824	0	4805	160.167
MW-18	0.000289733	0.000213589	0	4654	155.133
MW-19	0.000219167	4.52183e-005	0	1722	143.5
MW-20/R	0.0002965	0.000205766	0	3249	162.45
MW-21SR	0.00103211	0.00064338	0	2552	283.556
MW-22D/R	0.000462444	0.000383326	0	1972	219.111
MW-23S/R	0.0006285	0.000408765	0	2540	254

Basic Statistics

Parameter: Chromium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Measurements	355
Total Non-Detects	221 (62.2535%)
Pooled Mean	0.00205408
Pooled Std Dev	0.00239168
Compliance Meas.	0
Compliance Mean	0
Compliance Std Dev	0
Background Meas.	355
Background Mean	0.00205408
Background Std Dev	0.00239168

Background Locations

There are 20 background location

Location	Meas.	Non-Detects	% ND	Total
MW-06/R	5	1	20	0.0171
MW-09/R	32	24	75	0.0431
MW-14D/R	11	6	54.5455	0.0186
MW-14S/R	10	4	40	0.035
MW-16	31	22	70.9677	0.0611
MW-17	29	21	72.4138	0.058
MW-18	30	23	76.6667	0.0563
MW-19	12	7	58.3333	0.0586
MW-20/R	20	15	75	0.0284
MW-21SR	9	1	11.1111	0.0291
MW-22D/R	10	4	40	0.0259
MW-23S/R	10	3	30	0.0204
MW-24D/R	11	7	63.6364	0.018
MW-25	31	25	80.6452	0.0504
MW-40	21	12	57.1429	0.0384
MW-41	33	23	69.697	0.0595
MW-43D	12	7	58.3333	0.0217
MW-43S	12	4	33.3333	0.0367
MW-44	14	8	57.1429	0.0268
MW-45	12	4	33.3333	0.0261

Location	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-06/R	0.00342	0.00304335	0	1301	260.2
MW-09/R	0.00134688	0.00100289	0	4783	149.469
MW-14D/R	0.00169091	0.00121033	0	2014	183.091
MW-14S/R	0.0035	0.00362093	0	2264	226.4
MW-16	0.00197097	0.00201746	0	5113	164.935
MW-17	0.002	0.00210628	0	4733	163.207
MW-18	0.00187667	0.00186782	0	4711	157.033
MW-19	0.00488333	0.0077162	0	2402	200.167
MW-20/R	0.00142	0.00124334	0	3012	150.6
MW-21SR	0.00323333	0.002504	0	2377	264.111
MW-22D/R	0.00259	0.00230962	0	2169	216.9
MW-23S/R	0.00204	0.00187035	0	2213	221.3

Basic Statistics
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Measurements	348
Total Non-Detects	289 (83.046%)
Pooled Mean	0.00125977
Pooled Std Dev	0.00110401
Compliance Meas.	0
Compliance Mean	0
Compliance Std Dev	0
Background Meas.	348
Background Mean	0.00125977
Background Std Dev	0.00110401

Background Locations
There are 20 background location

Location	Meas.	Non-Detects	% ND	Total
MW-06/R	5	5	100	0.005
MW-09/R	30	27	90	0.035
MW-14D/R	11	8	72.7273	0.014
MW-14S/R	10	8	80	0.018
MW-16	31	26	83.871	0.047
MW-17	28	25	89.2857	0.0316
MW-18	29	26	89.6552	0.032
MW-19	12	7	58.3333	0.0124
MW-20/R	20	18	90	0.022
MW-21SR	8	6	75	0.008
MW-22D/R	10	6	60	0.013
MW-23S/R	10	7	70	0.015
MW-24D/R	9	8	88.8889	0.011
MW-25	32	28	87.5	0.0414
MW-40	21	15	71.4286	0.038
MW-41	31	26	83.871	0.04
MW-43D	12	11	91.6667	0.012
MW-43S	12	9	75	0.015
MW-44	15	12	80	0.016
MW-45	12	11	91.6667	0.012

Location	Mean	Std Dev	Std Err	Rank Sum	Rank Mean
MW-06/R	0.001	0	0	725	145
MW-09/R	0.00116667	0.00074664	0	4865	162.167
MW-14D/R	0.00127273	0.00064667	0	2100	190.909
MW-14S/R	0.0018	0.00252982	0	1798	179.8
MW-16	0.00151613	0.0022041	0	5359	172.871
MW-17	0.00112857	0.000574042	0	4572	163.286
MW-18	0.00110345	0.000557086	0	4699	162.034
MW-19	0.00103333	8.87625e-005	0	2543	211.917
MW-20/R	0.0011	0.000307794	0	3253	162.65
MW-21SR	0.001	0	0	1473	184.125
MW-22D/R	0.0013	0.000674949	0	2131	213.1
MW-23S/R	0.0015	0.00158114	0	1971	197.1

Skewness Coefficient
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Background Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-06/R	4	0.001	0	**Div 0**
MW-09/R	29	0.001	6.62036e-019	**-1**
MW-14D/R	11	0.00191818	0.00120733	0.83381
MW-14S/R	10	0.00163	0.00115089	**1.52937**
MW-16	29	0.00715172	0.00435518	0.362546
MW-17	28	0.00173929	0.00170649	**4.24957**
MW-18	28	0.00243571	0.000737972	-0.894791
MW-19	11	0.00112727	0.000296954	**2.60592**
MW-20/R	18	0.00166111	0.000769369	**1.45033**
MW-21SR	7	0.00172857	0.000939351	0.591198
MW-22D/R	9	0.00111111	0.000333333	**2.47487**
MW-23S/R	10	0.00202	0.00121179	**1.59867**
MW-24D/R	11	0.00358182	0.00184544	-0.476175
MW-25	29	0.00195172	0.000543547	-0.138667
MW-40	18	0.001	4.46254e-019	-1
MW-41	30	0.00187667	0.00081777	**2.47771**
MW-43D	11	0.00428182	0.00210847	-0.626848
MW-43S	11	0.00102727	9.04534e-005	**2.84605**
MW-44	11	0.001	2.27424e-019	**-1**
MW-45	10	0.00259	0.000517365	-0.0412052

All Locations

Obs.	Mean	Std. Dev.	Skewness
325	0.002292	0.00230394	**3.17042**

Skewness Coefficient

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Background Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-06/R	5	0.000442	0.000334843	1.0841
MW-09/R	31	0.000346774	0.000256468	1.76105
MW-14D/R	11	0.000256364	0.000119689	1.98772
MW-14S/R	10	0.000686	0.000799642	2.06543
MW-16	31	0.00025	0.000162706	3.70327
MW-17	30	0.000430667	0.000909824	4.84198
MW-18	30	0.000289733	0.000213589	2.26533
MW-19	12	0.000219167	4.52183e-005	1.8683
MW-20/R	20	0.0002965	0.000205766	1.83668
MW-21SR	9	0.00103211	0.00064338	0.11822
MW-22D/R	9	0.000462444	0.000383326	1.5067
MW-23S/R	10	0.0006285	0.000408765	0.610217
MW-24D/R	11	0.000361818	0.000307077	1.51013
MW-25	32	0.000410406	0.000568558	3.29022
MW-40	21	0.000435381	0.000536896	2.56326
MW-41	32	0.000383438	0.000673712	4.28781
MW-43D	12	0.000325	0.000305688	2.66807
MW-43S	12	0.000624167	0.00107509	2.63139
MW-44	15	0.000464333	0.000632091	2.82456
MW-45	11	0.000353636	0.000345667	1.73474

All Locations

Obs.	Mean	Std. Dev.	Skewness
354	0.0003985	0.000533289	4.7595

Skewness Coefficient

Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Background Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-06/R	5	0.001	0	**Div 0**
MW-09/R	30	0.00116667	0.00074664	**4.78419**
MW-14D/R	11	0.00127273	0.00064667	**2.07701**
MW-14S/R	10	0.0018	0.00252982	**2.66667**
MW-16	31	0.00151613	0.0022041	**4.82925**
MW-17	28	0.00112857	0.000574042	**4.73047**
MW-18	29	0.00110345	0.000557086	**5.10252**
MW-19	12	0.00103333	8.87625e-005	**2.5646**
MW-20/R	20	0.0011	0.000307794	**2.66667**
MW-21SR	8	0.001	0	**Div 0**
MW-22D/R	10	0.0013	0.000674949	**1.91979**
MW-23S/R	10	0.0015	0.00158114	**2.66667**
MW-24D/R	9	0.00122222	0.000666667	**2.47487**
MW-25	32	0.00129375	0.000826941	**2.62266**
MW-40	21	0.00180952	0.00204007	**2.58093**
MW-41	31	0.00129032	0.000782881	**2.84071**
MW-43D	12	0.001	2.26482e-019	**-1**
MW-43S	12	0.00125	0.000866025	**3.01511**
MW-44	15	0.00106667	0.000258199	**3.4744**
MW-45	12	0.001	2.26482e-019	**-1**

All Locations

Obs.	Mean	Std. Dev.	Skewness
348	0.00125977	0.00110401	**6.42463**

Skewness Coefficient

Parameter: Boron

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Background Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-06/R	5	-2.94027	0.341414	0.209981
MW-09/R	14	-1.86692	0.952378	-0.148857
MW-14D/R	11	-3.8004	0.815829	-0.983524
MW-14S/R	10	-3.66869	0.975543	-0.661305
MW-16	17	-3.75523	0.957998	-0.698498
MW-17	16	-2.7943	0.725491	**-2.74522**
MW-18	16	-3.42515	0.737757	**-1.08009**
MW-19	12	-2.46794	0.562654	-0.730146
MW-20/R	12	-3.94875	0.849999	0.0518091
MW-21SR	9	-2.83841	1.09424	**-1.29539**
MW-22D/R	10	-2.8691	0.676484	-0.806146
MW-23S/R	11	-3.20721	0.909986	**-1.24471**
MW-24D/R	12	-2.5591	0.814778	-0.120983
MW-25	15	-3.71606	0.734761	**-1.12743**
MW-40	12	-3.6258	0.655175	**-1.22472**
MW-41	15	-3.47883	0.638217	**-1.30756**
MW-43D	12	-3.89416	0.801396	-0.689035
MW-43S	12	-3.62369	0.724292	**-1.04028**
MW-44	12	-3.7344	0.801036	**-1.12755**
MW-45	12	-3.86419	0.811726	-0.743623

All Locations

Obs.	Mean	Std. Dev.	Skewness
245	-3.31729	0.960498	-0.243924

Skewness Coefficient
Parameter: Chromium
Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Background Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-06/R	5	-6.09639	1.04591	-0.232297
MW-09/R	32	-7.25956	0.67679	**1.88299**
MW-14D/R	11	-6.93177	0.862146	0.722362
MW-14S/R	10	-6.36997	1.23609	0.309795
MW-16	31	-7.0377	0.983363	**1.33287**
MW-17	29	-7.05321	0.997152	**1.4146**
MW-18	30	-7.10041	0.95477	**1.45992**
MW-19	12	-6.48963	1.486	0.776584
MW-20/R	20	-7.25184	0.729996	**2.05064**
MW-21SR	9	-6.12095	0.967719	-0.100183
MW-22D/R	10	-6.56043	1.08678	0.379884
MW-23S/R	10	-6.66549	0.895627	0.596538
MW-24D/R	11	-7.07184	0.859197	**1.34119**
MW-25	31	-7.23977	0.830075	**2.09789**
MW-40	21	-6.9559	0.889501	**1.12367**
MW-41	33	-7.06254	0.909144	**1.34503**
MW-43D	12	-6.956	0.901309	**1.06183**
MW-43S	12	-6.35917	1.0927	0.124109
MW-44	14	-6.88154	0.947451	0.73394
MW-45	12	-6.5202	0.872301	-0.18959

All Locations

Obs.	Mean	Std. Dev.	Skewness
355	-6.94211	0.964124	**1.14261**

Prediction Limit Calculations

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-14D/R
Parameter: Arsenic

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/26/2001	ND<0.001
	1/17/2002	0.001
	7/17/2002	0.002
	1/17/2003	0.004
	7/9/2003	0.004
	1/22/2004	0.001
	7/29/2004	0.0024
	7/11/2005	0.0027

From 11 baseline samples
Baseline mean = 0.00155455
Baseline std Dev = 0.0015642

For 4 recent sampling event(s)
95% confidence t = 2.63377 at 10 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	0.0027	[0, 0.00585748]	FALSE
7/29/2004	1	0.0024	[0, 0.00585748]	FALSE
1/22/2004	1	0.001	[0, 0.00585748]	FALSE
7/9/2003	1	0.004	[0, 0.00585748]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-16
Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	6/7/1995	0.006
	9/8/1995	ND<0.001
	10/23/1995	0.007
	11/27/1995	0.004
	1/22/1996	0.006
	3/6/1996	0.005
	4/24/1996	0.002
	6/4/1996	0.004
	7/15/1996	0.005
	9/1/1996	0.006
	12/1/1996	0.005
	7/1/1997	0.004
	7/1/1998	0.002
	7/6/1999	0.002
	1/5/2000	0.002
	7/6/2000	ND<0.001
	1/11/2001	0.006
	7/27/2001	0.009
	7/27/2001	0.012
	7/18/2002	0.012
	7/18/2002	0.01
	1/20/2003	0.009
	7/10/2003	0.01
	7/10/2003	0.016
	7/10/2003	0.011
	1/20/2004	0.0094
	7/28/2004	0.015
	7/11/2005	0.014
	7/11/2005	0.012

From 29 baseline samples
Baseline mean = 0.00715172
Baseline std Dev = 0.00435518

For 4 recent sampling event(s)
95% confidence t = 2.36845 at 28 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	2	0.013	[0, 0.0146929]	FALSE
7/28/2004	1	0.015	[0, 0.0176431]	FALSE
1/20/2004	1	0.0094	[0, 0.0176431]	FALSE
7/10/2003	3	0.0123333	[0, 0.0134076]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-17
Parameter: Arsenic

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	6/7/1995	-6.90776
	9/8/1995	-6.21461
	10/23/1995	-6.90776
	11/27/1995	-6.90776
	1/22/1996	-6.21461
	3/6/1996	-6.90776
	4/24/1996	-6.90776
	6/4/1996	-6.90776
	7/15/1996	-6.90776
	9/1/1996	-6.21461
	12/1/1996	-6.90776
	7/1/1997	-6.21461
	7/1/1998	-6.21461
	7/6/1999	-6.21461
	1/5/2000	-6.90776
	7/6/2000	-6.21461
	1/11/2001	ND<-7.6009
	7/27/2001	ND<-7.6009
	7/17/2002	-6.21461
	7/17/2002	ND<-7.6009
	1/20/2003	-5.80914
	7/9/2003	ND<-7.6009
	7/9/2003	ND<-7.6009
	1/20/2004	-6.31997
	7/26/2004	-6.64539
	7/8/2005	-6.57128
	7/8/2005	-6.72543

From 27 baseline samples
Baseline mean = -6.73935
Baseline std Dev = 0.527981

For 4 recent sampling event(s)
95% confidence t = 2.37878 at 26 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/8/2005	2	-6.64836	[0, -5.81895]	FALSE
7/26/2004	1	-6.64539	[0, -5.46035]	FALSE
1/20/2004	1	-6.31997	[0, -5.46035]	FALSE
7/9/2003	2	-7.6009	[0, -5.81895]	FALSE

0.00425 2673

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-18
Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	6/7/1995	0.003
	9/8/1995	0.003
	10/23/1995	0.003
	11/27/1995	0.003
	1/22/1996	0.003
	3/6/1996	0.003
	4/24/1996	0.003
	6/4/1996	0.003
	7/15/1996	0.003
	9/1/1996	0.003
	12/1/1996	0.002
	7/1/1997	0.003
	7/1/1998	0.003
	7/6/1999	0.003
	1/5/2000	0.003
	7/6/2000	0.003
	1/10/2001	0.002
	7/27/2001	0.002
	7/27/2001	0.002
	7/18/2002	0.002
	7/18/2002	ND<0.001
	1/14/2003	0.003
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/20/2004	ND<0.001
	7/28/2004	0.002
	7/7/2005	0.0021
	7/7/2005	0.0021

From 28 baseline samples
Baseline mean = 0.00243571
Baseline std Dev = 0.000737972

For 4 recent sampling event(s)
95% confidence t = 2.37342 at 27 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	2	0.0021	[0, 0.00371769]	FALSE
7/28/2004	1	0.002	[0, 0.00421823]	FALSE
1/20/2004	1	0.001	[0, 0.00421823]	FALSE
7/9/2003	2	0.001	[0, 0.00371769]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-20/R
Parameter: Arsenic
Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	6/4/1996	-6.21461
	1/1/1997	-6.90776
	7/1/1997	-6.90776
	1/5/1998	-6.21461
	7/1/1998	-6.21461
	1/5/1999	ND<-7.6009
	7/6/1999	-6.90776
	1/5/2000	-6.21461
	7/6/2000	-6.21461
	1/12/2001	-5.52146
	7/25/2001	ND<-7.6009
	1/16/2002	ND<-7.6009
	7/16/2002	-6.21461
	1/16/2003	-6.21461
	7/8/2003	ND<-7.6009
	1/20/2004	-6.37713
	7/30/2004	-6.90776
	7/7/2005	-6.1193

✓
From 18 baseline samples
Baseline mean = -6.64193
Baseline std Dev = 0.634225

For 4 recent sampling event(s)
95% confidence t = 2.45805 at 17 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	-6.1193	[0, -5.04025]	FALSE
7/30/2004	1	-6.90776	[0, -5.04025]	FALSE
1/20/2004	1	-6.37713	[0, -5.04025]	FALSE
7/8/2003	1	-7.6009	[0, -5.04025]	FALSE

✓
0.0064721301

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-23S/R
Parameter: Arsenic

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	7/6/2000	-6.90776
	1/12/2001	-6.90776
	7/25/2001	-6.21461
	1/16/2002	-5.80914
	7/16/2002	-6.21461
	1/16/2003	-5.29832
	7/8/2003	-6.21461
	1/20/2004	-6.43775
	7/30/2004	-6.50229
	7/7/2005	-6.81245

From 10 baseline samples
Baseline mean = -6.33193
Baseline std Dev = 0.507414

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	-6.81245	[0, -4.90302]	FALSE
7/30/2004	1	-6.50229	[0, -4.90302]	FALSE
1/20/2004	1	-6.43775	[0, -4.90302]	FALSE
7/8/2003	1	-6.21461	[0, -4.90302]	FALSE

✓ 0.00742941283

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-24D/R
Parameter: Arsenic

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/12/2001	0.005
	7/25/2001	0.005
	1/16/2002	0.006
	7/16/2002	0.004
	1/16/2003	0.005
	7/8/2003	0.001
	1/20/2004	0.0027
	7/30/2004	0.0042
✓	7/7/2005	0.0045

From 11 baseline samples
Baseline mean = 0.0034
Baseline std Dev = 0.00214523

For 4 recent sampling event(s)
95% confidence t = 2.63377 at 10 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.0045	[0, 0.00930127]	FALSE
7/30/2004	1	0.0042	[0, 0.00930127]	FALSE
1/20/2004	1	0.0027	[0, 0.00930127]	FALSE
7/8/2003	1	0.001	[0, 0.00930127]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-25
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	6/7/1995	0.002
	9/8/1995	0.002
	10/23/1995	0.002
	11/27/1995	0.002
	1/22/1996	0.002
	3/6/1996	0.002
	4/24/1996	0.002
	6/4/1996	0.002
	7/15/1996	0.002
	9/1/1996	0.002
	12/1/1996	0.002
	1/1/1997	0.002
	7/1/1997	0.002
	1/5/1998	0.002
	7/1/1998	0.002
	1/5/1999	0.001
	7/6/1999	0.002
	1/5/2000	0.002
	7/6/2000	0.002
	1/15/2001	0.001
	7/26/2001	ND<0.001
	1/17/2002	0.002
	7/17/2002	0.002
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	0.003
	7/26/2004	0.0028
	7/11/2005	0.0027
	7/11/2005	0.0031

From 29 baseline samples
Baseline mean = 0.00195172
Baseline std Dev = 0.000543547

For 4 recent sampling event(s)
95% confidence t = 2.36845 at 28 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	**2**	**0.0029**	**[0, 0.00289289]**	**TRUE**
7/26/2004	1	0.0028	[0, 0.0032611]	FALSE
1/22/2004	1	0.003	[0, 0.0032611]	FALSE
7/9/2003	2	0.001	[0, 0.00289289]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-41
Parameter: Arsenic
Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	6/7/1995	-6.21461
	9/8/1995	-6.90776
	10/23/1995	-6.21461
	11/27/1995	-6.21461
	1/22/1996	-6.21461
	3/6/1996	-6.21461
	4/24/1996	-6.21461
	6/4/1996	-6.21461
	7/15/1996	-6.21461
	9/1/1996	-6.21461
	12/1/1996	-6.21461
	1/1/1997	-6.21461
	7/1/1997	-6.90776
	1/5/1998	-6.90776
	7/1/1998	-6.21461
	1/5/1999	-6.90776
	7/6/1999	-6.21461
	1/5/2000	-6.21461
	7/6/2000	-6.21461
	1/16/2001	-6.90776
	7/26/2001	ND<-7.6009
	1/17/2002	-6.21461
	7/17/2002	-6.21461
	1/20/2003	-6.21461
	7/9/2003	ND<-7.6009
	7/9/2003	ND<-7.6009
	1/22/2004	-6.1193
	7/26/2004	-6.03229
	7/11/2005	-6.07485
	7/11/2005	-5.22136

From 30 baseline samples
Baseline mean = -6.42174
Baseline std Dev = 0.52289

For 4 recent sampling event(s)
95% confidence t = 2.36385 at 29 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	2	-5.6481	[0, -5.51907]	FALSE
7/26/2004	1	-6.03229	[0, -5.16528]	FALSE
1/22/2004	1	-6.1193	[0, -5.16528]	FALSE
7/9/2003	2	-7.6009	[0, -5.51907]	FALSE

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Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-43D
Parameter: Arsenic
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	0.006
	7/6/2000	ND<0.001
	1/10/2001	0.004
	7/27/2001	0.005
	1/16/2002	0.006
	7/17/2002	0.004
	1/17/2003	0.006
	7/8/2003	ND<0.001
	1/21/2004	0.0018
	7/29/2004	0.0058
	7/11/2005	0.0065

From 11 baseline samples
Baseline mean = 0.0041
Baseline std Dev = 0.00243352

For 4 recent sampling event(s)
95% confidence t = 2.63377 at 10 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	0.0065	[0, 0.0107943]	FALSE
7/29/2004	1	0.0058	[0, 0.0107943]	FALSE
1/21/2004	1	0.0018	[0, 0.0107943]	FALSE
7/8/2003	1	0.001	[0, 0.0107943]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-45
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	0.002
	7/6/2000	0.003
	1/15/2001	0.002
	7/25/2001	0.003
	1/16/2002	0.003
	1/17/2003	0.002
	7/9/2003	0.003
	1/20/2004	0.0022
	7/29/2004	0.0024
	7/12/2005	0.0033

From 10 baseline samples
Baseline mean = 0.00259
Baseline std Dev = 0.000517365

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/12/2005	1	0.0033	[0, 0.00404693]	FALSE
7/29/2004	1	0.0024	[0, 0.00404693]	FALSE
1/20/2004	1	0.0022	[0, 0.00404693]	FALSE
7/9/2003	1	0.003	[0, 0.00404693]	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-09/R
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 96.5517%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 29
Maximum Baseline Concentration = 0.001
Confidence Level = 87.9%
False Positive Rate = 12.1%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/16/2001	ND<0.001
	7/26/2001	ND<0.001
	7/18/2002	ND<0.001
	1/17/2003	0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/21/2004	ND<0.001
	7/27/2004	ND<0.001
	7/8/2005	ND<0.001
	7/8/2005	ND<0.001

Date	Count	Mean	Significant
7/8/2005	2	0.001	FALSE
7/27/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE
7/9/2003	2	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-14S/R
Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 70%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 10
Maximum Baseline Concentration = 0.0043
Confidence Level = 71.4%
False Positive Rate = 28.6%

Baseline Measurements	Date	Value
	1/5/2000	0.003
	7/6/2000	0.002
	1/15/2001	ND<0.001
	7/26/2001	ND<0.001
	1/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	ND<0.001
	7/29/2004	ND<0.001
	7/11/2005	0.0043

Date	Count	Mean	Significant
7/11/2005	1	0.0043	FALSE
7/29/2004	1	0.001	FALSE
1/22/2004	1	0.001	FALSE
7/9/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-19
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 63.6364%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.002
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/26/2001	ND<0.001
	1/15/2002	ND<0.001
	7/18/2002	ND<0.001
	1/15/2003	0.002
	7/10/2003	ND<0.001
	1/21/2004	0.0011
	7/29/2004	0.0012
	7/12/2005	0.0011

Date	Count	Mean	Significant
7/12/2005	1	0.0011	FALSE
7/29/2004	1	0.0012	FALSE
1/21/2004	1	0.0011	FALSE
7/10/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-22D/R
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 66.6667%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 9
Maximum Baseline Concentration = 0.002
Confidence Level = 69.2%
False Positive Rate = 30.8%

Baseline Measurements	Date	Value
	1/16/2001	ND<0.001
	7/25/2001	0.002
	1/16/2002	ND<0.001
	7/16/2002	ND<0.001
	1/15/2003	0.001
	7/8/2003	ND<0.001
	1/20/2004	0.001
	7/30/2004	ND<0.001
	7/7/2005	ND<0.001

Date	Count	Mean	Significant
7/7/2005	1	0.001	FALSE
7/30/2004	1	0.001	FALSE
1/20/2004	1	0.001	FALSE
7/8/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-40
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 94.4444%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 18
Maximum Baseline Concentration = 0.001
Confidence Level = 81.8%
False Positive Rate = 18.2%

Baseline Measurements	Date	Value
	6/4/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/18/2002	ND<0.001
	1/15/2003	0.001
	7/8/2003	ND<0.001
	1/21/2004	ND<0.001
	7/29/2004	ND<0.001
	7/12/2005	ND<0.001

Date	Count	Mean	Significant
7/12/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE
7/8/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-43S
Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 90.9091%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.0013
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/8/2003	ND<0.001
	1/21/2004	ND<0.001
	7/29/2004	ND<0.001
	7/11/2005	0.0013

Date	Count	Mean	Significant
7/11/2005	1	0.0013	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE
7/8/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-44
Parameter: Arsenic
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit.

Total Percent Non-Detects = 100%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.001
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/18/2002	ND<0.001
	1/15/2003	ND<0.001
	7/8/2003	ND<0.001
	1/21/2004	ND<0.001
	7/29/2004	ND<0.001
	7/12/2005	ND<0.001

Date	Count	Mean	Significant
7/12/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE
7/8/2003	1	0.001	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-09/R
Parameter: Boron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	0.055
	7/6/2000	ND<0.05
	1/16/2001	0.071
	7/26/2001	0.09
	7/18/2002	0.114
	1/17/2003	0.079
	7/9/2003	0.129
	7/9/2003	0.132
	1/21/2004	0.17
	7/27/2004	0.36
	1/20/2005	0.47
	1/20/2005	0.46
	7/8/2005	0.51
	7/8/2005	0.49

From 14 baseline samples
Baseline mean = 0.227143
Baseline std Dev = 0.184152

For 4 recent sampling event(s)
95% confidence t = 2.53263 at 13 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/8/2005	2	0.5	[0, 0.579699]	FALSE
1/20/2005	2	0.465	[0, 0.579699]	FALSE
7/27/2004	1	0.36	[0, 0.709901]	FALSE
1/21/2004	1	0.17	[0, 0.709901]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-14D/R
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	0.019
	7/26/2001	0.024
	1/17/2002	ND<0.01
	7/17/2002	0.023
	1/17/2003	ND<0.01
	7/9/2003	0.052
	1/22/2004	0.036
	7/29/2004	0.053
	7/11/2005	0.043

From 11 baseline samples
Baseline mean = 0.0227273
Baseline std Dev = 0.0210765

For 4 recent sampling event(s)
95% confidence t = 2.63377 at 10 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	0.043	[0, 0.0807062]	FALSE
7/29/2004	1	0.053	[0, 0.0807062]	FALSE
1/22/2004	1	0.036	[0, 0.0807062]	FALSE
7/9/2003	1	0.052	[0, 0.0807062]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-14S/R
Parameter: Boron

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	ND<0.01
	7/26/2001	0.034
	1/17/2002	0.02
	1/17/2003	ND<0.01
	7/9/2003	0.057
	1/22/2004	0.041
	7/29/2004	0.1
	7/11/2005	0.047

From 10 baseline samples
Baseline mean = 0.0299
Baseline std Dev = 0.0329223

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	0.047	[0, 0.122611]	FALSE
7/29/2004	1	0.1	[0, 0.122611]	FALSE
1/22/2004	1	0.041	[0, 0.122611]	FALSE
7/9/2003	1	0.057	[0, 0.122611]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-16
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples

Date	Result
1/5/2000	ND<0.05
7/6/2000	ND<0.05
1/11/2001	0.027
7/27/2001	ND<0.01
7/27/2001	0.046
7/18/2002	0.084
7/18/2002	0.044
1/20/2003	ND<0.01
7/10/2003	0.071
7/10/2003	ND<0.01
7/10/2003	ND<0.01
1/20/2004	0.036
1/20/2004	0.036
7/28/2004	0.063
1/24/2005	ND<0.05
7/11/2005	ND<0.05
7/11/2005	0.029

From 17 baseline samples
Baseline mean = 0.0256471
Baseline std Dev = 0.0286115

For 4 recent sampling event(s)
95% confidence t = 2.47288 at 16 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	2	0.0395	[0, 0.078538]	FALSE
1/24/2005	1	0.05	[0, 0.0984511]	FALSE
7/28/2004	1	0.063	[0, 0.0984511]	FALSE
1/20/2004	2	0.036	[0, 0.078538]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-17
Parameter: Boron
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	0.066
	7/6/2000	0.05
	1/11/2001	ND<0.01
	7/27/2001	0.038
	7/27/2001	0.068
	7/17/2002	0.098
	7/17/2002	0.068
	1/20/2003	0.05
	7/9/2003	0.071
	7/9/2003	0.103
	1/20/2004	0.089
	1/20/2004	0.089
	7/26/2004	0.11
	1/24/2005	0.073
	7/8/2005	0.069
	7/8/2005	0.084

From 16 baseline samples
Baseline mean = 0.071
Baseline std Dev = 0.0256047

For 4 recent sampling event(s)
95% confidence t = 2.48988 at 15 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/8/2005	2	0.0765	[0, 0.118814]	FALSE
1/24/2005	1	0.073	[0, 0.136715]	FALSE
7/26/2004	1	0.11	[0, 0.136715]	FALSE
1/20/2004	2	0.089	[0, 0.118814]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-18
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/10/2001	0.034
	7/27/2001	0.01
	7/27/2001	0.057
	7/18/2002	0.082
	7/18/2002	0.052
	1/14/2003	ND<0.01
	7/9/2003	0.023
	7/9/2003	0.057
	1/20/2004	0.053
	1/20/2004	0.053
	7/28/2004	0.074
	1/24/2005	ND<0.05
	7/7/2005	ND<0.05
	7/7/2005	0.036

From 16 baseline samples
Baseline mean = 0.0331875
Baseline std Dev = 0.0288426

For 4 recent sampling event(s)
95% confidence t = 2.48988 at 15 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	2	0.043	[0, 0.0870484]	FALSE
1/24/2005	1	0.05	[0, 0.107212]	FALSE
7/28/2004	1	0.074	[0, 0.107212]	FALSE
1/20/2004	2	0.053	[0, 0.0870484]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-19
Parameter: Boron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	0.061
	7/6/2000	ND<0.05
	1/15/2001	0.073
	7/26/2001	0.062
	1/15/2002	0.045
	7/18/2002	0.093
	1/15/2003	0.093
	7/10/2003	0.102
	1/21/2004	0.16
	7/29/2004	0.14
	1/20/2005	0.14
	7/12/2005	0.16

From 12 baseline samples
Baseline mean = 0.09825
Baseline std Dev = 0.0423022

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/12/2005	1	0.16	[0, 0.212423]	FALSE
1/20/2005	1	0.14	[0, 0.212423]	FALSE
7/29/2004	1	0.14	[0, 0.212423]	FALSE
1/21/2004	1	0.16	[0, 0.212423]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-20/R
Parameter: Boron

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<-3.68888
	7/6/2000	ND<-3.68888
	1/12/2001	ND<-5.29832
	7/25/2001	-4.01738
	1/16/2002	-4.19971
	7/16/2002	-3.86323
	1/16/2003	ND<-5.29832
	7/8/2003	-2.22562
	1/20/2004	-3.54046
	7/30/2004	-3.27017
	1/25/2005	ND<-3.68888
	7/7/2005	ND<-4.60517

From 12 baseline samples
Baseline mean = -3.94875
Baseline std Dev = 0.849999

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	-4.60517	[0, -1.65462]	FALSE
1/25/2005	1	-3.68888	[0, -1.65462]	FALSE
7/30/2004	1	-3.27017	[0, -1.65462]	FALSE
1/20/2004	1	-3.54046	[0, -1.65462]	FALSE

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0.191164845

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-21SR
Parameter: Boron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/12/2001	0.054
	7/25/2001	0.074
	1/16/2002	0.028
	7/16/2002	ND<0.01
	1/15/2003	0.044
	7/8/2003	0.124
	7/30/2004	0.12
	1/25/2005	0.169
	7/7/2005	0.13

From 9 baseline samples
Baseline mean = 0.0836667
Baseline std Dev = 0.0541387

For 4 recent sampling event(s)
95% confidence t = 2.75153 at 8 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.13	[0, 0.240689]	FALSE
1/25/2005	1	0.169	[0, 0.240689]	FALSE
7/30/2004	1	0.12	[0, 0.240689]	FALSE
7/8/2003	1	0.124	[0, 0.240689]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-22D/R
Parameter: Boron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/16/2001	0.043
	7/25/2001	0.082
	1/16/2002	0.042
	7/16/2002	0.014
	1/15/2003	0.028
	7/8/2003	0.14
	1/20/2004	0.073
	7/30/2004	0.096
	1/25/2005	0.079
	7/7/2005	0.077

From 10 baseline samples
Baseline mean = 0.0674
Baseline std Dev = 0.0368245

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.077	[0, 0.1711]	FALSE
1/25/2005	1	0.079	[0, 0.1711]	FALSE
7/30/2004	1	0.096	[0, 0.1711]	FALSE
1/20/2004	1	0.073	[0, 0.1711]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-23S/R
Parameter: Boron

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	7/6/2000	ND<0.05
	1/12/2001	0.101
	7/25/2001	0.048
	1/16/2002	0.013
	7/16/2002	ND<0.01
	1/16/2003	0.042
	7/8/2003	0.096
	1/20/2004	0.057
	7/30/2004	0.062
	1/25/2005	0.059
	7/7/2005	0.072

From 11 baseline samples
Baseline mean = 0.05
Baseline std Dev = 0.0345138

For 4 recent sampling event(s)
95% confidence t = 2.63377 at 10 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.072	[0, 0.144943]	FALSE
1/25/2005	1	0.059	[0, 0.144943]	FALSE
7/30/2004	1	0.062	[0, 0.144943]	FALSE
1/20/2004	1	0.057	[0, 0.144943]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-24D/R
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/12/2001	0.11
	7/25/2001	0.049
	1/16/2002	0.032
	7/16/2002	0.103
	1/16/2003	0.042
	7/8/2003	0.11
	1/20/2004	0.1
	7/30/2004	0.17
	1/25/2005	0.24
	7/7/2005	0.22

From 12 baseline samples
Baseline mean = 0.098
Baseline std Dev = 0.0795727

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.22	[0, 0.312765]	FALSE
1/25/2005	1	0.24	[0, 0.312765]	FALSE
7/30/2004	1	0.17	[0, 0.312765]	FALSE
1/20/2004	1	0.1	[0, 0.312765]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-25
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	0.018
	7/26/2001	0.035
	1/17/2002	ND<0.01
	7/17/2002	0.02
	1/20/2003	ND<0.01
	7/9/2003	0.037
	7/9/2003	0.048
	1/22/2004	0.045
	7/26/2004	0.07
	1/24/2005	ND<0.05
	1/24/2005	ND<0.05
	7/11/2005	ND<0.05
	7/11/2005	0.036

From 15 baseline samples
Baseline mean = 0.0206
Baseline std Dev = 0.0231109

For 4 recent sampling event(s)
95% confidence t = 2.50957 at 14 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	2	0.043	[0, 0.0642596]	FALSE
1/24/2005	2	0.05	[0, 0.0642596]	FALSE
7/26/2004	1	0.07	[0, 0.0805005]	FALSE
1/22/2004	1	0.045	[0, 0.0805005]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-40
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	0.041
	7/25/2001	0.036
	1/16/2002	0.016
	7/18/2002	0.026
	1/15/2003	ND<0.01
	7/8/2003	0.061
	1/21/2004	0.032
	7/29/2004	0.059
	1/20/2005	ND<0.05
	7/12/2005	0.023

From 12 baseline samples
Baseline mean = 0.0245
Baseline std Dev = 0.0222813

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/12/2005	1	0.023	[0, 0.0846367]	FALSE
1/20/2005	1	0.05	[0, 0.0846367]	FALSE
7/29/2004	1	0.059	[0, 0.0846367]	FALSE
1/21/2004	1	0.032	[0, 0.0846367]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-41
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/16/2001	0.04
	7/26/2001	0.039
	1/17/2002	0.024
	7/17/2002	0.025
	1/20/2003	ND<0.01
	7/9/2003	0.06
	7/9/2003	0.051
	1/22/2004	0.054
	7/26/2004	0.08
	1/20/2005	ND<0.05
	1/20/2005	ND<0.05
	7/11/2005	ND<0.05
	7/11/2005	0.036

From 15 baseline samples
Baseline mean = 0.0272667
Baseline std Dev = 0.0267033

For 4 recent sampling event(s)
95% confidence t = 2.50957 at 14 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	2	0.043	[0, 0.0777128]	FALSE
1/20/2005	2	0.05	[0, 0.0777128]	FALSE
7/26/2004	1	0.08	[0, 0.0964782]	FALSE
1/22/2004	1	0.054	[0, 0.0964782]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-43D
Parameter: Boron

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/10/2001	0.03
	7/27/2001	0.01
	1/16/2002	ND<0.01
	7/17/2002	0.016
	1/17/2003	ND<0.01
	7/8/2003	0.053
	1/21/2004	0.028
	7/29/2004	0.057
	1/25/2005	ND<0.05
	7/11/2005	0.032

From 12 baseline samples
Baseline mean = 0.0188333
Baseline std Dev = 0.0210317

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	0.032	[0, 0.0755975]	FALSE
1/25/2005	1	0.05	[0, 0.0755975]	FALSE
7/29/2004	1	0.057	[0, 0.0755975]	FALSE
1/21/2004	1	0.028	[0, 0.0755975]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-43S
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	0.039
	7/25/2001	0.06
	1/16/2002	0.011
	7/17/2002	0.017
	1/17/2003	ND<0.01
	7/8/2003	0.054
	1/21/2004	0.037
	7/29/2004	0.053
	1/20/2005	ND<0.05
	7/11/2005	0.036

From 12 baseline samples
Baseline mean = 0.0255833
Baseline std Dev = 0.0234848

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	0.036	[0, 0.0889685]	FALSE
1/20/2005	1	0.05	[0, 0.0889685]	FALSE
7/29/2004	1	0.053	[0, 0.0889685]	FALSE
1/21/2004	1	0.037	[0, 0.0889685]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-44
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	0.044
	7/25/2001	0.029
	1/16/2002	ND<0.01
	7/18/2002	0.02
	1/15/2003	ND<0.01
	7/8/2003	0.05
	1/21/2004	0.027
	7/29/2004	0.057
	1/20/2005	ND<0.05
	7/12/2005	0.045

From 12 baseline samples
Baseline mean = 0.0226667
Baseline std Dev = 0.0223905

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/12/2005	1	0.045	[0, 0.0830981]	FALSE
1/20/2005	1	0.05	[0, 0.0830981]	FALSE
7/29/2004	1	0.057	[0, 0.0830981]	FALSE
1/21/2004	1	0.027	[0, 0.0830981]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-45
Parameter: Boron
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.05
	7/6/2000	ND<0.05
	1/15/2001	0.036
	7/25/2001	0.041
	1/16/2002	ND<0.01
	1/17/2003	ND<0.01
	7/9/2003	0.052
	1/20/2004	0.021
	1/20/2004	0.021
	7/29/2004	0.055
	1/25/2005	ND<0.05
	7/12/2005	ND<0.02

From 12 baseline samples
Baseline mean = 0.0188333
Baseline std Dev = 0.0220158

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/12/2005	1	0.02	[0, 0.0782536]	FALSE
1/25/2005	1	0.05	[0, 0.0782536]	FALSE
7/29/2004	1	0.055	[0, 0.0782536]	FALSE
1/20/2004	2	0.021	[0, 0.0624359]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-14S/R
Parameter: Cadmium
Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	-5.87814
	7/6/2000	ND<-9.21034
	1/15/2001	-7.16912
	7/26/2001	-7.54263
	1/17/2002	-7.62111
	1/17/2003	ND<-9.21034
	7/9/2003	ND<-9.21034
	1/22/2004	-7.90201
	7/29/2004	-6.81245
	7/11/2005	-8.51719

From 10 baseline samples
Baseline mean = -7.90737
Baseline std Dev = 1.13244

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	-8.51719	[0, -4.71835]	FALSE
7/29/2004	1	-6.81245	[0, -4.71835]	FALSE
1/22/2004	1	-7.90201	[0, -4.71835]	FALSE
7/9/2003	1	-9.21034	[0, -4.71835]	FALSE

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0.0089299007

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-21SR
Parameter: Cadmium

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/12/2001	0.0021
	7/25/2001	0.0015
	1/16/2002	ND<0.0002
	7/16/2002	0.00149
	1/15/2003	0.00099
	7/8/2003	0.000759
	7/30/2004	ND<0.0002
	1/25/2005	0.00065
	7/7/2005	0.0014

From 9 baseline samples
Baseline mean = 0.000987667
Baseline std Dev = 0.000710582

For 4 recent sampling event(s)
95% confidence t = 2.75153 at 8 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.0014	[0, 0.00304862]	FALSE
1/25/2005	1	0.00065	[0, 0.00304862]	FALSE
7/30/2004	1	0.0002	[0, 0.00304862]	FALSE
7/8/2003	1	0.000759	[0, 0.00304862]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-22D/R
Parameter: Cadmium

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/16/2001	-7.29342
	7/25/2001	-6.60765
	1/16/2002	-8.01642
	7/16/2002	-7.33854
	1/15/2003	ND<-9.21034
	7/8/2003	-7.95188
	1/20/2004	ND<-9.21034
	7/30/2004	ND<-9.21034
	7/7/2005	ND<-9.21034

From 9 baseline samples
Baseline mean = -8.2277
Baseline std Dev = 1.0168

For 4 recent sampling event(s)
95% confidence t = 2.75153 at 8 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	-9.21034	[0, -5.27859]	FALSE
7/30/2004	1	-9.21034	[0, -5.27859]	FALSE
1/20/2004	1	-9.21034	[0, -5.27859]	FALSE
7/8/2003	1	-7.95188	[0, -5.27859]	FALSE

0.0052996162

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-23S/R
Parameter: Cadmium

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	7/6/2000	ND<0.0002
	7/25/2001	0.00143
	1/16/2002	0.000815
	7/16/2002	0.00106
	1/16/2003	0.00079
	7/8/2003	ND<0.0002
	1/20/2004	0.00055
	7/30/2004	ND<0.0002
	1/25/2005	0.00065
	7/7/2005	0.00039

From 10 baseline samples
Baseline mean = 0.0005685
Baseline std Dev = 0.000483276

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.00039	[0, 0.00192944]	FALSE
1/25/2005	1	0.00065	[0, 0.00192944]	FALSE
7/30/2004	1	0.0002	[0, 0.00192944]	FALSE
1/20/2004	1	0.00055	[0, 0.00192944]	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-09/R
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 54.8387%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 31
Maximum Baseline Concentration = 0.0011
Confidence Level = 88.6%
False Positive Rate = 11.4%

Baseline Measurements	Date	Value
	6/7/1995	0.0006
	9/8/1995	0.0003
	10/23/1995	ND<0.0002
	11/27/1995	ND<0.0002
	1/22/1996	0.0002
	3/6/1996	0.0002
	4/24/1996	0.0005
	6/4/1996	0.0004
	7/15/1996	0.0002
	9/1/1996	0.0011
	12/1/1996	ND<0.0002
	1/1/1997	ND<0.0002
	7/1/1997	0.0007
	1/5/1998	ND<0.0002
	7/1/1998	ND<0.0002
	1/5/1999	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/16/2001	0.00103
	7/26/2001	0.00084
	7/18/2002	ND<0.0002
	1/17/2003	0.00056
	7/9/2003	ND<0.0002
	7/9/2003	ND<0.0002
	1/21/2004	ND<0.0002
	7/27/2004	0.00033
	1/20/2005	0.00039
	1/20/2005	ND<0.0002
	7/8/2005	ND<0.0002
	7/8/2005	ND<0.0002

Date	Count	Mean	Significant
7/8/2005	2	0.0002	FALSE
1/20/2005	2	0.000295	FALSE
7/27/2004	1	0.00033	FALSE
1/21/2004	1	0.0002	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-14D/R
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 63.6364%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.00057
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/15/2001	0.0004
	7/26/2001	0.00023
	1/17/2002	0.00057
	7/17/2002	ND<0.0002
	1/17/2003	ND<0.0002
	7/9/2003	ND<0.0002
	1/22/2004	0.00022
	7/29/2004	ND<0.0002
	7/11/2005	ND<0.0002

Date	Count	Mean	Significant
7/11/2005	1	0.0002	FALSE
7/29/2004	1	0.0002	FALSE
1/22/2004	1	0.00022	FALSE
7/9/2003	1	0.0002	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-16
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 83.871%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 31
Maximum Baseline Concentration = 0.001
Confidence Level = 88.6%
False Positive Rate = 11.4%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.0002
	9/8/1995	ND<0.0002
	10/23/1995	ND<0.0002
	11/27/1995	ND<0.0002
	1/22/1996	ND<0.0002
	3/6/1996	ND<0.0002
	4/24/1996	ND<0.0002
	6/4/1996	ND<0.0002
	7/15/1996	ND<0.0002
	9/1/1996	ND<0.0002
	12/1/1996	ND<0.0002
	7/1/1997	ND<0.0002
	7/1/1998	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/11/2001	ND<0.0002
	7/27/2001	0.0006
	7/27/2001	ND<0.0002
	7/18/2002	0.00024
	7/18/2002	ND<0.0002
	1/20/2003	0.00046
	7/10/2003	0.001
	7/10/2003	ND<0.0002
	7/10/2003	ND<0.0002
	1/20/2004	ND<0.0002
	1/20/2004	ND<0.0002
	7/28/2004	ND<0.0002
	1/24/2005	0.00025
	7/11/2005	ND<0.0002
	7/11/2005	ND<0.0002

Date	Count	Mean	Significant
7/11/2005	2	0.0002	FALSE
1/24/2005	1	0.00025	FALSE
7/28/2004	1	0.0002	FALSE
1/20/2004	2	0.0002	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-17

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 78.5714%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 28
Maximum Baseline Concentration = 0.00121
Confidence Level = 87.5%
False Positive Rate = 12.5%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.0002
	9/8/1995	ND<0.0002
	10/23/1995	ND<0.0002
	11/27/1995	ND<0.0002
	1/22/1996	ND<0.0002
	3/6/1996	ND<0.0002
	4/24/1996	ND<0.0002
	6/4/1996	ND<0.0002
	7/15/1996	ND<0.0002
	9/1/1996	ND<0.0002
	12/1/1996	ND<0.0002
	7/1/1997	ND<0.0002
	7/1/1998	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/11/2001	ND<0.0002
	7/27/2001	0.00121
	7/27/2001	ND<0.0002
	7/17/2002	0.00038
	1/20/2003	0.00065
	7/9/2003	ND<0.0002
	7/9/2003	ND<0.0002
	1/20/2004	0.00033
	1/20/2004	0.00033
	7/26/2004	0.00029
	1/24/2005	ND<0.0002
	7/8/2005	ND<0.0002

Date	Count	Mean	Significant
7/8/2005	2	0.0002	FALSE
1/24/2005	1	0.0002	FALSE
7/26/2004	1	0.00029	FALSE
1/20/2004	2	0.00033	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-18
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 80%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 30
Maximum Baseline Concentration = 0.00099
Confidence Level = 88.2%
False Positive Rate = 11.8%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.0002
	9/8/1995	ND<0.0002
	10/23/1995	ND<0.0002
	11/27/1995	ND<0.0002
	1/22/1996	ND<0.0002
	3/6/1996	ND<0.0002
	4/24/1996	ND<0.0002
	6/4/1996	ND<0.0002
	7/15/1996	ND<0.0002
	9/1/1996	ND<0.0002
	12/1/1996	ND<0.0002
	7/1/1997	ND<0.0002
	7/1/1998	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/10/2001	ND<0.0002
	7/27/2001	ND<0.0002
	7/27/2001	ND<0.0002
	7/18/2002	0.0008
	7/18/2002	ND<0.0002
	1/14/2003	0.00099
	7/9/2003	0.000262
	7/9/2003	ND<0.0002
	1/20/2004	0.00051
	1/20/2004	0.00051
	7/28/2004	0.00082
	1/24/2005	ND<0.0002
	7/7/2005	ND<0.0002
	7/7/2005	ND<0.0002

Date	Count	Mean	Significant
7/7/2005	2	0.0002	FALSE
1/24/2005	1	0.0002	FALSE
7/28/2004	1	0.00082	FALSE
1/20/2004	2	0.00051	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-19
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 83.3333%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.00033
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/15/2001	0.0003
	7/26/2001	0.00033
	1/15/2002	ND<0.0002
	7/18/2002	ND<0.0002
	1/15/2003	ND<0.0002
	7/10/2003	ND<0.0002
	1/21/2004	ND<0.0002
	7/29/2004	ND<0.0002
	1/20/2005	ND<0.0002
	7/12/2005	ND<0.0002

Date	Count	Mean	Significant
7/12/2005	1	0.0002	FALSE
1/20/2005	1	0.0002	FALSE
7/29/2004	1	0.0002	FALSE
1/21/2004	1	0.0002	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-20/R
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 20
Maximum Baseline Concentration = 0.00086
Confidence Level = 83.3%
False Positive Rate = 16.7%

Baseline Measurements	Date	Value
	11/27/1995	ND<0.0002
	6/4/1996	ND<0.0002
	12/1/1996	ND<0.0002
	1/1/1997	ND<0.0002
	7/1/1997	ND<0.0002
	1/5/1998	ND<0.0002
	7/1/1998	ND<0.0002
	1/5/1999	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	7/25/2001	0.00075
	1/16/2002	0.00049
	7/16/2002	0.00061
	1/16/2003	ND<0.0002
	7/8/2003	ND<0.0002
	1/20/2004	0.00086
	7/30/2004	0.00022
	1/25/2005	ND<0.0002
	7/7/2005	ND<0.0002

Date	Count	Mean	Significant
7/7/2005	1	0.0002	FALSE
1/25/2005	1	0.0002	FALSE
7/30/2004	1	0.00022	FALSE
1/20/2004	1	0.00086	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-24D/R
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 63.6364%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.00105
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.0002
	7/6/2000	0.0002
	7/25/2001	0.00105
	1/16/2002	0.00086
	7/16/2002	ND<0.0002
	1/16/2003	ND<0.0002
	7/8/2003	ND<0.0002
	1/20/2004	0.00047
	7/30/2004	ND<0.0002
	1/25/2005	ND<0.0002
	7/7/2005	ND<0.0002

Date	Count	Mean	Significant
7/7/2005	1	0.0002	FALSE
1/25/2005	1	0.0002	FALSE
7/30/2004	1	0.0002	FALSE
1/20/2004	1	0.00047	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-25
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 78.125%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 32
Maximum Baseline Concentration = 0.00291
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.0002
	9/8/1995	ND<0.0002
	10/23/1995	ND<0.0002
	11/27/1995	ND<0.0002
	1/22/1996	ND<0.0002
	3/6/1996	ND<0.0002
	4/24/1996	ND<0.0002
	6/4/1996	ND<0.0002
	7/15/1996	ND<0.0002
	9/1/1996	ND<0.0002
	12/1/1996	ND<0.0002
	1/1/1997	ND<0.0002
	7/1/1997	ND<0.0002
	1/5/1998	ND<0.0002
	7/1/1998	ND<0.0002
	1/5/1999	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/15/2001	0.00291
	7/26/2001	0.00181
	1/17/2002	ND<0.0002
	7/17/2002	0.00051
	1/20/2003	ND<0.0002
	7/9/2003	0.000801
	7/9/2003	0.000942
	1/22/2004	0.00026
	7/26/2004	0.0009
	1/24/2005	ND<0.0002
	1/24/2005	ND<0.0002
	7/11/2005	ND<0.0002
	7/11/2005	ND<0.0002

Date	Count	Mean	Significant
7/11/2005	2	0.0002	FALSE
1/24/2005	2	0.0002	FALSE
7/26/2004	1	0.0009	FALSE
1/22/2004	1	0.00026	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-40

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 47.619%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 21
Maximum Baseline Concentration = 0.00215
Confidence Level = 84%
False Positive Rate = 16%

Baseline Measurements	Date	Value
	11/27/1995	ND<0.0002
	6/4/1996	ND<0.0002
	12/1/1996	0.0003
	1/1/1997	ND<0.0002
	7/1/1997	ND<0.0002
	1/5/1998	ND<0.0002
	7/1/1998	ND<0.0002
	1/5/1999	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/15/2001	0.00215
	7/25/2001	0.00185
	1/16/2002	0.0003
	7/18/2002	0.00035
	1/15/2003	0.00075
	7/8/2003	0.000373
	1/21/2004	0.00035
	7/29/2004	0.00027
	1/20/2005	0.00022
	7/12/2005	0.00023

Date	Count	Mean	Significant
7/12/2005	1	0.00023	FALSE
1/20/2005	1	0.00022	FALSE
7/29/2004	1	0.00027	FALSE
1/21/2004	1	0.00035	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-41

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 32
Maximum Baseline Concentration = 0.00376
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.0002
	9/8/1995	ND<0.0002
	10/23/1995	ND<0.0002
	11/27/1995	ND<0.0002
	1/22/1996	ND<0.0002
	3/6/1996	ND<0.0002
	4/24/1996	ND<0.0002
	6/4/1996	ND<0.0002
	7/15/1996	ND<0.0002
	9/1/1996	ND<0.0002
	12/1/1996	ND<0.0002
	1/1/1997	ND<0.0002
	7/1/1997	ND<0.0002
	1/5/1998	ND<0.0002
	7/1/1998	ND<0.0002
	1/5/1999	ND<0.0002
	7/6/1999	ND<0.0002
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/16/2001	0.00376
	7/26/2001	0.00147
	1/17/2002	0.00112
	7/17/2002	0.00032
	1/20/2003	ND<0.0002
	7/9/2003	ND<0.0002
	7/9/2003	ND<0.0002
	1/22/2004	ND<0.0002
	7/26/2004	ND<0.0002
	1/20/2005	ND<0.0002
	1/20/2005	ND<0.0002
	7/11/2005	ND<0.0002
	7/11/2005	ND<0.0002

Date	Count	Mean	Significant
7/11/2005	2	0.0002	FALSE
1/20/2005	2	0.0002	FALSE
7/26/2004	1	0.0002	FALSE
1/22/2004	1	0.0002	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-43D
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 66.6667%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.00126
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/10/2001	ND<0.0002
	7/27/2001	0.00126
	1/16/2002	0.00022
	7/17/2002	ND<0.0002
	1/17/2003	ND<0.0002
	7/8/2003	ND<0.0002
	1/21/2004	0.00045
	7/29/2004	ND<0.0002
	1/25/2005	0.00037
	7/11/2005	ND<0.0002

Date	Count	Mean	Significant
7/11/2005	1	0.0002	FALSE
1/25/2005	1	0.00037	FALSE
7/29/2004	1	0.0002	FALSE
1/21/2004	1	0.00045	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-43S
Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 50%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.00389
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	0.0002
	7/6/2000	0.0005
	1/15/2001	0.00389
	7/25/2001	0.00128
	1/16/2002	ND<0.0002
	7/17/2002	0.0002
	1/17/2003	ND<0.0002
	7/8/2003	ND<0.0002
	1/21/2004	0.00022
	7/29/2004	ND<0.0002
	1/20/2005	ND<0.0002
	7/11/2005	ND<0.0002

Date	Count	Mean	Significant
7/11/2005	1	0.0002	FALSE
1/20/2005	1	0.0002	FALSE
7/29/2004	1	0.0002	FALSE
1/21/2004	1	0.00022	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-44
Parameter: Cadmium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 60%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 15
Maximum Baseline Concentration = 0.00259
Confidence Level = 78.9%
False Positive Rate = 21.1%

Baseline Measurements	Date	Value
	7/1/1998	ND<0.0002
	1/5/1999	ND<0.0002
	7/6/1999	0.0003
	1/5/2000	ND<0.0002
	7/6/2000	0.0004
	1/15/2001	0.00259
	7/25/2001	0.00107
	1/16/2002	0.000545
	7/18/2002	ND<0.0002
	1/15/2003	ND<0.0002
	7/8/2003	ND<0.0002
	1/21/2004	ND<0.0002
	7/29/2004	ND<0.0002
	1/20/2005	ND<0.0002
	7/12/2005	0.00026

Date	Count	Mean	Significant
7/12/2005	1	0.00026	FALSE
1/20/2005	1	0.0002	FALSE
7/29/2004	1	0.0002	FALSE
1/21/2004	1	0.0002	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-45

Parameter: Cadmium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 81.8182%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.00116
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.0002
	7/6/2000	ND<0.0002
	1/15/2001	0.00093
	1/16/2002	0.00116
	1/17/2003	ND<0.0002
	7/9/2003	ND<0.0002
	1/20/2004	ND<0.0002
	1/20/2004	ND<0.0002
	7/29/2004	ND<0.0002
	1/25/2005	ND<0.0002
	7/12/2005	ND<0.0002

Date	Count	Mean	Significant
7/12/2005	1	0.0002	FALSE
1/25/2005	1	0.0002	FALSE
7/29/2004	1	0.0002	FALSE
1/20/2004	2	0.0002	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-14S/R
Parameter: Chromium

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<-7.6009
	7/6/2000	ND<-7.6009
	1/15/2001	-6.21461
	7/26/2001	-4.96185
	1/17/2002	-6.21461
	1/17/2003	ND<-7.6009
	7/9/2003	ND<-7.6009
	1/22/2004	-4.89285
	7/29/2004	-6.50229
	7/11/2005	-4.50986

From 10 baseline samples
Baseline mean = -6.36997
Baseline std Dev = 1.23609

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	-4.50986	[0, -2.88906]	FALSE
7/29/2004	1	-6.50229	[0, -2.88906]	FALSE
1/22/2004	1	-4.89285	[0, -2.88906]	FALSE
7/9/2003	1	-7.6009	[0, -2.88906]	FALSE

✓ 0.0556284788

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-21SR
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/12/2001	0.006
	7/25/2001	0.004
	1/16/2002	ND<0.001
	7/16/2002	0.001
	1/15/2003	0.007
	7/8/2003	0.001
	7/30/2004	0.002
	1/25/2005	0.0012
	7/7/2005	0.0059

From 9 baseline samples
Baseline mean = 0.00323333
Baseline std Dev = 0.002504

For 4 recent sampling event(s)
95% confidence t = 2.75153 at 8 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.0059	[0, 0.0104958]	FALSE
1/25/2005	1	0.0012	[0, 0.0104958]	FALSE
7/30/2004	1	0.002	[0, 0.0104958]	FALSE
7/8/2003	1	0.001	[0, 0.0104958]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-22D/R
Parameter: Chromium

Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/16/2001	ND<0.001
	7/25/2001	0.005
	1/16/2002	ND<0.001
	7/16/2002	0.001
	1/15/2003	ND<0.001
	7/8/2003	0.002
	1/20/2004	0.0064
	7/30/2004	0.0013
	1/25/2005	ND<0.001
	7/7/2005	0.0062

From 10 baseline samples
Baseline mean = 0.00219
Baseline std Dev = 0.00264846

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	0.0062	[0, 0.00964823]	FALSE
1/25/2005	1	0.001	[0, 0.00964823]	FALSE
7/30/2004	1	0.0013	[0, 0.00964823]	FALSE
1/20/2004	1	0.0064	[0, 0.00964823]	FALSE

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-23S/R
Parameter: Chromium

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	7/6/2000	ND<-7.6009
	7/25/2001	-5.80914
	1/16/2002	-6.90776
	7/16/2002	ND<-7.6009
	1/16/2003	-6.90776
	7/8/2003	ND<-7.6009
	1/20/2004	-5.00565
	7/30/2004	-6.72543
	1/25/2005	-6.81245
	7/7/2005	-5.68398

From 10 baseline samples
Baseline mean = -6.66549
Baseline std Dev = 0.895627

For 4 recent sampling event(s)
95% confidence t = 2.68501 at 9 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/7/2005	1	-5.68398	[0, -4.14334]	FALSE
1/25/2005	1	-6.81245	[0, -4.14334]	FALSE
7/30/2004	1	-6.72543	[0, -4.14334]	FALSE
1/20/2004	1	-5.00565	[0, -4.14334]	FALSE

0.01586975779
✓

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-43S
Parameter: Chromium

Natural Logarithm Transformation
Non-Detects Replaced with 1/2 DL

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<-7.6009
	7/6/2000	ND<-7.6009
	1/15/2001	-6.21461
	7/25/2001	-5.80914
	1/16/2002	-6.90776
	7/17/2002	-5.80914
	1/17/2003	ND<-7.6009
	7/8/2003	ND<-7.6009
	1/21/2004	-4.91988
	7/29/2004	-6.21461
	1/20/2005	-4.60517
	7/11/2005	-5.42615

From 12 baseline samples
Baseline mean = -6.35917
Baseline std Dev = 1.0927

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/11/2005	1	-5.42615	[0, -3.40999]	FALSE
1/20/2005	1	-4.60517	[0, -3.40999]	FALSE
7/29/2004	1	-6.21461	[0, -3.40999]	FALSE
1/21/2004	1	-4.91988	[0, -3.40999]	FALSE

0.6336415348 ✓

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-45
Parameter: Chromium
Original Data (Not Transformed)
Aitchison's Adjustment

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.002
	7/25/2001	0.002
	1/16/2002	0.002
	1/17/2003	ND<0.001
	7/9/2003	ND<0.001
	1/20/2004	0.0045
	1/20/2004	0.0045
	7/29/2004	0.0017
	1/25/2005	0.0016
	7/12/2005	0.0038

From 12 baseline samples
Baseline mean = 0.00184167
Baseline std Dev = 0.0016973

For 4 recent sampling event(s)
95% confidence t = 2.5931 at 11 degrees of freedom

Date	Samples	Mean	Interval	Significant
7/12/2005	1	0.0038	[0, 0.00642265]	FALSE
1/25/2005	1	0.0016	[0, 0.00642265]	FALSE
7/29/2004	1	0.0017	[0, 0.00642265]	FALSE
1/20/2004	2	0.0045	[0, 0.00520319]	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-09/R
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 32
Maximum Baseline Concentration = 0.0051
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/16/2001	ND<0.001
	7/26/2001	0.001
	7/18/2002	ND<0.001
	1/17/2003	0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/21/2004	0.0027
	7/27/2004	ND<0.001
	1/20/2005	0.0018
	1/20/2005	0.0013
	4/15/2005	ND<0.001
	4/15/2005	0.0014
	7/8/2005	0.0048
	7/8/2005	0.0051

Date	Count	Mean	Significant
7/8/2005	2	0.00495	FALSE
4/15/2005	2	0.0012	FALSE
1/20/2005	2	0.00155	FALSE
7/27/2004	1	0.001	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-14D/R

Parameter: Chromium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 54.5455%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.0042
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/26/2001	0.002
	1/17/2002	0.001
	7/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	0.0042
	7/29/2004	0.0015
	7/11/2005	0.0039

Date	Count	Mean	Significant
7/11/2005	1	0.0039	FALSE
7/29/2004	1	0.0015	FALSE
1/22/2004	1	0.0042	FALSE
7/9/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-16
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 70.9677%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 31
Maximum Baseline Concentration = 0.0072
Confidence Level = 88.6%
False Positive Rate = 11.4%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	7/1/1997	ND<0.001
	7/1/1998	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/11/2001	ND<0.001
	7/27/2001	ND<0.001
	7/27/2001	0.005
	7/18/2002	0.007
	7/18/2002	0.001
	1/20/2003	ND<0.001
	7/10/2003	0.003
	7/10/2003	ND<0.001
	7/10/2003	ND<0.001
	1/20/2004	0.0072
	1/20/2004	0.0072
	7/28/2004	ND<0.001
	1/24/2005	ND<0.001
	7/11/2005	0.0049
	7/11/2005	0.0028

Date	Count	Mean	Significant
7/11/2005	2	0.00385	FALSE
1/24/2005	1	0.001	FALSE
7/28/2004	1	0.001	FALSE
1/20/2004	2	0.0072	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-17
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 72.4138%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 29
Maximum Baseline Concentration = 0.0076
Confidence Level = 87.9%
False Positive Rate = 12.1%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	7/1/1997	ND<0.001
	7/1/1998	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/11/2001	ND<0.001
	7/27/2001	0.007
	7/27/2001	0.003
	7/17/2002	ND<0.001
	1/20/2003	ND<0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/20/2004	0.0061
	1/20/2004	0.0061
	7/26/2004	0.001
	1/24/2005	0.001
	7/8/2005	0.0076
	7/8/2005	0.0052

Date	Count	Mean	Significant
7/8/2005	2	0.0064	FALSE
1/24/2005	1	0.001	FALSE
7/26/2004	1	0.001	FALSE
1/20/2004	2	0.0061	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-18
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 76.6667%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 30
Maximum Baseline Concentration = 0.007
Confidence Level = 88.2%
False Positive Rate = 11.8%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	7/1/1997	ND<0.001
	7/1/1998	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/10/2001	ND<0.001
	7/27/2001	ND<0.001
	7/27/2001	0.002
	7/18/2002	0.007
	7/18/2002	0.002
	1/14/2003	ND<0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/20/2004	0.0063
	1/20/2004	0.0063
	7/28/2004	ND<0.001
	1/24/2005	ND<0.001
	7/7/2005	0.0044
	7/7/2005	0.0053

Date	Count	Mean	Significant
7/7/2005	2	0.00485	FALSE
1/24/2005	1	0.001	FALSE
7/28/2004	1	0.001	FALSE
1/20/2004	2	0.0063	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-19
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 58.3333%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.027
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/26/2001	0.027
	1/15/2002	ND<0.001
	7/18/2002	ND<0.001
	1/15/2003	ND<0.001
	7/10/2003	ND<0.001
	1/21/2004	0.012
	7/29/2004	0.0027
	1/20/2005	0.0034
	7/12/2005	0.0065

Date	Count	Mean	Significant
7/12/2005	1	0.0065	FALSE
1/20/2005	1	0.0034	FALSE
7/29/2004	1	0.0027	FALSE
1/21/2004	1	0.012	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-20/R
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 20
Maximum Baseline Concentration = 0.0052
Confidence Level = 83.3%
False Positive Rate = 16.7%

Baseline Measurements	Date	Value
	11/27/1995	ND<0.001
	6/4/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/16/2002	0.001
	1/16/2003	ND<0.001
	7/8/2003	ND<0.001
	1/20/2004	0.0049
	7/30/2004	0.0012
	1/25/2005	0.0011
	7/7/2005	0.0052

Date	Count	Mean	Significant
7/7/2005	1	0.0052	FALSE
1/25/2005	1	0.0011	FALSE
7/30/2004	1	0.0012	FALSE
1/20/2004	1	0.0049	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-24D/R
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 63.6364%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 11
Maximum Baseline Concentration = 0.0058
Confidence Level = 73.3%
False Positive Rate = 26.7%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/16/2002	ND<0.001
	1/16/2003	ND<0.001
	7/8/2003	ND<0.001
	1/20/2004	0.003
	7/30/2004	0.0011
	1/25/2005	0.0011
	7/7/2005	0.0058

Date	Count	Mean	Significant
7/7/2005	1	0.0058	FALSE
1/25/2005	1	0.0011	FALSE
7/30/2004	1	0.0011	FALSE
1/20/2004	1	0.003	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-25
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 80.6452%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 31
Maximum Baseline Concentration = 0.0075
Confidence Level = 88.6%
False Positive Rate = 11.4%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	0.003
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	ND<0.001
	7/26/2001	0.001
	1/17/2002	ND<0.001
	7/17/2002	ND<0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	0.0054
	7/26/2004	ND<0.001
	1/24/2005	0.0013
	1/24/2005	ND<0.001
	7/11/2005	0.0075
	7/11/2005	0.0072

Date	Count	Mean	Significant
7/11/2005	2	0.00735	FALSE
1/24/2005	2	0.00115	FALSE
7/26/2004	1	0.001	FALSE
1/22/2004	1	0.0054	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-40
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 57.1429%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 21
Maximum Baseline Concentration = 0.0092
Confidence Level = 84%
False Positive Rate = 16%

Baseline Measurements	Date	Value
	11/27/1995	ND<0.001
	6/4/1996	ND<0.001
	12/1/1996	0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.002
	7/25/2001	0.002
	1/16/2002	ND<0.001
	7/18/2002	0.001
	1/15/2003	0.002
	7/8/2003	ND<0.001
	1/21/2004	0.0092
	7/29/2004	0.0027
	1/20/2005	0.0015
	7/12/2005	0.005

Date	Count	Mean	Significant
7/12/2005	1	0.005	FALSE
1/20/2005	1	0.0015	FALSE
7/29/2004	1	0.0027	FALSE
1/21/2004	1	0.0092	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-41
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 69.697%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 33
Maximum Baseline Concentration = 0.0074
Confidence Level = 89.2%
False Positive Rate = 10.8%

Baseline Measurements	Date	Value
	6/7/1995	0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/16/2001	0.003
	1/17/2002	0.002
	7/17/2002	ND<0.001
	1/20/2003	ND<0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	0.0074
	7/26/2004	0.0014
	1/20/2005	0.0026
	1/20/2005	0.0017
	4/15/2005	ND<0.001
	4/15/2005	0.0045
	7/11/2005	0.0057
	7/11/2005	0.0072

Date	Count	Mean	Significant
7/11/2005	2	0.00645	FALSE
4/15/2005	2	0.00275	FALSE
1/20/2005	2	0.00215	FALSE
7/26/2004	1	0.0014	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-43D
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 58.3333%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.0073
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/10/2001	ND<0.001
	7/27/2001	0.002
	1/16/2002	ND<0.001
	7/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/8/2003	ND<0.001
	1/21/2004	0.0073
	7/29/2004	0.0014
	1/25/2005	0.0013
	7/11/2005	0.0027

Date	Count	Mean	Significant
7/11/2005	1	0.0027	FALSE
1/25/2005	1	0.0013	FALSE
7/29/2004	1	0.0014	FALSE
1/21/2004	1	0.0073	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-44
Parameter: Chromium
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 57.1429%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 14
Maximum Baseline Concentration = 0.0062
Confidence Level = 77.8%
False Positive Rate = 22.2%

Baseline Measurements	Date	Value
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.001
	7/25/2001	0.003
	1/16/2002	ND<0.001
	7/18/2002	ND<0.001
	1/15/2003	ND<0.001
	7/8/2003	ND<0.001
	1/21/2004	0.0062
	7/29/2004	0.0021
	1/20/2005	0.0022
	7/12/2005	0.0043

Date	Count	Mean	Significant
7/12/2005	1	0.0043	FALSE
1/20/2005	1	0.0022	FALSE
7/29/2004	1	0.0021	FALSE
1/21/2004	1	0.0062	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-09/R
Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 90%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 30
Maximum Baseline Concentration = 0.005
Confidence Level = 88.2%
False Positive Rate = 11.8%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/16/2001	0.005
	7/26/2001	0.002
	7/18/2002	ND<0.001
	1/17/2003	0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/21/2004	ND<0.001
	7/27/2004	ND<0.001
	1/20/2005	ND<0.001
	1/20/2005	ND<0.001
	7/8/2005	ND<0.001
	7/8/2005	ND<0.001

Date	Count	Mean	Significant
7/8/2005	2	0.001	FALSE
1/20/2005	2	0.001	FALSE
7/27/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-14S/R
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 80%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 10
Maximum Baseline Concentration = 0.009
Confidence Level = 71.4%
False Positive Rate = 28.6%

Baseline Measurements	Date	Value
	1/5/2000	0.001
	7/6/2000	ND<0.001
	1/15/2001	0.009
	7/26/2001	ND<0.001
	1/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	ND<0.001
	7/29/2004	ND<0.001
	7/11/2005	ND<0.001

Date	Count	Mean	Significant
7/11/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/22/2004	1	0.001	FALSE
7/9/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-17
Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 89.2857%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 28
Maximum Baseline Concentration = 0.004
Confidence Level = 87.5%
False Positive Rate = 12.5%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	7/1/1997	ND<0.001
	7/1/1998	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/11/2001	ND<0.001
	7/27/2001	ND<0.001
	7/17/2002	0.001
	1/20/2003	ND<0.001
	7/9/2003	0.004
	7/9/2003	ND<0.001
	1/20/2004	ND<0.001
	1/20/2004	ND<0.001
	7/26/2004	0.0016
	1/24/2005	ND<0.001
	7/8/2005	ND<0.001
	7/8/2005	ND<0.001

Date	Count	Mean	Significant
7/8/2005	2	0.001	FALSE
1/24/2005	1	0.001	FALSE
7/26/2004	1	0.0016	FALSE
1/20/2004	2	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-19
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 58.3333%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.0013
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.001
	7/26/2001	0.001
	1/15/2002	0.001
	7/18/2002	ND<0.001
	1/15/2003	ND<0.001
	7/10/2003	ND<0.001
	1/21/2004	0.0013
	7/29/2004	ND<0.001
	1/20/2005	ND<0.001
	7/12/2005	0.0011

Date	Count	Mean	Significant
7/12/2005	1	0.0011	FALSE
1/20/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.0013	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-21SR
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.001
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	1/12/2001	0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/16/2002	ND<0.001
	1/15/2003	0.001
	7/30/2004	ND<0.001
	1/25/2005	ND<0.001
	7/7/2005	ND<0.001

Date	Count	Mean	Significant
7/7/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/30/2004	1	0.001	FALSE
1/15/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-23S/R
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 70%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 10
Maximum Baseline Concentration = 0.006
Confidence Level = 71.4%
False Positive Rate = 28.6%

Baseline Measurements	Date	Value
	7/6/2000	ND<0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/16/2002	ND<0.001
	1/16/2003	0.001
	7/8/2003	0.006
	1/20/2004	0.001
	7/30/2004	ND<0.001
	1/25/2005	ND<0.001
	7/7/2005	ND<0.001

Date	Count	Mean	Significant
7/7/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/30/2004	1	0.001	FALSE
1/20/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-25
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 32
Maximum Baseline Concentration = 0.004
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001
	7/15/1996	ND<0.001
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.004
	7/26/2001	ND<0.001
	1/17/2002	ND<0.001
	7/17/2002	ND<0.001
	1/20/2003	ND<0.001
	7/9/2003	0.004
	7/9/2003	0.003
	1/22/2004	0.0024
	7/26/2004	ND<0.001
	1/24/2005	ND<0.001
	1/24/2005	ND<0.001
	7/11/2005	ND<0.001
	7/11/2005	ND<0.001

Date	Count	Mean	Significant
7/11/2005	2	0.001	FALSE
1/24/2005	2	0.001	FALSE
7/26/2004	1	0.001	FALSE
1/22/2004	1	0.0024	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-41
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 83.871%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 31
Maximum Baseline Concentration = 0.004
Confidence Level = 88.6%
False Positive Rate = 11.4%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	0.004
	10/23/1995	0.004
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	0.002
	4/24/1996	0.002
	6/4/1996	ND<0.001
	7/15/1996	0.002
	9/1/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	7/26/2001	ND<0.001
	1/17/2002	ND<0.001
	7/17/2002	ND<0.001
	1/20/2003	ND<0.001
	7/9/2003	ND<0.001
	7/9/2003	ND<0.001
	1/22/2004	ND<0.001
	7/26/2004	ND<0.001
	1/20/2005	ND<0.001
	1/20/2005	ND<0.001
	7/11/2005	ND<0.001
	7/11/2005	ND<0.001

Date	Count	Mean	Significant
7/11/2005	2	0.001	FALSE
1/20/2005	2	0.001	FALSE
7/26/2004	1	0.001	FALSE
1/22/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-43S
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.004
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.001
	7/25/2001	0.001
	1/16/2002	ND<0.001
	7/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/8/2003	0.004
	1/21/2004	ND<0.001
	7/29/2004	ND<0.001
	1/20/2005	ND<0.001
	7/11/2005	ND<0.001

Date	Count	Mean	Significant
7/11/2005	1	0.001	FALSE
1/20/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-45
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 91.6667%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 12
Maximum Baseline Concentration = 0.001
Confidence Level = 75%
False Positive Rate = 25%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.001
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	1/17/2003	ND<0.001
	7/9/2003	ND<0.001
	1/20/2004	ND<0.001
	1/20/2004	ND<0.001
	7/29/2004	ND<0.001
	1/25/2005	ND<0.001
	7/12/2005	ND<0.001

Date	Count	Mean	Significant
7/12/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/20/2004	2	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-14D/R
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 62.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.003
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	1/5/2000	0.002
	7/6/2000	0.003
	1/15/2001	ND<0.001
	7/26/2001	ND<0.001
	1/17/2002	ND<0.001
	7/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/9/2003	0.001

Date	Count	Mean	Significant
7/11/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/22/2004	1	0.001	FALSE
7/9/2003	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-16
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 100%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.001
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001

Date	Count	Mean	Significant
7/11/2005	2	0.001	FALSE
1/24/2005	1	0.001	FALSE
7/28/2004	1	0.001	FALSE
1/20/2004	2	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-18
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 100%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.001
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	6/7/1995	ND<0.001
	9/8/1995	ND<0.001
	10/23/1995	ND<0.001
	11/27/1995	ND<0.001
	1/22/1996	ND<0.001
	3/6/1996	ND<0.001
	4/24/1996	ND<0.001
	6/4/1996	ND<0.001

Date	Count	Mean	Significant
7/7/2005	2	0.001	FALSE
1/24/2005	1	0.001	FALSE
7/28/2004	1	0.001	FALSE
1/20/2004	2	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-20/R
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.002
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	11/27/1995	0.002
	6/4/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001

Date	Count	Mean	Significant
7/7/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/30/2004	1	0.001	FALSE
1/20/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-22D/R
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 50%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.003
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	1/16/2001	0.001
	7/25/2001	0.002
	1/16/2002	ND<0.001
	7/16/2002	ND<0.001
	1/15/2003	0.001
	7/8/2003	0.003
	1/20/2004	ND<0.001
	7/30/2004	ND<0.001

Date	Count	Mean	Significant
7/7/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/30/2004	1	0.001	FALSE
1/20/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-24D/R
Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.003
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	7/25/2001	ND<0.001
	1/16/2002	ND<0.001
	7/16/2002	ND<0.001
	1/16/2003	ND<0.001
	7/8/2003	0.003
	1/20/2004	ND<0.001
	7/30/2004	ND<0.001
	1/25/2005	ND<0.001

Date	Count	Mean	Significant
7/7/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/30/2004	1	0.001	FALSE
1/20/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-40
Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.001
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurement	Date	Value
	11/27/1995	0.001
	6/4/1996	ND<0.001
	12/1/1996	ND<0.001
	1/1/1997	ND<0.001
	7/1/1997	ND<0.001
	1/5/1998	ND<0.001
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001

Date	Count	Mean	Significant
7/12/2005	**1**	**0.002**	**TRUE**
1/20/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-43D
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 87.5%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.001
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/10/2001	ND<0.001
	7/27/2001	ND<0.001
	1/16/2002	0.001
	7/17/2002	ND<0.001
	1/17/2003	ND<0.001
	7/8/2003	ND<0.001

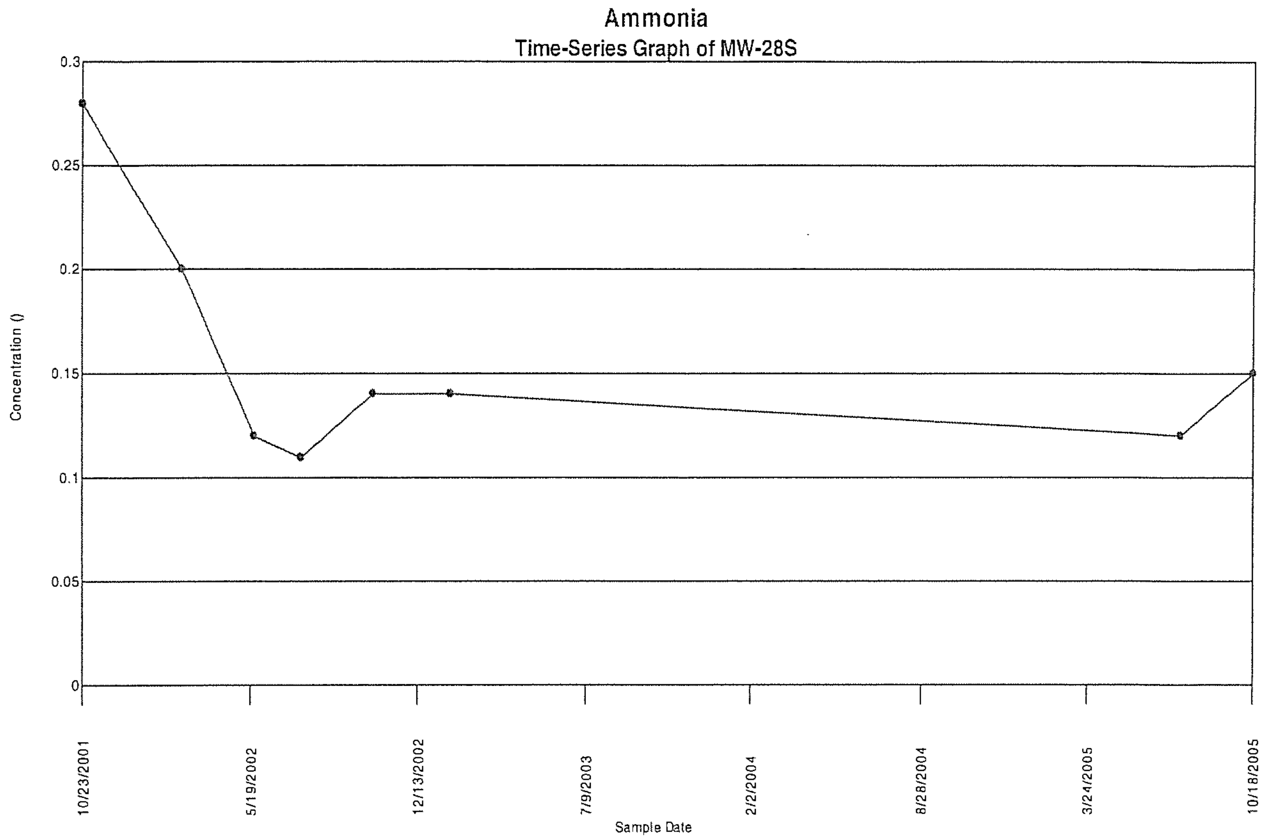
Date	Count	Mean	Significant
7/11/2005	1	0.001	FALSE
1/25/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE

Non-Parametric Prediction Interval
Intra-Well Comparison for MW-44
Parameter: Lead
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 4
Recent Dates = 4
Baseline Measurements (n) = 8
Maximum Baseline Concentration = 0.002
Confidence Level = 66.7%
False Positive Rate = 33.3%

Baseline Measurements	Date	Value
	7/1/1998	ND<0.001
	1/5/1999	ND<0.001
	7/6/1999	ND<0.001
	1/5/2000	ND<0.001
	7/6/2000	ND<0.001
	1/15/2001	0.002
	7/25/2001	0.001
	1/16/2002	ND<0.001

Date	Count	Mean	Significant
7/12/2005	1	0.001	FALSE
1/20/2005	1	0.001	FALSE
7/29/2004	1	0.001	FALSE
1/21/2004	1	0.001	FALSE


Ammonia
Time-Series Graph of MW-28S
Concentration ()
0.3
0.25
0.2
0.15
0.1
0.05
0
10/23/2001
5/19/2002
12/13/2002
7/9/2003
2/2/2004
8/28/2004
3/24/2005
10/18/2005
Sample Date

Concentrations

Parameter: Ammonia

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
Total Measurements: 16
Total Non-Detect: 1
Percent Non-Detects: 6.25%
Total Background Measurements: 16
There are 2 background locations

Loc.	Meas.	ND	Date	Conc.	Original
MW-28D	8	1 (12.5%)	10/23/2001	0.39	0.39
			2/22/2002	0.2	0.2
			5/23/2002	ND<0.01	ND<0.01
			7/23/2002	0.15	0.15
			10/21/2002	0.14	0.14
			1/23/2003	0.15	0.15
			7/18/2005	0.14	0.14
			10/18/2005	0.2	0.2
MW-28S	8	0 (0%)	10/23/2001	0.28	0.28
			2/22/2002	0.2	0.2
			5/23/2002	0.12	0.12
			7/23/2002	0.11	0.11
			10/21/2002	0.14	0.14
			1/23/2003	0.14	0.14
			7/18/2005	0.12	0.12
			10/18/2005	0.15	0.15

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Skewness Coefficient

Parameter: Ammonia

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Skewness > 1 indicates positively skewed data
Skewness < -1 indicates negatively skewed data

Background Locations

Location	Obs.	Mean	Std. Dev.	Skewness
MW-28D	8	0.1725	0.105796	0.767142
MW-28S	8	0.1575	0.0567576	**1.41264**

All Locations

Obs.	Mean	Std. Dev.	Skewness
16	0.165	0.0823812	**1.09543**

Shapiro-Wilks Test of Normality
Parameter: Ammonia
Location: MW-28S
Normality Test of Parameter Concentrations

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit
K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	0.11	0.28	0.17	0.6052	0.102884
2	0.12	0.2	0.08	0.3164	0.025312
3	0.12	0.15	0.03	0.1743	0.005229
4	0.14	0.14	0	0.0561	0
5	0.14	0.14	0		
6	0.15	0.12	-0.03		
7	0.2	0.12	-0.08		
8	0.28	0.11	-0.17		

Sum of b values = 0.133425
Sample Standard Deviation = 0.0567576
W Statistic = 0.789456

5% Critical value of 0.818 exceeds 0.789456
Evidence of non-normality at 95% level of significance

1% Critical value of 0.749 is less than 0.789456
Data is normally distributed at 99% level of significance

Parametric Prediction Interval Analysis
Intra-Well Comparison for MW-28S
Parameter: Ammonia
Natural Logarithm Transformation
Non-Detects Replaced with Detection Limit

Intra-Well USEPA (1989/1992) Formula 95% Comparison

Baseline Samples	Date	Result
	10/23/2001	-1.27297
	2/22/2002	-1.60944
	5/23/2002	-2.12026
	7/23/2002	-2.20727
	10/21/2002	-1.96611
	1/23/2003	-1.96611
	7/18/2005	-2.12026
	10/18/2005	-1.89712

From 8 baseline samples
Baseline mean = -1.89494
Baseline std Dev = 0.311126

For 5 recent sampling event(s)
95% confidence t = 2.99795 at 7 degrees of freedom

Date	Samples	Mean	Interval	Significant
10/18/2005	1	-1.89712	[0, -0.905625]	FALSE
7/18/2005	1	-2.12026	[0, -0.905625]	FALSE
1/23/2003	1	-1.96611	[0, -0.905625]	FALSE
10/21/2002	1	-1.96611	[0, -0.905625]	FALSE
7/23/2002	1	-2.20727	[0, -0.905625]	FALSE

e ^ -0.905625 = 0.404259154

APPENDIX G

Post-Closure Cost Estimate and Financial Assurance

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

EGLE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 16, 2019

Mr. Todd Granger
Granger Land Development Company
16980 Wood Road
Lansing, Michigan 48906

Dear Mr. Granger:

SUBJECT: In Compliance Determination: Financial Assurance for Postclosure Care; Granger Land Development Company, Grand Ledge, Michigan; MID 082 771 700; Waste Data System Number 397449

Effective April 22, 2019, the Michigan Department of Environmental Quality, Waste Management and Radiological Protection Division, became the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Materials Management Division (MMD).

On July 10, 2019, EGLE, MMD, conducted a financial record review (FRR) of the Trust Agreement between The Bank of New York Mellon, Granger Land Development Company (Granger), and EGLE to demonstrate financial assurance for postclosure care at the Granger Grand River Landfill located at 8550 West Grand River Highway, Grand Ledge, Michigan.

Granger's establishment of financial assurance for post-closure is required by Condition II.J, Financial Assurance for Postclosure, of its Hazardous Waste Management Facility Operating License issued pursuant to Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, and its administrative rules.

Based on the FRR, the MMD hereby determines that Granger is in compliance with the Part 111 financial assurance requirements.

If you have any questions, please feel free to contact me at 517-284-6574; TysonK@Michigan.gov; or EGLE, MMD, P.O. Box 30241, Lansing, Michigan 48909-7741.

Todd
7/23/2019

Sincerely,

Kimberly M. Tyson

Kimberly M. Tyson, P.E., Supervisor
Permit and Corrective Action
Hazardous Waste Section
Materials Management Division

cc: Ms. Christine Matlock, EGLE
HWS-C&E File

Table 4.1

Post-Closure Cost Estimate

Granger MID 082 771 700
55.2 acres

Conditions:

1. Inflation Adjustment - adjusted annually — 1.02
   Gross Domestic Product Implicit Price Deflator
   Base Year Oct 2015 — 220.506
   October 2016 — 224.271
2. 30-year Post-Closure Period from April 13, 1990
3. Remaining Years of Post-Closure: — 3.02
4. Estimate completed: — 3/28/2017

			Annual Cost	Total Cost
1.0 Groundwater Monitoring				
Groundwater Monitoring			$ 19,950	$ 60,342
	3	deep wells		
$	570	per well/per year		
	16	wells		
$	570	per well/per 6 months		
Repair/Replacement of Monitoring Wells			$ 1,250.00	$ 3,780.82
$	1,250	per repair		
	1	repairs/year or replacement/5 yrs		
Surface Water Monitoring			$ 3,011.22	$ 9,107.91
	6	samples per year		
$	501.87	per sample		
2.0 Leachate Management				
Leachate Disposal			$ 3,595.37	$ 10,874.75
$	0.0065	per gallon (based on SCCMUA costs - 2014)		
	10,000	gallons per acre per year		
Leachate Pump Station Maintenance (replacement of floats, pumps, etc.)			$ 866.12	$ 2,619.70
$	411.32	Materials		
$	454.80	Labor (12 hrs)		
Leachate Pump Station Electrical Requirements			$ 255.24	$ 772.01
	23	gpm pump		
	10	hp motor		
	552,000	gallons/yr		
	0.746	kwh/hp-hr.		
	2984.00	kwh/yr		
$	0.0855	cost per kwh		
Leachate Monitoring			$ 501.87	$ 1,517.98
$	501.87	average cost per year		

3.0 Final Cover Maintenance

Semi-Annual Inspection		$	1,475.64	$	4,463.31
8	hrs. per inspection				
$ 92.23	labor rate (inspector)				
Mowing		$	7,994.06	$	24,179.31
$ 72.41	per acre				
2	mowing per year				
Cap Repair & Maintenance (1 acre/yr.)		$	8,352.45	$	25,263.31
$ 1,715.66	Materials				
$ 90.12	Equipment per hour (1 equip. wks/year)				
$ 37.90	Labor per hour (2 wks/year)				

4.0 Storm Water Controls

Storm Water Retention pond/ditch maintenance:		$	1,024.16	$	3,097.73
$ 90.12	Equipment (8 hrs per year)				
$ 37.90	Labor(8 hours per year)				

5.0 Misc. Maintenance

Repair of Fencing & Security Devices		$	385.54	$	1,166.13
15	ft. per year				
$ 13.07	per linear foot (fencing)				
$ 189.50	Labor (5 hrs)				
Resurvey of Benchmarks & Monitoring Wells					
4	hrs per year	$	122.98	$	371.99
$ 61.49	per hr (survey crew)				
	performed every other year (/2)				

6.0 Groundwater Remediation - Purge System

Purge System Monitoring	$	1,995.46	$	6,035.58
7 samples (quarterly monitoring)				
$ 71.27 per sample				
Purge Well Replacement	$	800.00	$	2,419.73
4 wells				
$ 4,000.00 per repair/replacement				
$ 800.00 per year (pro-rated annual repair cost)				
Purge Well System Discharge	$	62,777	$	189,879
9,638,241 purge water volume (gallons)				
$ 0.007 disposal cost per gallon				
Purge System Maintenance	$	609.28	$	1,842.87
$ 457.68 Materials				
$ 151.60 Labor (4 hrs)				
Purge System Electrical Requirements	$	1,952.43	$	9,762.13
4 hp motor				
21 gpm pump(s)				
9,638,241 gallons/yr				
0.746 kwh/hp-hr				
22826 kwh/yr.				
$ 0.086 cost per kwh				
SUBTOTAL:	$	116,919.01	$	357,496.66
Administrative Costs: (15%)	$	17,537.85	$	53,045.99
Third Party Contractor Escalator (10%) *	$	11,691.90	$	35,364.00
TOTAL:	**$**	**146,148.76**	**$**	**445,906.65**

* A line item has been added as an escalator to reflect costs that might be experienced under administration by a third-party contractor. Some costs, i.e. groundwater, surface water, and leachate monitoring, as well as regular mowing are already performed by a third party and as a result, the cost estimate with the escalator should be conservative.

FIFTH THIRD BANK

February 18, 2009

Granger Land Development Company
16980 Wood Road
Lansing, MI 48906

RE: Irrevocable Stand-by Letter of Credit #CIS407297 and
Irrevocable Stand-by Letter of Credit #MIS300862

This letter serves to acknowledge that Letter of Credit #MIS300862 in the amount of $945,000.00 (copy attached) is presently valid and active at this time. The current expiration date is July 1, 2009.

Additionally, Letter of Credit #CIS 407297 in the amount of $180,000.00 (copy attached) is presently valid and active at this time. The current expiration date is January 28, 2010.

These Letters of Credit contain an automatic extension clause and therefore, will be automatically extended for additional terms of one (1) year unless notice is provided to both the beneficiary and customer at least one hundred twenty (120) days before it's expiration date that the Bank elects to terminate the credit at the end of it's then current term.

Please feel free to contact me if you have any questions or need additional information. Thank you.

Sincerely,

Carla Schindler

Carla D. Schindler
Portfolio Manager Corporate Banking
517.351.5204 direct
517.351.5036 fax
carla.schindler@53.com

att

Fifth Third Bank

ISSUING BANK:
FIFTH THIRD BANK, (WESTERN MICHIGAN)

BENEFICIARY:
DIRECTOR, DEPARTMENT OF
ENVIRONMENTAL QUALITY, WASTE AND
HAZARDOUS MATERIALS DIVISION
HAZARDOUS WASTE RADIOLOGICAL PROTECTION SECTION
PO BOX 30241, LANSING, MI 48909-7741

APPLICANT:
GRANGER LAND DEVELOPMENT COMPANY
16980 WOOD ROAD
LANSING, MI 48906

LETTER OF CREDIT NO: MIS300862
ISSUE DATE: JUNE 19, 2003
EXPIRATION DATE: JULY 01, 2004
EXPIRATION PLACE: AT OUR COUNTERS
AMOUNT: 945,000.00 USD NINE HUNDRED FORTY FIVE THOUSAND 00/100

1. WE HEREBY ISSUE OUR IRREVOCABLE STANDBY LETTER OF CREDIT NO. MIS300862 IN YOUR FAVOR ON BEHALF OF GRANGER LAND DEVELOPMENT COMPANY, HEREINAFTER KNOWN AS THE COMPANY, FOR A SUM OF USD945,000.00 (NINE HUNDRED FORTY-FIVE THOUSAND AND 00/100 U.S. DOLLARS) AVAILABLE BY YOUR DRAFTS AT SIGHT DRAWN ON OUR INSTITUTION, FIFTH THIRD BANK, WESTERN MICHIGAN, MARKED "DRAWN UNDER FIFTH THIRD BANK, WESTERN MICHIGAN LETTER OF CREDIT NO. MIS300862 DATED JUNE 19, 2003." "WE ARE A BANK OR FINANCIAL INSTITUTION WHICH HAS THE AUTHORITY TO ISSUE LETTERS OF CREDIT. OUR LETTER OF CREDIT OPERATIONS ARE REGULATED AND EXAMINED BY THE U.S. COMPTROLLER OF THE CURRENCY.

2. THIS LETTER OF CREDIT IS ISSUED TO PROVIDE FINANCIAL ASSURANCE TO THE STATE OF MICHIGAN, DEPARTMENT OF ENVIRONMENTAL QUALITY FOR POST-CLOSURE CARE/CORRECTIVE ACTION OF THE FOLLOWING HAZARDOUS WASTE MANAGEMENT FACILITY(IES): GRANGER MID 082 771 700 LANDFILL, 8550 WEST GRAND RIVER AVE., GRAND LEDGE, MICHIGAN 48837, EPA ID NO. MID 082 771 700, FOR USD945,000.00.

3. THIS LETTER OF CREDIT SHALL EXPIRE ON JULY 1, 2004, BUT SUCH EXPIRATION DATE SHALL BE AUTOMATICALY EXTENDED WITHOUT AMENDMENT

Fifth Third Bank

FOR PERIODS OF ONE YEAR, UNLESS, NOT LESS THAN 120 (ONE HUNDRED TWENTY) DAYS BEFORE THE CURRENT EXPIRATION DATE, WE NOTIFY BOTH YOU AND THE COMPANY BY CERTIFIED OR COURIER MAIL OF OUR DECISION NOT TO EXTEND THE CURRENT EXPIRATION DATE. WE AGREE THAT THE 120 (ONE HUNDRED TWENTY) DAY PERIOD SHALL BEGIN ON THE DATE WHEN BOTH YOU AND THE COMPANY HAVE RECEIVED THE NOTICE, AS EVIDENCED BY THE RETURN RECEIPTS.

4. YOU MAY DRAW ON THIS LETTER OF CREDIT IN THE EVENT THAT YOU ISSUE A NOTICE OF VIOLATION OR OTHER ORDER IN ACCORDANCE WITH THE ADMINISTRATIVE RULES PROMULGATED PURSUANT TO PART 111 OF 1994 PA 451, AS AMENDED, INDICATING THAT THE COMPANY HAS FAILED TO PROPERLY EXECUTE ITS POST-CLOSURE CARE/CORRECTIVE ACTION RESPONSIBILITIES. YOU ALSO MAY DRAW ON THIS LETTER OF CREDIT IN THE EVENT THAT THE COMPANY FAILS TO PROVIDE YOU WITH AN EXTENSION OF THIS LETTER OF CREDIT, AN ACCEPTABLE REPLACEMENT LETTER OF CREDIT, OR ANOTHER TYPE OF FINANCIAL ASSURANCE ACCEPTABLE TO YOU, WITHIN 90 DAYS AFTER RECEIPT BY BOTH YOU AND THE COMPANY OF A NOTICE FROM US THAT WE HAVE DECIDED NOT TO EXTEND THIS LETTER OF CREDIT BEYOND ITS CURRENT EXPIRATION DATE.

5. PARTIAL DRAWINGS ARE PERMITTED. THIS ORIGINAL LETTER OF CREDIT ALONG WITH ANY AMENDMENTS MUST BE SUBMITTED TO US TOGETHER WITH ANY DRAWINGS HEREUNDER FOR OUR ENDORSEMENT OF ANY PAYMENTS EFFECTED BY US AND/OR FOR CANCELLATION.

6. THIS LETTER OF CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (1993 REVISION, INTERNATIONAL CHAMBER OF COMMERCE PUBLICATION NO. 500), AND THE MICHIGAN UNIFORM COMMERCIAL CODE, WHERE APPLICABLE. WHERE CONFLICTS EXIST BETWEEN THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS AND THE MICHIGAN UNIFORM COMMERCIAL CODE, THE MICHIGAN UNIFORM COMMERCIAL CODE SHALL CONTROL.

7. WE SHALL HONOR DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS LETTER OF CREDIT AND THESE DRAFTS WILL BE DULY HONORED UPON PRESENTATION TO US IF PRESENTED ON OR AFTER JUNE 19, 2003 AND ON OR BEFORE JULY 1, 2004, OR ANY AUTOMATICALLY EXTENDED DATE AS PROVIDED IN PARAGRAPH 3 ABOVE. THE AMOUNT OF EACH DRAFT MUST BE ENDORESED ON THE REVERSE OF THIS LETTER OF CREDIT BY US.

Fifth Third Bank

8. WE CERTIFY THAT THE WORDING OF THIS LETTER OF CREDIT IS IDENTICAL TO THE WORDING PROVIED BY THE MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALTIY AS OF THE DATE SHOWN IMMEDIATELY BELOW.

VERY TRULY YOURS,

Ruth M. Esakson
RUTH M. ESAKSON
INT'L TRADE SERVICE OFFICER
FIFTH THIRD BANK
1850 EAST PARIS S.E.
GRAND RAPIDS, MICHIGAN 49546

Lee Neas
LEE NEAS
TRADE SERVICE REPRESENTATIVE

DATE: JUNE 19, 2003

Fifth Third Bank

ISSUING BANK:
FIFTH THIRD BANK, (WESTERN MICHIGAN)

BENEFICIARY:
DIRECTOR, MICHIGAN DEPARTMENT OF
ENVIRONMENTAL QUALITY, C/O DIV
CHIEF WASTE MANAGEMENT DIVISION
PO BOX 30241
LANSING, MI 48909-7741

APPLICANT:
GRANGER LAND DEVELOPMENT
16980 WOOD ROAD
LANSING, MI 48906

LETTER OF CREDIT NO: CIS407297
ISSUE DATE: JANUARY 28, 2008
EXPIRATION DATE: JANUARY 28, 2009
EXPIRATION PLACE: AT OUR COUNTERS
AMOUNT: 180,000.00 USD ONE HUNDRED EIGHTY THOUSAND 00/100

WE HEREBY ISSUE OUR IRREVOCABLE STANDBY LETTER OF CREDIT NO. CIS407297 IN YOUR FAVOR ON BEHALF OF GRANGER LAND DEVELOPMENT, HEREINAFTER KNOWN AS THE COMPANY, FOR A SUM OF USD180,000.00 (ONE HUNDRED EIGHTY THOUSAND AND 00/100 U.S. DOLLARS) AVAILABLE BY YOUR DRAFTS AT SIGHT DRAWN ON OUR INSTITUTION, FIFTH THIRD BANK, (WESTERN MICHIGAN), MARKED "DRAWN UNDER FIFTH THIRD BANK, (WESTERN MICHIGAN) LETTER OF CREDIT NO. CIS407297 DATED JANUARY 28, 2008." WE ARE A BANK OR FINANCIAL INSTITUTION WHICH HAS THE AUTHORITY TO ISSUE LETTERS OF CREDIT. OUR LETTER OF CREDIT OPERATIONS ARE REGULATED AND EXAMINED BY THE U.S. COMPTROLLER OF THE CURRENCY.

THIS LETTER OF CREDIT IS ISSUED TO PROVIDE FINANCIAL ASSURANCE TO THE STATE OF MICHIGAN, DEPARTMENT OF ENVIRONMENTAL QUALITY FOR POST-CLOSURE CARE/CORRECTIVE ACTION OF THE FOLLOWING HAZARDOUS WASTER MANAGEMENT FACILITY(IES): GRANGER MID 082 771 700 LANDFILL, 8550 WEST GRANT RIVER AVE., GRAND LEDGE, MICHIGAN 48837, EPA ID NO. 082 771 700, FOR USD180,000.00.

THIS LETTER OF CREDIT SHALL EXPIRE ON JANUARY 28, 2009, BUT SUCH EXPIRATION DATE SHALL BE AUTOMATICALY EXTENDED WITHOUT AMENDMENT

Fifth Third Bank

FOR PERIODS OF ONE YEAR, UNLESS, NOT LESS THAN 120 (ONE HUNDRED TWENTY) DAYS BEFORE THE CURRENT EXPIRATION DATE, WE NOTIFY BOTH YOU AND THE COMPANY BY REGISTERED, CERTIFIED OR COURIER MAIL OF OUR DECISION NOT TO EXTEND THE CURRENT EXPIRATION DATE. WE AGREE THAT THE 120 (ONE HUNDRED TWENTY) DAY PERIOD SHALL BEGIN ON THE DATE WHEN BOTH YOU AND THE COMPANY HAVE RECEIVED THE NOTICE, AS EVIDENCED BY THE RETURN RECEIPTS.

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PARTIAL DRAWINGS ARE PERMITTED. THIS ORIGINAL LETTER OF CREDIT ALONG WITH ANY AMENDMENTS MUST BE SUBMITTED TO US TOGETHER WITH ANY DRAWINGS HEREUNDER FOR OUR ENDORSEMENT OF ANY PAYMENTS EFFECTED BY US AND/OR FOR CANCELLATION.

THIS LETTER OF CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (2007 REVISION, INTERNATIONAL CHAMBER OF COMMERCE PUBLICATION NO. 600), AND THE MICHIGAN UNIFORM COMMERCIAL CODE, WHERE APPLICABLE. WHERE CONFLICTS EXIST BETWEEN THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS AND THE MICHIGAN UNIFORM COMMERCIAL CODE, THE MICHIGAN UNIFORM COMMERCIAL CODE SHALL CONTROL.

WE SHALL HONOR DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS LETTER OF CREDIT AND THESE DRAFTS WILL BE DULY HONORED UPON PRESENTATION TO US IF PRESENTED ON OR AFTER JANUARY 28, 2008 AND ON OR BEFORE JANUARY 28, 2009, OR ANY AUTOMATICALLY EXTENDED DATE AS PROVIDED IN PARAGRAPH 3 ABOVE. THE AMOUNT OF EACH DRAFT MUST BE ENDORSED ON THE REVERSE OF THIS LETTER OF CREDIT BY US.

VERY TRULY YOURS,

AUTHORIZED SIGNATURE

AUTHORIZED SIGNATURE

GOLDER
MEMBER OF WSP

golder.com