



**Fourth Annual Interim
Measures Capture Zone
Report**

General Motors Corporation
Moraine, Ohio

PREPARED FOR

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Introduction	1
TW-2 Operation	1
DN-13 Operation	2
Regulatory Monitoring	2
Capture Zone Influence Monitoring	3
Groundwater Elevation Monitoring	3
Groundwater Quality Monitoring	4
Conclusions	4
References	6

Tables

1	Air Permit Influent Monitoring, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
2	NPDES Effluent Monitoring, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
3	Water-Level Elevations from Upper Aquifer Monitor Wells, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
4	Water-Level Elevations from Lower Aquifer Monitor Wells, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
5	Detected Volatile Organic Compounds in Groundwater, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

Figures

1	Pre-Pumping Water-Table Surface - Shallow on January 31, 1996, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
2	Pre-Pumping Potentiometric Surface - Deep on January 31, 1996, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

3	Water-Table Surface - Shallow on April 30, 1999, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
4	Potentiometric Surface - Deep on April 30, 1999, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
5	Water-Table Surface - Shallow on July 29, 1999, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
6	Potentiometric Surface - Deep on July 29, 1999, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
7	Water-Table Surface - Shallow on October 29, 1999, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
8	Potentiometric Surface - Deep on October 29, 1999, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
9	Water-Table Surface - Shallow on January 31, 2000, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.
10	Potentiometric Surface - Deep on January 31, 2000, Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

Appendices

A	Water Table Surface, November 16, 1999
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Introduction

General Motors Corporation (GM) has been operating a groundwater recovery and treatment system at the Delphi Harrison Thermal Systems Moraine, Ohio facility (Delphi Thermal Moraine) since January 31, 1996 as a component of interim measures required by the United States Environmental Protection Agency (U.S. EPA). The objective of these interim measures, as stated in the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995), is to control the migration of groundwater that contains volatile organic compounds (VOCs). The Final Interim Measures Design Plans were approved by the U.S. EPA in a July 31, 1995 letter.

The interim measures consist of continued pumping of Montgomery County Well DN-13, screened in the lower aquifer, at a rate of 2.663 million gallons per day (mgd) and pumping Delphi Thermal Recovery Well 2 (TW-2), screened in the upper aquifer, at a rate of 0.239 mgd (166 gallons per minute [gpm]). DN-13 is a well that Montgomery County has been using in a Pump-to-Waste Program since March 1990. TW-2 is a component of the interim measures system which was designed, installed, started up, and monitored in compliance with the approved Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995). The groundwater recovered by TW-2 is treated using an air stripper tower and discharged through Delphi Thermal Moraine's National Pollutant Discharge Elimination System (NPDES) permitted outfall to the Great Miami River.

Data collected to monitor the effectiveness of the interim measures system during the first seven months of operation (January 31, 1996 through August 29, 1996) were summarized in a report titled Interim Measures Capture Zone Monitoring (Geraghty & Miller, Inc. 1996a) in response to a request from U.S. EPA through the former PRC Environmental Management (currently known as TetraTech). Reports summarizing data collected since the 1996 start-up of TW-2 are submitted to the Ohio EPA on an annual basis. This report provides a summary of data collected during the fourth year of operation (January 31, 1999 through January 31, 2000). Data summarized in these reports were collected to monitor the effectiveness of the interim measures system as required by the approved Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995).

TW-2 Operation

Groundwater recovery from TW-2 began on the afternoon of January 31, 1996. During the first four years of operation (January 31, 1996 through January 31, 2000),

the system has recovered and treated a total of 231,658,610 gallons at an average flow rate of approximately 150 gpm. Annual total gallons recovered and average flow rate for the 1999 period were 79,867,400 gallons and approximately 157 gpm, respectively.

From November 1996 through the end of this reporting period, GM has monitored the water level in TW-2 and adjusted the TW-2 flow rate as recommended in the October 1996 Monthly Technical Progress Report (Geraghty & Miller, Inc. 1996b) and approved by U.S. EPA (Personal Communication, 1996). This procedure was implemented to avoid drawdown levels within the well which could cause damage to the well screen and/or the pump. The flow rate from TW-2 is adjusted as necessary to maintain the water level in TW-2 at least 0.5 feet above the top of the well screen.

From January 31, 1999 through January 31, 2000, the TW-2 component of the Interim Measures remediation system has operated continuously except for seven scheduled shutdowns for routine maintenance, repairs, and cleaning. During March 1999, the system was shut down twice for periods of approximately 3 hours and 1 hour to repair the brominator feed system's hose and fittings. During late October, 1999, the system was shut down for approximately 10 days to allow for chemical cleaning of the tower and cleanout of the well and influent line. The treatment system was shut down for approximately 1 hour in November 1999 to repair a leak. Also in November 1999, a shutdown occurred for approximately 5 minutes for repairs. During December 1999, the system was shut down twice for repairs, each lasting approximately 10 hours. Finally, the system was shut down for approximately 18 hours on December 31, 1999, through January 1, 2000, for Year 2000 (Y2K) precautions.

DN-13 Operation

Montgomery County Well DN-13 was operational throughout the reporting period (January 31, 1999 through January 31, 2000) except for four brief shutdowns. These occurred in June 1999, when the well was shut down twice for periods of 6 hours and eight hours; in September, 1999, when the well was shut down for a period of 8 hours; and in December 1999, when the well was shut down for a period of 8 hours. These shutdowns were to allow for repair of minor maintenance issues.

Regulatory Monitoring

The Air Permit issued to GM Remediation and NPDES Permit issued to Delphi Thermal Moraine for the groundwater recovery and treatment system require periodic

monitoring and reporting of water quality in the influent and effluent streams, and pumping flow rates. Samples of groundwater being pumped through the air stripping treatment tower were collected and analyzed monthly by TestAmerica, Inc., of Dayton, Ohio, for the parameters required in the permits. All analyses were conducted in accordance with methods specified in the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995), and the VOC analyses were conducted using the updated method 8260 instead of the original method 8240, as approved by the U.S. EPA during the Supplemental RFI field investigation. The results of the influent and effluent sampling are presented in Tables 1 and 2, respectively.

Influent sampling results (Table 1) were within the required Air Permit limits during the reporting period (January 31, 1999 through January 31, 2000). Effluent sampling results (Table 2) during the same period were within the required NPDES Permit limits.

Capture Zone Influence Monitoring

The purpose of capture zone influence monitoring is to verify that operation of the groundwater recovery and treatment system meets the interim measures objectives. This monitoring was accomplished by collecting water levels and groundwater quality data from select wells identified in the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995).

Groundwater Elevation Monitoring

Groundwater elevations for select upper aquifer monitoring wells and lower aquifer monitoring wells are presented in Tables 3 and 4, respectively. Groundwater elevations were collected prior to start-up of the system (with both TW-2 and DN-13 not pumping), and then during 28 other groundwater monitoring events over the four years of operation, with four of these events conducted during the current reporting period. These groundwater monitoring events provide sufficient data for evaluating the effectiveness of the Interim Measures in accordance with the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995).

To evaluate the effectiveness of Interim Measures, groundwater flow maps were developed. Groundwater flow maps depicting upper and lower aquifer conditions have been developed for January 1996 pre-start-up conditions (Figures 1 and 2, respectively), and for the four quarters of the reporting period (January 31, 1999 through January 31, 2000). The quarterly groundwater elevation measurements were

performed for upper and lower wells on April 30, 1999 (Figures 3 and 4, respectively), July 29, 1999 (Figures 5 and 6, respectively), October 29, 1999 (Figures 7 and 8, respectively) and January 31, 2000 (Figures 9 and 10, respectively).

Figures 3, 5, 7 and 9 depict groundwater flow in the upper aquifer during the Capture Zone Monitoring quarterly events. Well TW-2 is shown to effectively influence upper aquifer groundwater flow in all four quarters of the reporting period, when operational. The effects of shutting the TW-2 extraction and treatment system down from October 22, 1999 to November 1, 1999 for cleaning of the tower are evident in the upper aquifer groundwater flow map for October 29, 1999 (Figure 7). An evaluation of the influence of Well TW-2 on the upper aquifer during this part of the year was made using groundwater flow data obtained on November 16, 1999 as part of the North Settling Lagoon assessment program. The North Settling Lagoon Sixteenth Annual Groundwater Quality Assessment (ARCADIS Geraghty & Miller, 2000) illustrates the water-table surface on November 16, 1999 (Appendix A). Figures 4, 6, 8, and 10 depict the influence of the Interim Measures on groundwater flow in the lower aquifer with DN-13 operating.

These figures indicate that the Interim Measures continue to be effective at maintaining hydraulic control at the southern end of the Delphi Thermal Moraine site. Additionally, it should be noted that these flow maps are consistent with the flow conditions predicted by the capture zone modeling, presented on Figures 2 and 3 of the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995).

Groundwater Quality Monitoring

Groundwater samples from TW-2 and four monitoring wells were collected and analyzed for VOCs during the month before the system was initially started, 6 months after operation began, 18 months after operation began, 30 months after operation began, and 42 months after operation began (July 29, 1999). In general, total VOC concentrations have decreased in these wells during the four years of combined TW-2 and DN-13 operation. Results from these sampling events are provided in Table 5.

Conclusions

The results of monitoring conducted to evaluate the performance of the interim measures during the fourth year of operation indicate that the groundwater recovery and treatment system is operating to provide effective capture. This conclusion is based on the following facts.

1. Groundwater elevations indicate that an effective zone of influence has been developed by pumping TW-2 and DN-13 such that hydraulic control at the southern end of the facility has been established (Figures 3 through 10; Appendix A) as described in the approved Interim Measures Design Plans.
2. Influent groundwater samples contain VOCs at concentrations below the regulatory requirements set by the Air Permit (Table 1).
3. Effluent (treated) groundwater samples are within allowable limits for all parameters required by the NPDES permit (Table 2).
4. Groundwater quality results (Table 5) indicate that total VOC concentrations have, in general, decreased over the four years of combined TW-2 and DN-13 operation.

References

- ARCADIS Geraghty & Miller. 2000. Sixteenth Annual Groundwater Quality Assessment, North Settling Lagoon, January 1999 through December 1999, Delphi Harrison Thermal Systems, Moraine, Ohio. February, 2000.
- Geraghty & Miller, Inc. 1995. Final Interim Measures Design Plans, Harrison Division - General Motors Corporation, Moraine, Ohio. April, 1995.
- Geraghty & Miller, Inc. 1996a. Interim Measures Capture Zone Monitoring. Delphi Harrison Thermal Systems, Moraine, Ohio. September, 1996.
- Geraghty & Miller, Inc. 1996b. Monthly Technical Progress Report, October 1996, RCRA Facility Investigation, Delphi Harrison Thermal Systems, General Motors Corporation, Moraine, Ohio. November, 1996.
- Personal Communication. 1996. Personal Communication between Mr. William Buller of the U.S. EPA and Mr. James Reid of Geraghty & Miller, Inc. November, 1996.

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Table 1. Air Permit Influent Monitoring, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

CONSTITUENT	RESULTS											
	02/10/99	03/10/99	04/07/99	05/05/99	06/02/99	07/09/99	08/11/99	09/21/99	10/19/99	11/16/99	12/15/99	01/11/00
Benzene	--	--	1.0	--	1.0	--	--	--	--	--	--	--
Chloroethane	5.9	4.4	5.5	5.0	5.4	6.4	5.3	--	--	--	4.4	--
1,1-Dichloroethane	27.1	20.8	21.2	17.5	20.2	21.7	22.0	20.0	18.3	19.3	18.6	17.5
trans-1,2-Dichloroethene	2.6	1.9	2.2	1.8	2.6	2.9	2.8	2.7	2.2	2.4	2.7	2.8
Ethylbenzene	4.1	4.7	4.5	4.3	4.7	5.0	6.2	4.3	4.6	3.7	5.6	5.4
Tetrachloroethene	44.7	38.4	35.7	33.1	31.4	34.0	45.0	39.9	35.2	37.8	52.2	48.7
Toluene	1.9	--	--	--	--	--	1.0	--	--	--	--	--
1,1,1-Trichloroethane	15.0	10.2	10.6	8.3	8.8	9.4	9.9	10.6	9.1	10.4	11.6	11.4
Trichloroethene	87.7	67.6	63.7	57.3	60.6	59.0	66.0	57.2	58.6	65.2	72.0	69.3
Vinyl chloride	7.9	2.5	2.5	2.1	2.8	3.4	3.2	2.6	2.2	--	3.0	3.1
Xylenes	5.9	10.2	8.8	5.6	5.0	7.4	11.5	11.7	7.7	22.1	9.6	11.4
TOTAL*	202.8	160.7	155.7	135.0	142.5	149.2	172.9	149.0	137.9	160.9	179.7	169.6

* Permit Limit 850 ug/L.

All concentrations in micrograms per liter (ug/L) as reported by the laboratory.

-- Not detected.

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Table 2. NPDES Effluent Monitoring, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

CONSTITUENT	UNITS	PERMIT LIMIT	RESULTS											
			02/10/99	03/10/99	04/07/99	05/05/99	06/02/99	07/09/99	08/11/99	09/21/99	10/19/99	11/16/99	12/15/99	01/11/00
Fats, Oils & Grease	(mg/L)	10 mg/L	--	--	--	--	--	--	--	--	--	--	--	--
pH, Field	(S.U.)	6.5 - 9.0 S.U.	7.99	8.05	7.65	8.04	8.01	7.86	8.04	8.62	7.52	8.14	7.98	7.93
Benzene	(ug/L)	5 ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	(ug/L)	5 ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	(ug/L)	5 ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes	(ug/L)	NA	--	--	--	--	--	--	--	--	--	--	--	--

mg/L Milligrams per Liter.
 S.U. Standard Units.
 ug/L Micrograms per Liter.
 -- Not detected.
 NA Not available.

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Table 3. Water-Level Elevations from Upper Aquifer Monitor Wells, Interim Measures Capture Zone Monitoring,
General Motors Corporation, Moraine, Ohio.

Date	Water-Level Elevation (Feet MSL)													
	GM-2	4S	GM-6	GM-8	GM-16	GM-17	GM-18	WS-17	WS-18	WS-19	TW-2	GM-10	WSU-24	GM-26
01/31/1996	705.77	705.75	705.80	705.88	705.68	705.46	705.63	705.83	705.79	705.92	705.76	NA	NA	NA
02/01/1996	705.66	705.51	705.34	705.62	705.47	705.46	705.42	705.46	704.96	705.67	702.88	NA	NA	NA
02/02/1996	705.57	705.38	705.20	705.49	705.34	705.31	705.26	705.32	705.32	705.53	702.71	NA	NA	NA
02/03/1996	705.50	705.31	705.12	705.39	705.24	705.22	705.17	705.22	705.24	705.42	702.60	NA	NA	NA
02/04/1996	705.41	705.19	704.95	705.24	705.09	705.07	705.03	705.08	705.12	705.29	702.88	NA	NA	NA
02/05/1996	705.38	705.15	704.89	705.18	704.99	705.01	704.96	705.00	705.07	705.21	702.34	NA	NA	NA
02/06/1996	705.31	705.09	704.82	705.11	704.90	704.93	704.87	704.92	705.01	705.14	702.26	NA	NA	NA
02/07/1996	705.31	705.06	704.77	705.06	704.87	704.90	704.84	704.88	704.98	705.08	702.15	NA	NA	NA
02/13/1996	705.11	704.86	704.50	704.79	704.58	704.63	704.55	704.63	714.27	704.81	701.60	NA	NA	NA
02/22/1996	704.42	704.07	703.63	703.97	703.68	703.73	703.65	703.76	703.93	703.98	700.52	NA	NA	NA
02/27/1996	704.28	703.94	703.51	703.86	703.61	703.63	703.56	703.64	703.82	703.85	700.35	NA	NA	NA
03/12/1996	704.35	704.03	703.62	703.97	703.72	703.74	703.65	702.90	703.92	704.02	700.33	NA	NA	NA
06/10/1996	709.33	708.99	708.64	708.79	708.68	707.79	708.69	708.78	708.93	708.87	705.01	NA	NA	NA
07/31/1996	707.21	706.79	706.24	706.45	704.34	706.27	706.14	706.37	706.64	706.46	701.33	NA	NA	NA
10/30/1996	704.28	703.89	703.44	703.75	703.42	703.49	703.38	703.38	703.79	703.76	696.77	NA	NA	NA
01/30/1997	704.32	704.04	703.65	703.94	703.67	703.70	703.62	703.77	703.92	703.97	698.05	723.90	NA	NA
04/30/1997	705.16	704.85	703.55	703.77	704.39	704.50	704.41	704.54	704.77	704.66	695.58	704.43	705.17	NA
07/30/1997	705.43	705.10	704.66	704.87	704.59	704.72	704.69	704.78	705.00	704.91	697.38	704.64	705.40	NA
10/30/1997	703.13	702.83	702.43	702.70	702.36	702.40	702.30	702.52	702.72	702.69	696.11	702.06	703.02	NA
01/30/1998	702.90	702.61	702.17	702.50	702.20	702.27	702.18	702.29	702.50	702.48	700.13	701.97	702.85	NA
04/29/1998	705.22	704.93	704.56	704.80	704.53	704.61	704.52	704.67	703.85	704.70	703.30	704.34	705.19	704.08
07/30/1998	706.05	705.66	705.16	705.36	705.00	704.14	705.01	705.26	705.53	705.34	702.97	704.89	705.91	704.46
10/30/1998	702.99	702.66	702.25	702.51	702.25	702.30	702.22	702.36	702.58	702.53	700.23	702.00	702.90	701.56
01/29/1999	704.64	703.55	704.54	704.83	704.68	704.58	704.51	704.40	704.54	704.83	701.90	704.11	704.73	703.72
04/30/1999	704.29	703.98	703.55	703.85	703.57	703.62	703.53	703.68	703.90	703.83	700.93	703.38	704.24	703.01
07/29/1999	702.15	701.85	701.43	701.76	700.47	701.50	701.42	701.56	701.76	701.75	698.48	701.18	702.06	700.71
10/29/1999	700.27	700.06	699.93	700.03	699.69	699.71	699.61	699.94	700.04	700.05	NM*	699.28	700.16	698.66
01/31/2000	699.50	699.22	698.80	699.17	698.91	698.88	698.82	698.93	699.15	699.18	696.00	698.55	699.38	698.08

NA Not Available.

MSL Mean Sea Level.

TW-2 Upper Aquifer Recovery Well.

Water-level elevations measured in wells GM-16, GM-10, WSU-24, and GM-26 are not required in the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995) but are being measured for additional data.

NM* Not measured due to maintenance being performed on TW-2 on day of measurements.

Table 4. Water-Level Elevations from Lower Aquifer Monitor Wells, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

Date	Water-Level Elevation (Feet MSL)												
	GM-1	GM-3	GM-4	GM-5	GM-7R	GM-9	GM-11	GM-13	GM-14	GM-15	GM-20D	M73C	MT-69
01/31/1996	705.56	705.46	705.45	705.50	705.85	705.25	705.53	705.25	705.24	705.16	705.80	704.62	NA
02/01/1996	705.52	705.38	705.37	705.43	705.78	705.12	705.22	705.15	705.11	705.06	705.73	704.50	NA
02/02/1996	705.44	705.30	705.28	705.36	705.69	705.02	705.13	705.03	705.01	704.93	705.64	704.38	NA
02/03/1996	705.37	705.21	705.19	705.27	705.61	704.92	705.04	704.94	704.91	704.83	705.57	704.23	NA
02/04/1996	705.31	705.13	705.12	705.21	705.53	704.81	704.93	704.82	704.80	704.73	705.50	704.14	NA
02/05/1996	705.27	705.09	705.08	705.16	705.50	704.77	704.89	704.78	704.75	704.67	705.46	704.09	NA
02/06/1996	705.23	705.03	705.02	705.11	705.44	704.71	704.83	704.72	704.68	704.61	705.41	704.03	NA
02/07/1996	705.23	705.02	704.95	705.11	705.42	704.67	704.81	704.71	704.67	704.56	705.41	704.00	NA
02/13/1996	705.11	704.85	704.86	704.97	705.30	704.48	704.65	704.53	704.47	704.38	705.26	703.79	NA
02/22/1996	703.99	703.39	703.36	703.61	703.89	702.98	702.70	702.12	702.03	703.91	704.08	701.70	NA
02/27/1996	703.94	703.33	703.32	703.55	703.84	702.93	702.65	702.07	701.99	701.87	704.01	NA	NA
03/12/1996	703.98	703.39	703.36	703.53	703.90	702.97	702.43	702.13	702.01	701.92	704.06	702.24	NA
06/10/1996	708.83	708.18	708.20	708.43	708.63	708.04	708.63	707.09	706.98	706.82	709.03	NA	NA
07/31/1996	706.68	705.93	705.89	706.18	706.39	705.51	705.21	704.59	704.45	706.02	706.77	704.63	NA
10/30/1996	703.88	703.21	703.18	703.43	703.71	702.72	702.45	701.86	701.74	701.63	703.91	701.95	NA
01/30/1997	703.91	703.32	703.31	703.54	703.82	702.91	702.67	702.08	701.94	701.84	704.00	702.20	NA
04/30/1997	705.11	703.96	703.98	704.89	704.36	704.39	704.60	704.41	704.35	704.22	705.30	704.17	NA
07/30/1997	705.36	705.03	705.01	705.14	705.43	704.61	704.80	704.61	704.56	704.41	705.51	704.37	703.86
10/30/1997	702.66	701.97	701.93	702.22	702.48	701.46	701.20	700.50	700.39	700.22	702.67	700.62	701.36
01/30/1998	702.50	701.88	701.83	702.11	702.39	701.45	701.17	700.52	700.37	700.24	702.57	700.65	NA
04/29/1998	704.74	704.07	704.08	704.32	704.57	703.82	703.43	702.81	702.65	702.54	704.82	702.95	703.83
07/30/1998	705.52	704.76	704.75	705.04	705.26	704.32	704.02	703.32	703.18	703.03	705.57	703.43	NA
10/30/1998	702.60	701.92	701.92	702.19	702.43	701.45	701.21	700.54	700.43	700.31	702.64	700.71	NA
01/29/1999	704.13	703.71	703.69	703.85	704.19	703.49	703.10	702.49	702.38	702.42	704.26	702.81	703.56
04/30/1999	703.88	703.24	703.23	703.48	703.73	702.86	702.59	701.99	701.86	NA	703.97	702.11	NA
07/29/1999	701.79	701.19	701.16	701.41	701.70	700.70	700.56	699.97	699.80	699.70	701.84	700.01	NA
10/29/1999	699.92	699.36	699.34	699.56	699.89	698.82	698.69	698.15	697.96	697.93	699.92	698.22	NA
01/31/2000	699.26	698.73	698.72	698.93	699.28	698.17	698.04	697.60	697.36	697.35	699.28	697.58	697.87

MSL Mean Sea Level.

NA Not Available.

Water-level elevation data in well MT-69 are not required in the Final Interim Measures Design Plans (Geraghty & Miller, Inc. 1995) but are being measured to provide additional data.

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Table 5. Detected Volatile Organic Compounds in Groundwater, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

DETECTED CONSTITUENTS	TW-2					4S					GM-6				
	01/31/96	07/31/96	07/30/97	07/30/98	07/29/99	01/31/96	07/31/96	07/30/97	07/30/98	07/29/99	01/31/96	07/31/96	07/30/97	07/30/98	07/29/99
Benzene	3.9	1.6	1.2	1.4	--	2.2	--	--	--	--	2.5	--	--	--	--
Chlorobenzene	--	5.5	2.5	1.9	--	4.9	--	--	--	--	--	--	--	--	--
Chloroethane	17	--	--	--	6.5	19.9	16	--	--	7.2	13	24.3	19.5	15.4	9.1
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	4.4	--	--	--	--	15
1,1-Dichloroethane	110	50.6	37.6	27.7	25.4	69.6	45.6	24.5	17.7	10.7	88.5	82.6	55.4	39.3	38.3
1,1-Dichloroethene	1.2	--	--	--	--	--	--	--	--	--	1.2	--	1.8	1.7	--
trans-1,2-Dichloroethene	11.1	4.4	2.6	2.8	3.1	3.7	8.4	3	--	--	9.1	6.5	3	3.6	2.7
cis-1,2-Dichloroethene	--	41.3	35.2	33.8	32.5	--	16.2	1	--	2.8	--	97.4	119	106	80.9
Ethylbenzene	127	10.7	5.7	5.6	--	2.9	4.1	--	--	--	88.8	3.6	--	--	--
Tetrachloroethene	--	10.4	26.4	26.5	37.9	--	--	--	--	--	10.3	68	94	99.8	108
Toluene	4	6.7	--	1.8	--	--	--	--	--	--	1.3	--	--	--	--
1,1,1-Trichloroethane	4.9	9.7	14.3	8.5	11.3	--	--	--	--	--	20	36.8	48.9	27.5	27.5
Trichloroethene	43	64.6	73.5	66.5	65.7	5.6	8	2.4	1.3	4.4	118	160	118	128	110
Vinyl Chloride	32.4	8.7	3.3	4.4	4.5	--	14.1	--	--	4	16.3	21.4	7.8	14	5.3
Xylenes	103	25.6	10.3	8.9	7.4	1	--	--	--	--	37.6	--	--	--	--
Total VOC Concentration	457.5	239.8	212.6	189.8	194.3	109.8	112.4	30.9	19.0	33.5	406.6	500.6	467.4	435.3	396.8

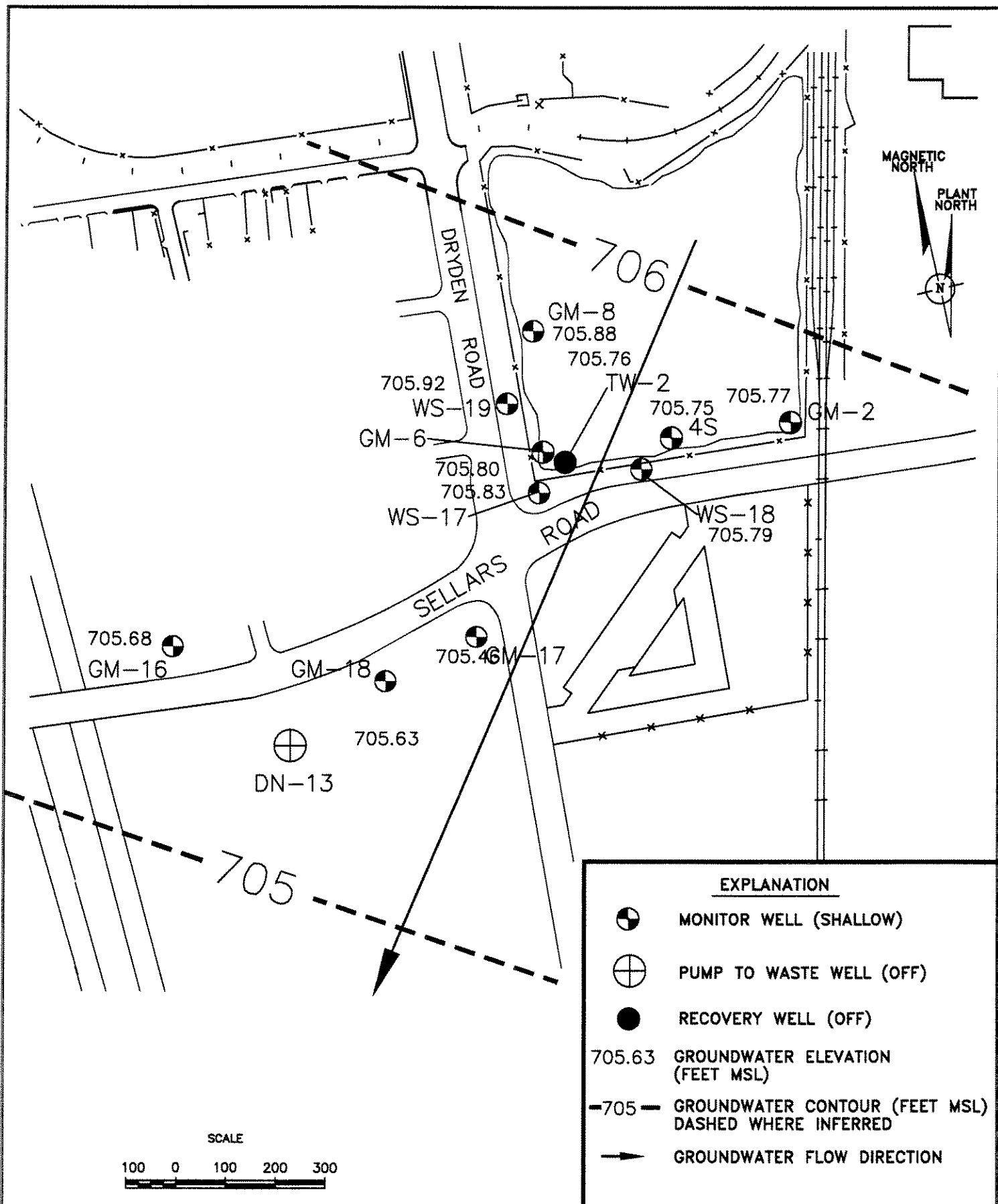
All concentrations in micrograms per liter (ug/L) as reported by the laboratory.
 -- Not detected.

ARCADIS GERAGHTY & MILLER

Table 5. Detected Volatile Organic Compounds in Groundwater, Interim Measures Capture Zone Monitoring, General Motors Corporation, Moraine, Ohio.

DETECTED CONSTITUENTS	GM-17					GM-18				
	01/31/96	07/31/96	07/30/97	07/30/98	07/29/99	01/31/96	07/31/96	07/30/97	07/30/98	07/29/99
Benzene	4.3	1.5	--	--	--	--	1.1	1.1	--	--
Chlorobenzene	3.1	6.7	3.1	--	--	--	--	--	--	--
Chloroethane	16.4	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	1.5
1,1-Dichloroethane	99.7	28.1	6.4	3.3	11.3	57.1	61.6	45.4	29.1	17.8
1,1-Dichloroethene	--	--	--	--	--	1.9	--	1.6	--	--
trans-1,2-Dichloroethene	9.9	2.4	--	--	--	4.1	5.3	3.7	2.5	1.8
cis-1,2-Dichloroethene	--	21.2	4.1	4.3	13	--	118	80.8	49.9	28.5
Ethylbenzene	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	1.2	1.2	1.4	2.6	4.7	2.5	3.2	3.9	3.6	4.9
Toluene	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	7	4.7	3.4	3.7	5.8	41.6	41.2	33.5	31.5	29.1
Trichloroethene	39.2	34.5	44.6	43	45.1	105	110	105	109	113
Vinyl Chloride	16.6	--	--	--	--	--	--	--	--	--
Xylenes	--	--	--	--	--	--	--	--	--	--
Total VOC Concentration	197.4	100.3	63.0	56.9	79.9	212.2	340.4	275.0	225.6	196.6

All concentrations in micrograms per liter (ug/L) as reported by the laboratory.
 -- Not detected.



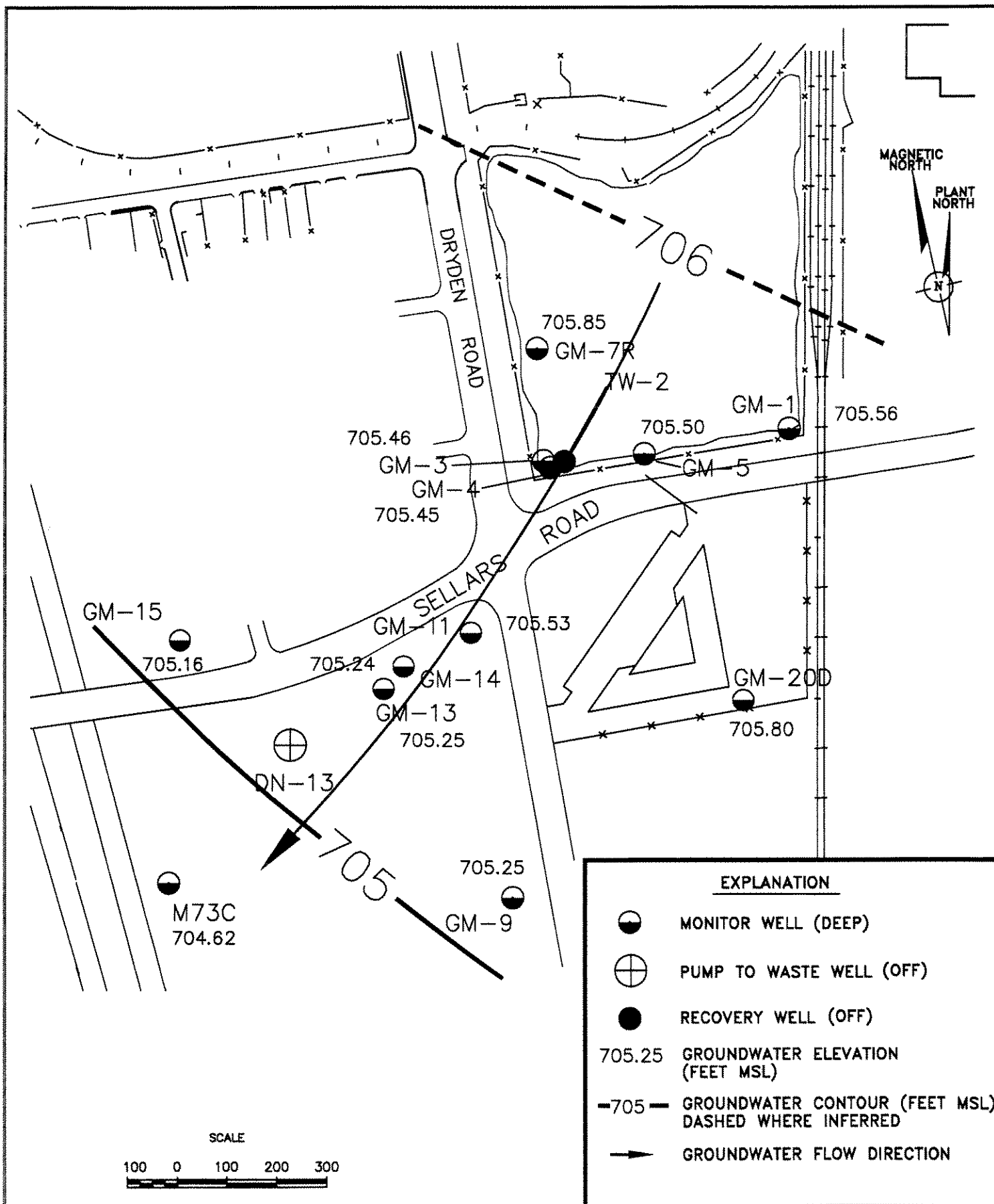
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6377 Riverchase Parkway
Suite 100, Dublin, OH 43018
Tel 614/764-2260 Fax 614/764-1270

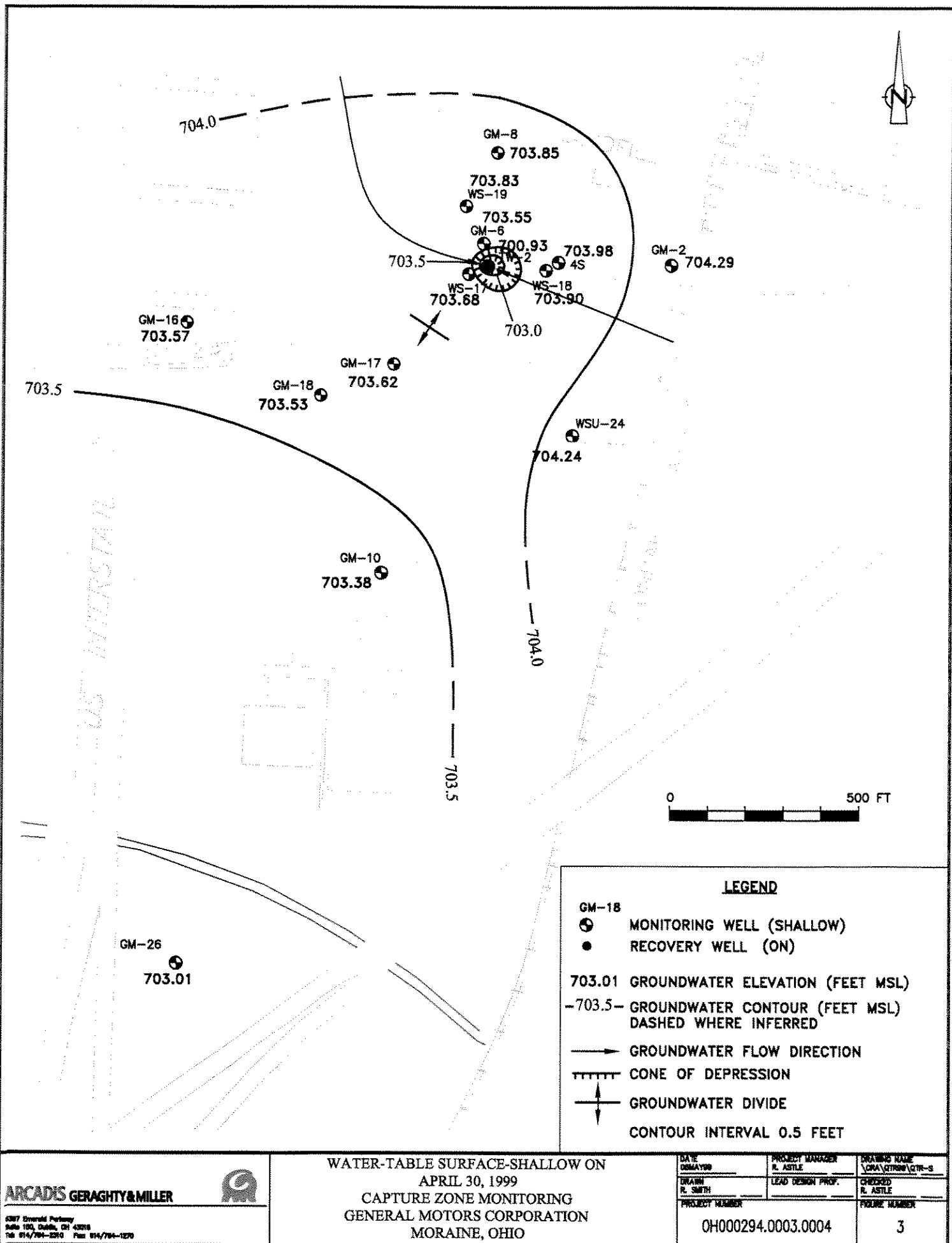
PRE-PUMPING WATER-TABLE
SURFACE - SHALLOW ON JANUARY 31, 1996,
CAPTURE ZONE MONITORING
GENERAL MOTORS CORPORATION
MORaine, OHIO

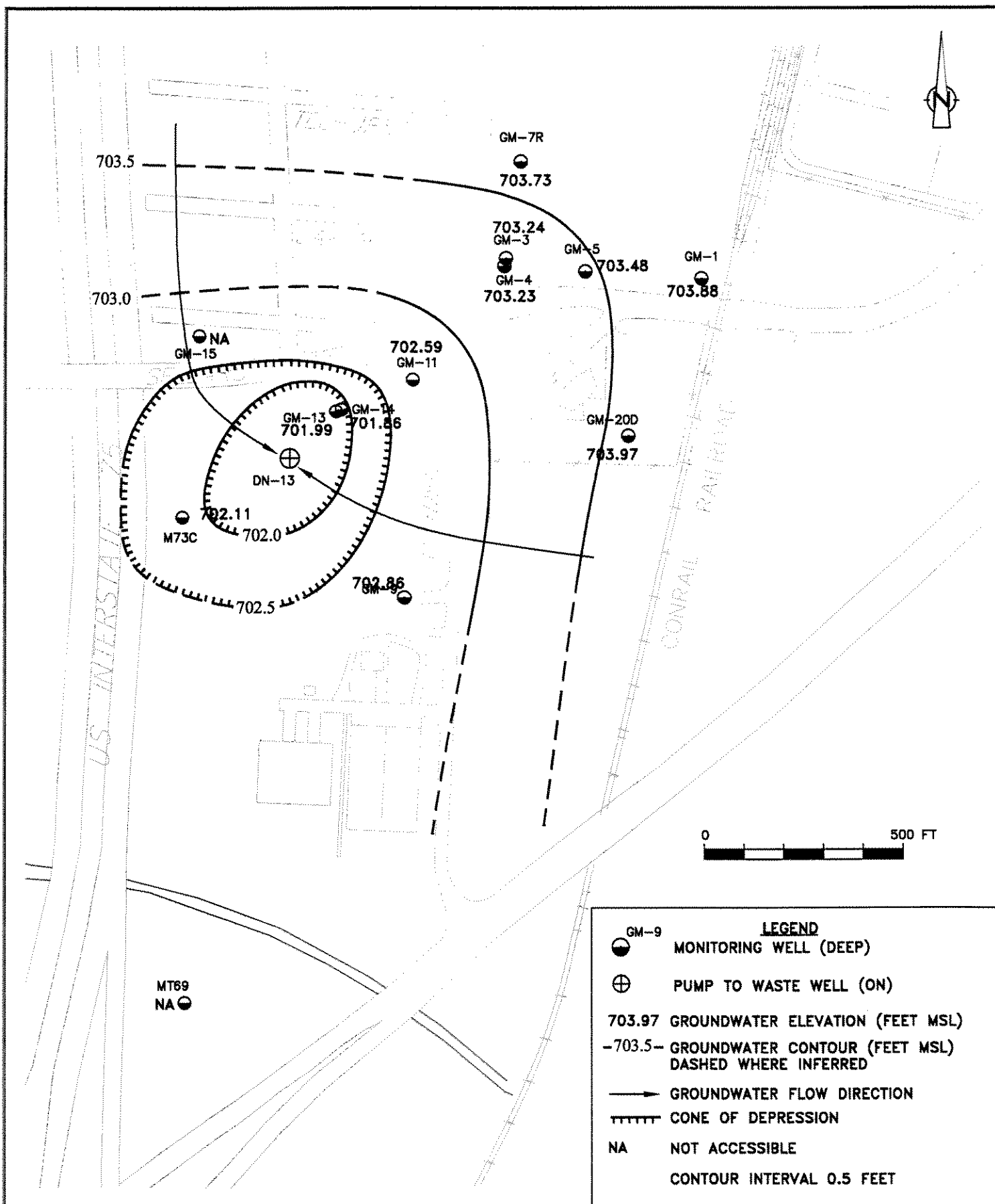
DATE 02/08/96	PROJECT MANAGER R. ASHLE	DRAWING NAME M011-M
DRAWN R. SMITH	LEAD DESIGN PROF. J. REED	CHECKED S. FERGUSON
PROJECT NUMBER OH000294.0003.0004		PAGE NUMBER 1



EXPLANATION		
	MONITOR WELL (DEEP)	
	PUMP TO WASTE WELL (OFF)	
	RECOVERY WELL (OFF)	
705.25	GROUNDWATER ELEVATION (FEET MSL)	
-705-	GROUNDWATER CONTOUR (FEET MSL) DASHED WHERE INFERRED	
	GROUNDWATER FLOW DIRECTION	

ARCADIS GERAGHTY & MILLER 6307 Emerald Parkway Suite 100, Dublin, OH 43018 Tel: 614/764-2310 Fax: 614/764-1270	PRE-PUMPING POTENTIOMETRIC SURFACE - DEEP ON JANUARY 31, 1996, CAPTURE ZONE MONITORING GENERAL MOTORS CORPORATION MORaine, OHIO	DATE	PROJECT MANAGER	DRAWING NAME
		08MAR96	R. ASTLE	HIF-L1-M
		DRAWN	LEAD DESIGN PROF.	CHECKED
		R. SMITH	J. REED	B. FERGUSON
		PROJECT NUMBER	FIGURE NUMBER	
		OH000294.0003.0004	2	





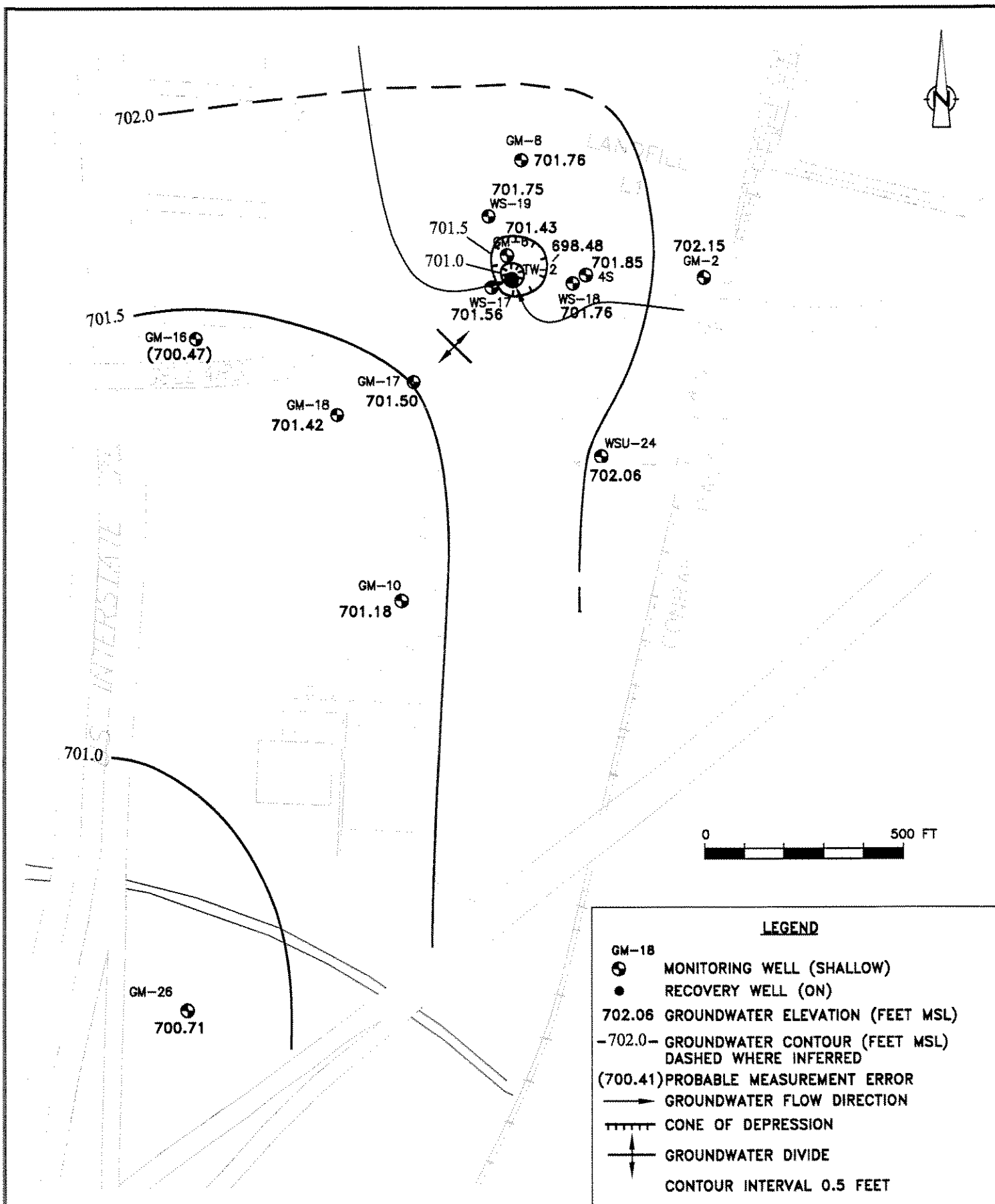
ARCADIS GERAGHTY & MILLER



6387 Emerald Parkway
Suite 100, Dublin, OH 43016
Tel: 614/764-3300 Fax: 614/764-1270

POTENTIOMETRIC SURFACE-DEEP
ON APRIL 30, 1999
CAPTURE ZONE MONITORING
GENERAL MOTORS CORPORATION
MORaine, OHIO

DATE DRAWING	PROJECT MANAGER R. ASTLE	DRAWING NAME CRA/COTR-0
DRAWN R. SMITH	LEAD DESIGN PROF.	CHECKED R. ASTLE
PROJECT NUMBER	PIRONE NUMBER	
0H000294.0003.0004	4	



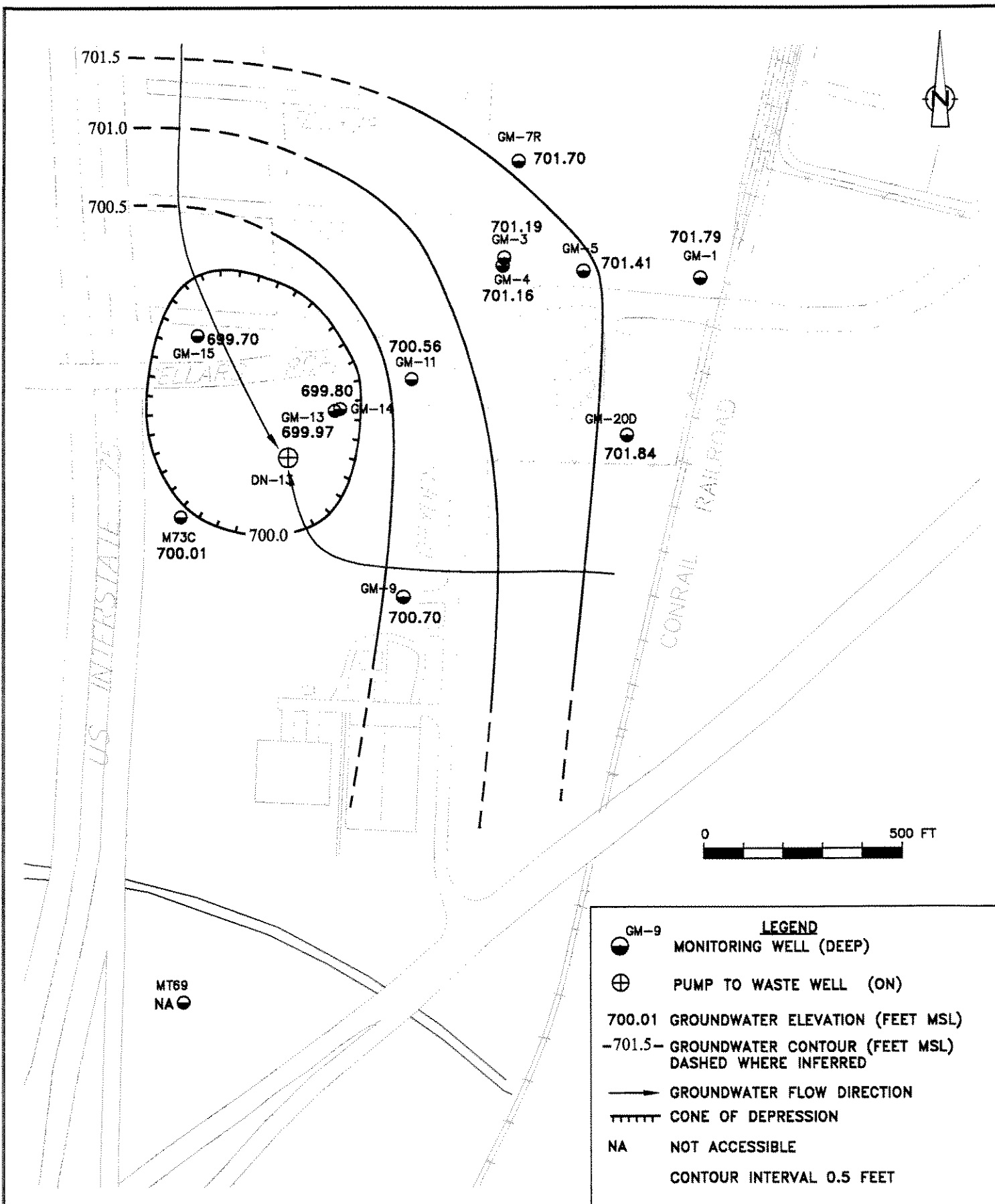
ARCADIS GERAGHTY & MILLER



4387 Emerald Parkway
Suite 100, Dublin, OH 43016
Tel: 614/764-3310 Fax: 614/764-3220

WATER-TABLE SURFACE-SHALLOW ON
JULY 29, 1999
CAPTURE ZONE MONITORING
GENERAL MOTORS CORPORATION
MORaine, OHIO

DATE 08/04/99	PROJECT MANAGER R. ASTLE	DRAWING NAME ORA\CTR06\CTR-3
DRAWN R. SMITH	LEAD DESIGN PROF.	CHECKED R. ASTLE
PROJECT NUMBER OH000294.0003.0004		FIGURE NUMBER 5



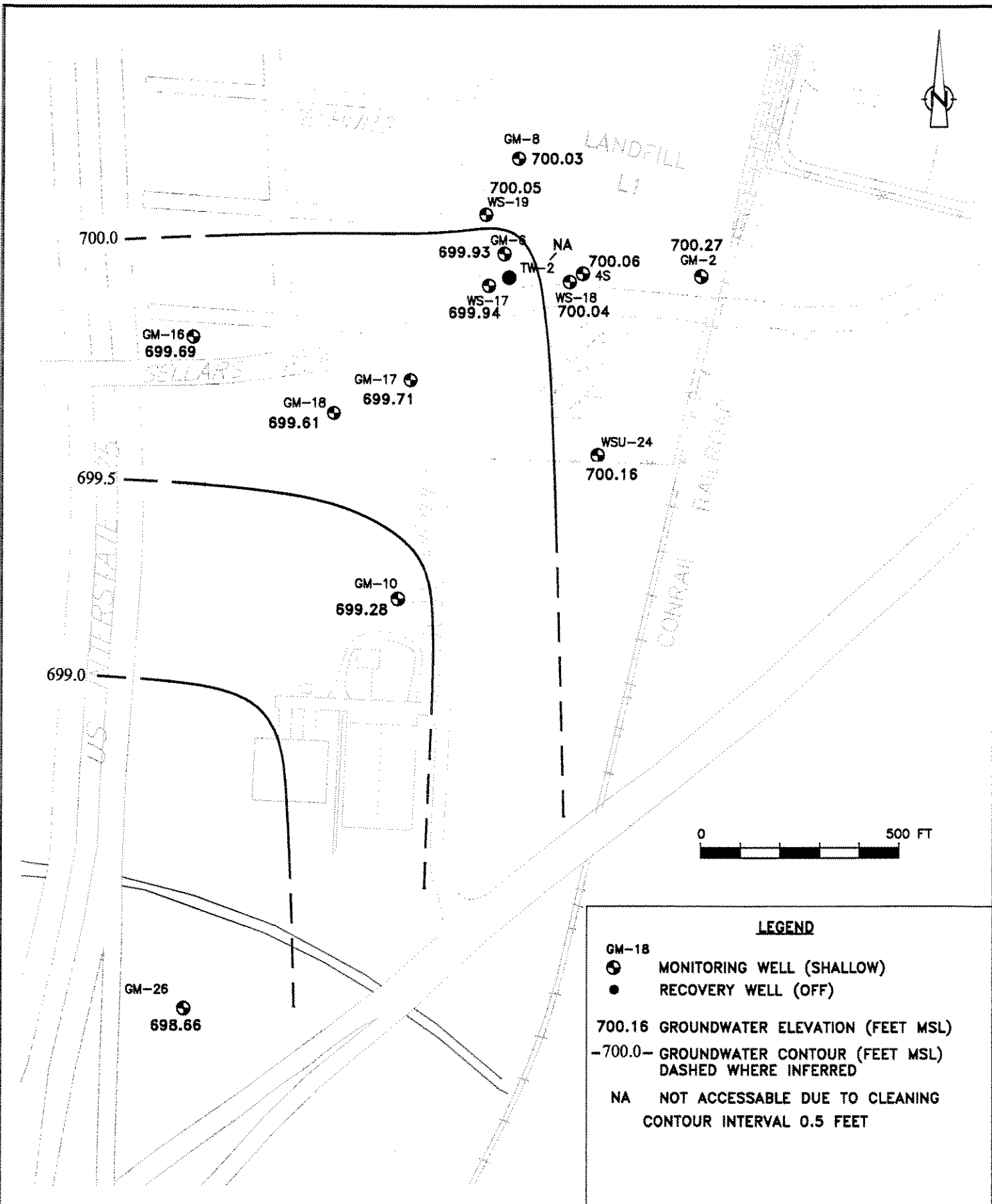
ARCADIS GERAGHTY & MILLER



6387 Emerald Parkway
Suite 100, Dublin, OH 43010
Tel 614/764-6310 Fax 614/764-1270

POTENTIOMETRIC SURFACE-DEEP
ON JULY 29, 1999
CAPTURE ZONE MONITORING
GENERAL MOTORS CORPORATION
MORAINES, OHIO

DATE 08/04/99	PROJECT MANAGER R. ASTLE	DRAWING NAME CONRAIL/GTR-D
DRAWN R. SMITH	LEAD DESIGN PROF.	CHECKED R. ASTLE
PROJECT NUMBER OH000294.0003.0004	FIGURE NUMBER 6	



LEGEND

GM-18



MONITORING WELL (SHALLOW)



RECOVERY WELL (OFF)

700.16 GROUNDWATER ELEVATION (FEET MSL)

-700.0- GROUNDWATER CONTOUR (FEET MSL)
DASHED WHERE INFERRED

NA NOT ACCESSABLE DUE TO CLEANING
CONTOUR INTERVAL 0.5 FEET

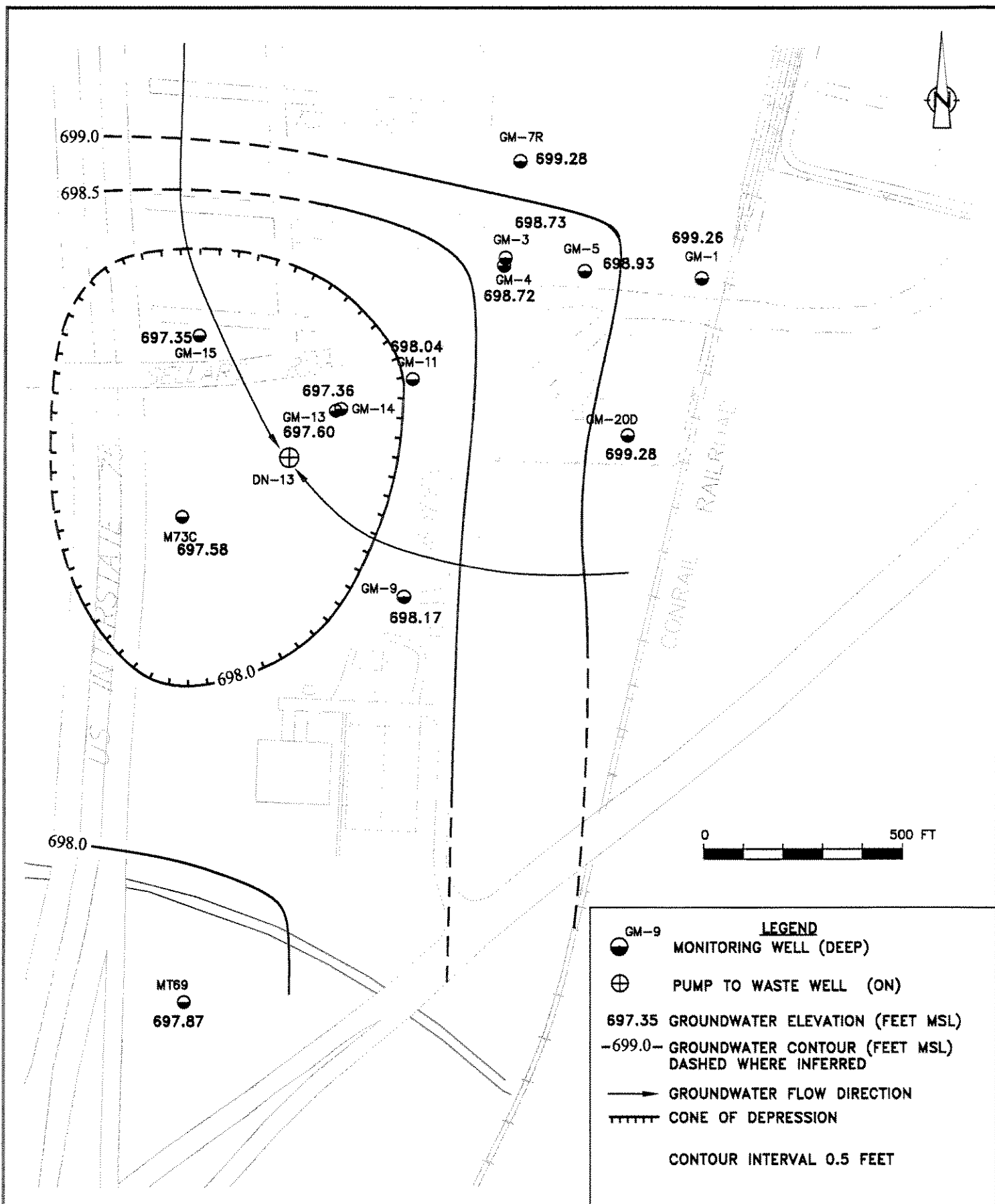
ARCADIS GERAGHTY & MILLER



WATER-TABLE SURFACE-SHALLOW ON
OCTOBER 29, 1999
CAPTURE ZONE MONITORING
GENERAL MOTORS CORPORATION
MORaine, OHIO

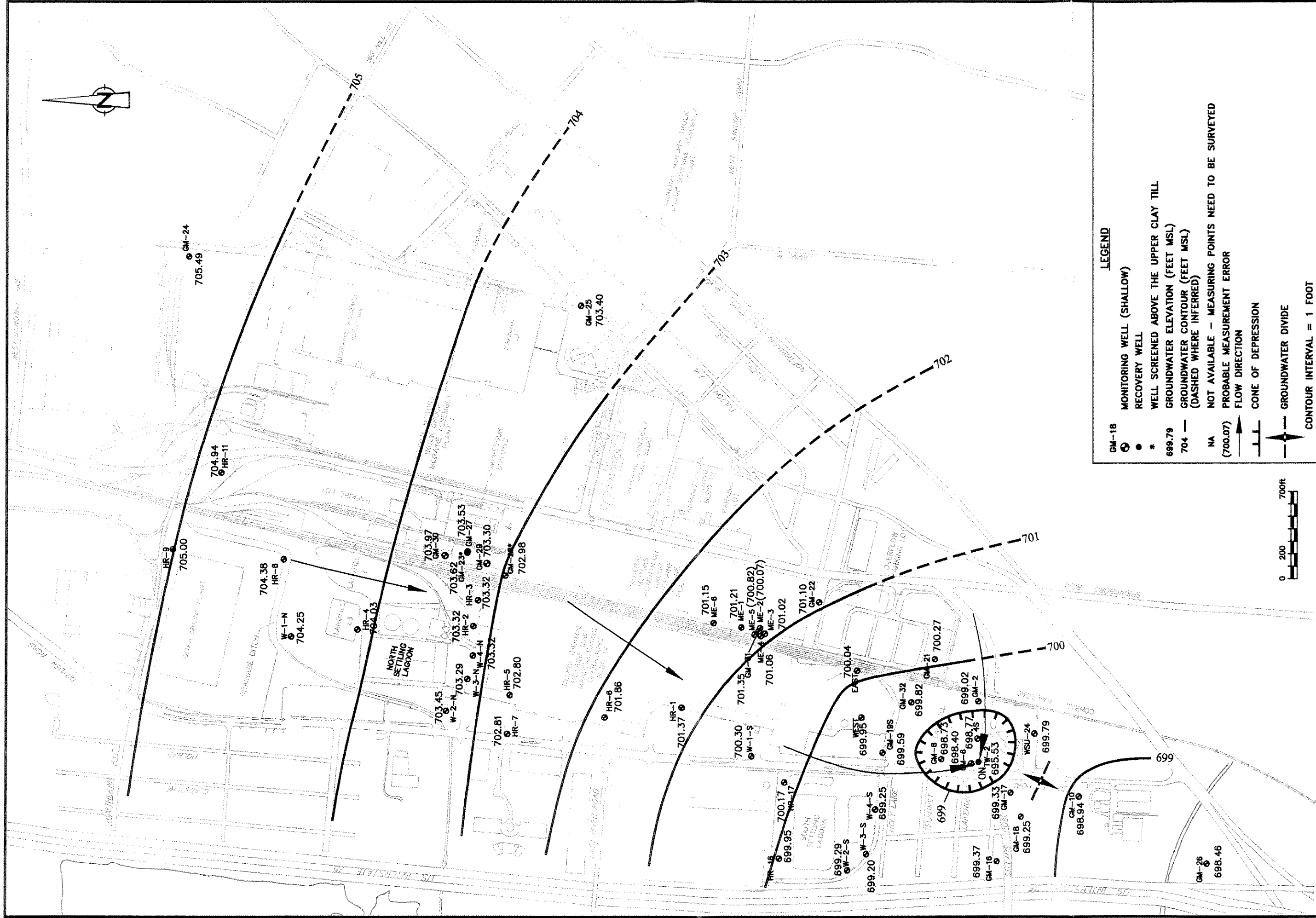
DATE OCTOBER 29, 1999	PROJECT MANAGER R. ASTLE	DRAWING NAME C:\DATA\GTRM\QTR-S
DRAWN R. SMITH	LEAD DESIGN PROP.	CHECKED R. ASTLE
PROJECT NUMBER OH000294.0003.0004	FIGURE NUMBER 7	

6307 Grand Parkway
Suite 100, Dallas, TX 75248
Tel: 972/794-2200 Fax: 972/794-1270



Appendix A

Water Table Surface,
November 16, 1999



ARCADIS GERAGHTY & MILLER 6387 Emerald Parkway Suite 150, Dublin, OH 43016 Tel: 614/764-2310 Fax: 614/764-1270	WATER TABLE SURFACE (UPPER AQUIFER) ON NOVEMBER 16, 1999 MORaine ENGINE, MORaine ASSEMBLY AND DELPHI THERMAL FACILITIES GENERAL MOTORS CORPORATION, MORaine, OHIO				DATE 05MAY99	PROJECT MANAGER R. ASTLE	DRAWING NAME CRA/GM99/SHAL09
	PROJECT NUMBER 0H000294.0003.0004				DRAWN R. SMITH	LEAD DESIGN PROF. R. ASTLE	CHECKED R. ASTLE