



DRAFT MEMORANDUM
PRIVILEGED AND CONFIDENTIAL
PREPARED AT THE REQUEST OF COUNSEL

TO: Mr. Robert Hare, MLC

FROM: Mr. Terry Gayman, CRA/cb/9

RE: **Background Soil Investigation**
Pontiac Validation Center
Pontiac, Michigan

REF. NO.: 017322

DATE: December 8, 2009

1.0 INTRODUCTION

Conestoga-Rovers & Associates, Inc. (CRA) has prepared this Memorandum to present the results of a background soil investigation at the Pontiac Validation Center (Site) located in Pontiac, Michigan. The background soil investigation was conducted concurrently with the Phase II Environmental Site Assessment (ESA) activities at the Site. The Phase II ESA activities were performed between October 2007 and April 2008, the results of which are summarized in a Phase II ESA Report (CRA, 2009). The purpose of the background soil investigation was to assist in evaluating due care obligations at the Site in accordance with Michigan Act 451 Part 201 Section 20107(a).

2.0 BACKGROUND

CRA was retained by Environmental Corporate Remediation Company Inc. (ENCORE), at the request of General Motors Corporation (GM) Legal Staff, to complete a Phase II ESA for the Site. The Phase II ESA was performed to further investigate potential areas of concern (PAOCs) identified during the Phase I ESA completed by CRA in 2006. The Phase II ESA included soil and groundwater investigative activities.

3.0 BACKGROUND METALS CONCENTRATIONS IN SOIL

During the Phase II ESA, CRA completed a preliminary review of background metals concentrations in Site soils. This background soil investigation was initiated after the preliminary review of soil data revealed various metals concentrations exceeding Part 201 Criteria. The background soil investigation was completed in accordance with the requirements presented in the Michigan Department of Environmental Quality (MDEQ) document *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria* (MDEQ, 2002, referred to as the "S³TM"). Site-specific background metals concentrations (as defined in Section 4.3 of "Statistical Methods" (Tab 7) of the S³TM) were determined for naturally-occurring metals in soils (as described in the following sections), and are used as a basis of comparison in cases where on-Site soil samples contain metals at concentrations exceeding applicable Part 201 Criteria. It is known that the

Erie Lobe during the last glaciation period had higher values of naturally occurring metals than the State-wide Default Background Values.

3.1 Statistical Methodologies and Calculated Background Values

Guidance for generating and applying soil background data for assessing compliance with Part 201 requirements is detailed in "Statistical Guidesheet 10" and Chapter 4 of Tab 7 of the S³TM. If background concentrations are greater than Part 201 Criteria for naturally occurring substances, then background comparisons may be performed on a point-by-point basis using a background mean plus three standard deviations value. A number of assumptions for the background data set must be statistically assessed before the comparisons are performed. The following subsections present the required details for the statistical calculations. Background values are established separately for each soil horizon being evaluated at a Act 451 Part 201 Facility (i.e. clay, sand, etc.).

3.1.1 Background Data

The geologic framework for the Site was defined from a review of stratigraphic and instrumentation logs from the Phase II ESA investigative activities. The Site geologic setting is primarily dominated by a sand and gravel fill layer, underlain by native clay/silt glacial deposits, underlain by bedrock. Isolated and discontinuous sand layers are interspersed throughout the native clay/silt glacial deposit at varying depths and thicknesses.

Background data for metals were collected at ten locations (BG-01 to BG-10) in March 2008. At each of the ten locations, two samples were collected: one shallow sample (typically 2-8 feet below ground surface (bgs)) in a sand layer as encountered; and a second, deep, sample (typically 10-19 feet bgs) in the native clay/silt deposit. A sandy layer was not encountered during boring at BG-05, and consequently, only a clay soil sample was collected. The background sample locations are presented on Figure A.1. Stratigraphy logs are presented in Attachment A.

The background soil samples were shipped to Test America Laboratories, Inc. (Test America) under standard chain of custody (COC) procedures and were submitted for laboratory analysis of 23 metals. A summary of the stratigraphy at the sampled locations is provided in Table 1, and the resulting background data sets are provided in Table 2. The S³TM recommends a minimum of nine background samples for establishing a Facility-specific background concentration, which have been successfully obtained for both sandy (9 background samples) and clayey (10 background samples) horizons being evaluated at the Site.

3.1.2 Non-Detects in the Background Data Set

The derivation of Site-specific background concentrations (see Table 3) when non-detect data are present is presented in Chapter 5 of Tab 7 of the S³TM. Specifically, if more than 50 percent of the background data for a given inorganic parameter is non-detect, non-parametric upper tolerance limits should be used. This occurred for five cases in the background data (see Tables 2 and 3): hexavalent chromium in both sandy and clay background samples; silver and thallium in sands; and mercury in clays. In these cases, the maximum concentration (or target detection limit) was taken as the non-parametric upper tolerance limit.

For data sets with up to 50 percent non-detect data, a value of one-half the detection limit is to be substituted for each non-detect data point prior to statistical evaluations (i.e., distribution testing, outlier testing, and background value computation).

3.1.3 Assessment of Data Characteristics and Assumptions

For background data sets containing up to 50 percent non-detect data, prior to calculating a Site-specific background concentration each set must be evaluated for underlying statistical distribution (i.e., normal, lognormal, or neither) and the presence of statistical outliers (atypically large or small values), per Section 4.3.1.1 of Tab 7 of the S³TM.

The background data distribution was assessed using the Shapiro-Wilk W-test, and probability plots where needed (Sections 1.3.5 and 1.3.3, respectively, of Tab 7 of the S³TM), considering both the original and log-transformed concentration data. Concurrently, the presence of statistical outliers was assessed using Dixon's test (for up to 25 data points, Section 2.1.4 of Tab 7 of the S³TM) for the original and log-transformed data sets. Since the assessment of these two data characteristics (distribution and outliers), is interrelated, a final decision on the appropriate data distribution to use was made considering the results of both tests. In cases where a data distribution could not be identified, the non-parametric upper tolerance limit procedure (see Section 3.1.2 above) is appropriate for determining a background value.

Results of the data distribution and outlier testing are given in Table 3.

3.1.4 Calculation of Site-Specific Background Concentrations

As noted above, if greater than 50 percent of the background data are non-detect results, or a given background data set was neither normally nor lognormally distributed, then a non-parametric upper tolerance limit was used for the background value. For instances with fewer than 86 background data points (which is the case for the background sampling), the nonparametric upper tolerance limit of the 95th percentile of background data is the maximum concentration observed.

For normal and lognormal data sets containing up to 50 percent non-detects, the Site-specific background concentration is calculated as the mean plus three standard deviations (Section 4.3.1.1 of Tab 7 of the S³TM).

The treatment of statistical outliers identified is outlined in Section 2.2 of Tab 7 of the S³TM. As noted under "*Facility-specific background samples collected off of the property of interest*" in this section, the background data obtained for the Site are believed to represent naturally occurring background metals concentrations, and were therefore retained. In some cases this resulted in the background data set being neither normally nor lognormally distributed, requiring the use of an upper tolerance limit. In other cases, a discernable data distribution was appropriate (normal or lognormal), and the mean plus three standard deviation method was used to calculate background values.

Details of the background value calculations, and the values obtained, are presented in Table 3 for sandy and clayey soil at the Site.

3.2 Applicability of Background Values for Comparing On-Site Conditions

The Site-specific background concentrations have been established for the 23 inorganic chemicals analyzed in the background samples. These background values are appropriate for a point-by-point comparisons of on-Site data. The background values are not appropriate for group-based comparisons (such as comparing an area of the Site against background conditions), in which case the procedures found in Section 4.3.2 of Tab 7 of the S³TM should be applied.

4.0 REFERENCES

CRA, 2006. Phase I Environmental Site Assessment, General Motors Pontiac Centerpoint Campus - Validation Center, Pontiac, Michigan.

CRA, 2009. Phase II Environmental Site Assessment, General Motors Validation Center, Pontiac, Michigan.

MDEQ, 2002. Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria. Michigan Department of Environmental Quality, Environmental Response Division.

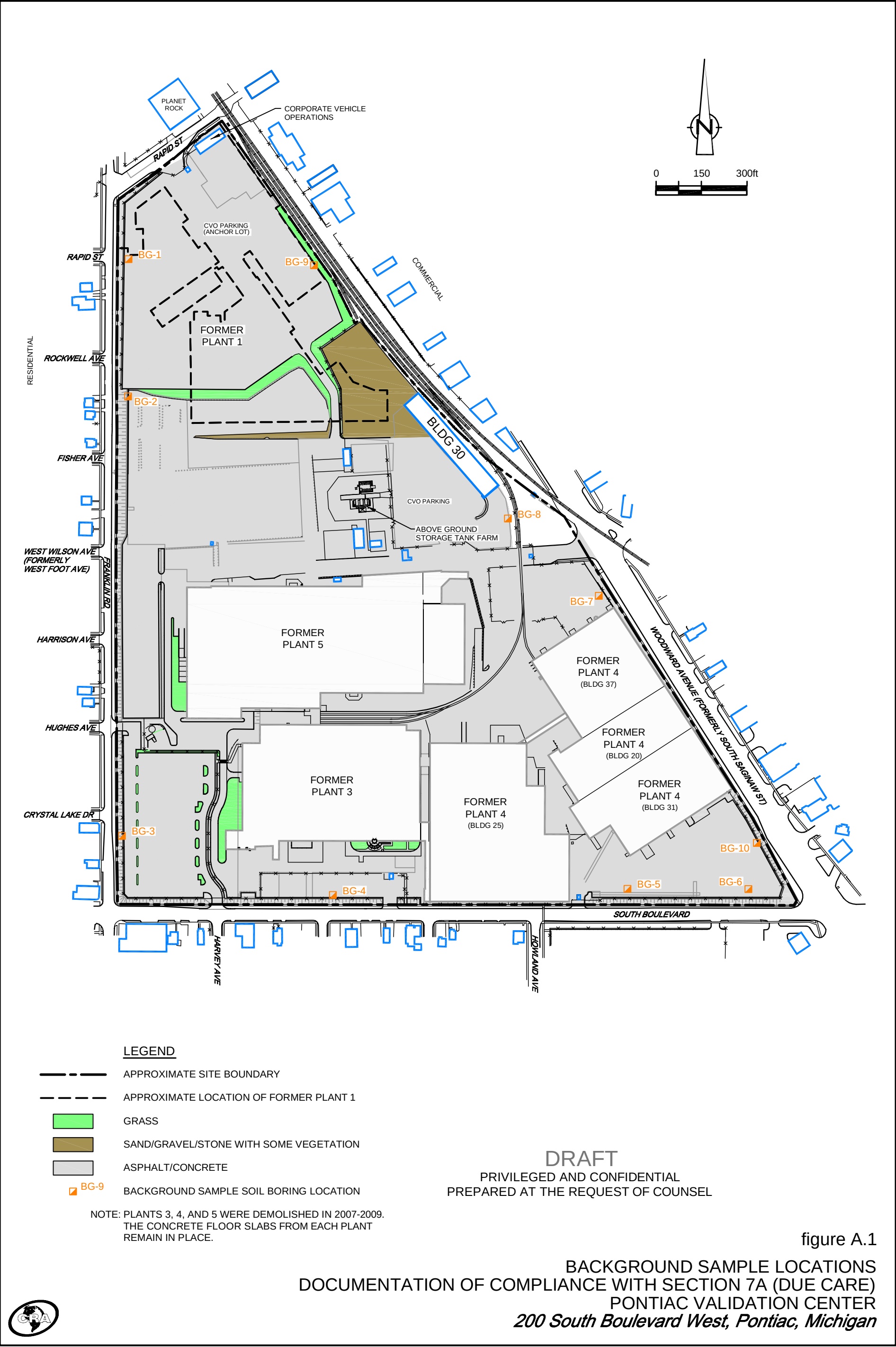


TABLE 1
BACKGROUND SAMPLE KEY AND STRATIGRAPHY
PONTIAC VALIDATION CENTER
PONTIAC, MICHIGAN

<i>Borehole Name</i>	<i>Samples Collected in Sand Layer</i>		<i>Samples Collected in Clay/Silt Layer</i>	
	<i>Depth (ft bgs)</i>	<i>Soil Description</i>	<i>Depth (ft bgs)</i>	<i>Soil Description</i>
BG-1	4-6	Sand, trace gravel	17-19	Clays, trace gravels
BG-2	11-13	Sands, trace fine gravels	16-18	Sand clays, silts
BG-3	7-8	Sands, medium to fine grained	12-14	Clays, trace gravels
BG-4	3-5	Sandy silts	12-14	Clays
BG-5	--	< no sandy soil encountered >	11-13	Clays, trace gravels
BG-6	7-9	Sands with clays	13-15	Clays, trace gravels
BG-7	3-5	Sands, trace gravels	12-14	Clays, trace gravels
BG-8	1.5-2	Sands, clays, silts	6-8	Clays, trace gravels
BG-9	2-3	Sands, trace gravels	4-6	Clays, trace gravels
BG-10	2-4	Sands, some clays	8-10	Clays, trace fine gravels

Samples in Sandy Soils

Sample Location: Depth (ft bgs)		BG-01 (4-6)	BG-02 (11-13)	BG-03 (7-8)	BG-04 (3-5)	BG-05 --	BG-06 (7-9)	BG-07 (3-5)	BG-08 (1.5-2)	BG-09 (2-3)	BG-10 (2-4)
Sample ID:		SO-17322-030708-MC-012	SO-17322-030708-MC-001	SO-17322-030608-MC-003	SO-17322-030608-MC-001	--	SO-17322-030708-MC-004	SO-17322-030708-MC-006	SO-17322-030708-MC-008	SO-17322-030708-MC-010	SO-17322-030708-MC-014
Sample Date:		03/07/2008	03/07/2008	03/06/2008	03/06/2008	--	03/07/2008	03/07/2008	03/07/2008	03/07/2008	03/07/2008
Sample Type:											
Parameter:	Units										
Metals											
Aluminum	mg/kg	2430	1640	4590	5240	--	7220	2120	4950	2740	7550
Antimony	mg/kg	0.069 J	0.080 J	R	0.053 J	--	0.054 J	0.056 J	0.057 J	0.053 J	0.056 J
Arsenic	mg/kg	4.1 J	3.7	2.6 J	4.7	--	5.8 J	3.6 J	2.8 J	3.3 J	4.8 J
Barium	mg/kg	12.6	7.6	23.7	38.3	--	214	4.7	44.3	12.2	35.9
Beryllium	mg/kg	0.14 J	0.18 U	0.24	0.28	--	0.43	0.17 U	0.26	0.17 J	0.36
Cadmium	mg/kg	0.12	0.26	0.064 J	0.23	--	0.45	0.082 J	0.15	0.098	0.22
Calcium	mg/kg	91300	37600	1010	65900	--	2060	40400	1400	24700	11400
Chromium III (Trivalent)	mg/kg	5.7	4.6	8.1	9.2	--	12.6	7.4	8.4	5.9	14.2
Chromium Total	mg/kg	5.7	4.6	8.4	9.7	--	12.9	7.6	8.7	5.9	14.7
Chromium VI (Hexavalent)	mg/kg	0.83 U	0.89 U	0.95 U	0.88 U	--	0.93 U	0.87 U	0.94 U	0.93 U	0.91 U
Cobalt	mg/kg	3.3	2.4	2.7	5.3	--	9.3	2.8	5.4	4.0	6.9
Copper	mg/kg	8.9	8.0	6.6	15.4	--	6.1	6.2	6.5	14.1	13.0
Iron	mg/kg	6240	5150	8370	11800	--	20500	5580	8700	8270	13500
Lead	mg/kg	4.5	3.6	4.0	6.1	--	5.7	3.5	18.2	6.0	6.6
Magnesium	mg/kg	15200	7290	1160	10700	--	1530	9700	1260	4710	4310
Manganese (Dissolved)	mg/kg	285	124	55.7	373	--	4110	184	517	374	413
Mercury	mg/kg	0.041 U	0.045 U	0.018 J	0.044 U	--	0.048	0.044 U	0.032 J	0.019 J	0.028 J
Nickel	mg/kg	8.8 J	8.2 J	8.4 J	13.9 J	--	14.1 J	7.5 J	8.0 J	9.8 J	15.8 J
Potassium	mg/kg	364 J	371 J	370 J	1010	--	590	281 J	592	501	841
Selenium	mg/kg	0.21 J	0.21	0.38 J	0.39	--	0.76 J	0.17 J	0.41 J	0.41 J	0.49 J
Silver	mg/kg	0.083 UJ	0.089 U	0.095 UJ	0.088 U	--	0.021 J	0.087 UJ	0.028 J	0.093 UJ	0.019 J
Sodium	mg/kg	224	89.0 U	442	826	--	248	87.2 U	515	186	178
Thallium	mg/kg	0.11 U	0.13	0.095 U	0.17	--	0.19	0.087 U	0.094 U	0.14	0.11 U
Vanadium	mg/kg	8.1	8.5	12.4	13.7	--	24.2	8.7	12.9	8.9	21.4
Zinc	mg/kg	22.1 J	33.2 J	19.2 J	33.8 J	--	47.5 J	18.7 J	28.6 J	30.1 J	31.8 J

- Notes:
- U Not present at or above the associated value.
 - J Estimated concentration.
 - UJ Estimated reporting limit.
 - R Rejected based on outlying matrix spike/matrix spike duplicate recoveries .
 - Sandy soils not encountered, no sample obtained.
 - ft bgs Feet below ground surface.

Samples in Clayey Soils

Sample Location: Depth (ft bgs)		BG-01 (17-19)	BG-02 (16-18)	BG-03 (12-14)	BG-04 (12-14)	BG-05 (11-13)	BG-06 (13-15)	BG-07 (12-14)	BG-08 (6-8)	BG-09 (4-6)	BG-10 (8-10)
Sample ID:		SO-17322-030708-MC-013	SO-17322-030708-MC-002	SO-17322-030608-MC-004	SO-17322-030608-MC-002	SO-17322-030708-MC-003	SO-17322-030708-MC-005	SO-17322-030708-MC-007	SO-17322-030708-MC-009	SO-17322-030708-MC-011	SO-17322-030708-MC-015
Sample Date:		03/07/2008	03/07/2008	03/06/2008	03/06/2008	03/07/2008	03/07/2008	03/07/2008	03/07/2008	03/07/2008	03/07/2008
Sample Type:											
Parameter:	Units										
Metals											
Aluminum	mg/kg	4580	3050	7650	6550	7820	6380	7830	8930	5060	7510
Antimony	mg/kg	0.063 J	0.16 J	0.066 J	0.066 J	0.074 J	0.030 J	0.067 J	0.064 J	0.060 J	0.067 J
Arsenic	mg/kg	3.5 J	6.6	4.6 J	6.7	2.7 J	1.2 J	3.5 J	4.5 J	5.6 J	5.2 J
Barium	mg/kg	22.7	12.9	54.9	41.9	42.0	27.6	42.3	56.1	26.1	44.5
Beryllium	mg/kg	0.22	0.20 J	0.42	0.36	0.41	0.30	0.38	0.44	0.27	0.40
Cadmium	mg/kg	0.17	0.62	0.25	0.31	0.14	0.12	0.21	0.23	0.20	0.23
Calcium	mg/kg	57000	68700	95100	74800	77700	54500	66300	79000	55500	100000
Chromium III (Trivalent)	mg/kg	9.3	6.4	14.3	11.9	13.4	11.6	13.7	14.7	11.3	13.5
Chromium Total	mg/kg	9.3	6.4	14.3	12.3	14.0	11.9	13.7	15.3	11.3	13.5
Chromium VI (Hexavalent)	mg/kg	0.88 U	1.0 U	0.91 U	0.91 U	0.94 U	0.89 U	0.91 U	0.91 U	0.89 U	0.90 U
Cobalt	mg/kg	5.2	5.0	13.3	6.3	7.9	4.6	5.0	8.9	5.0	6.5
Copper	mg/kg	9.5	15.7	18.0	15.9	14.2	9.0	14.5	17.3	11.5	17.8
Iron	mg/kg	9920	10600	16200	16600	13300	9620	14000	17200	11500	15300
Lead	mg/kg	4.3	6.1	8.5	7.2	7.0	6.0	6.1	7.7	27.6	7.3
Magnesium	mg/kg	18500	24900	14500	11400	14400	19900	12500	14500	17600	14900
Manganese (Dissolved)	mg/kg	231	334	583	336	350	227	288	467	294	396
Mercury	mg/kg	0.044 U	0.052 U	0.020 J	0.046 U	0.047 U	0.045 U	0.046 U	0.018 J	0.045 U	0.021 J
Nickel	mg/kg	13.2 J	15.3 J	24.9 J	18.1 J	20.9 J	13.7 J	17.5 J	25.1 J	13.8 J	18.4 J
Potassium	mg/kg	1000	726	1870	1190	1830	1280	1800	1840	1020	1480
Selenium	mg/kg	0.32 J	0.71	0.53 J	0.48	0.55 J	0.47 J	0.44 J	0.47 J	0.36 J	0.50 J
Silver	mg/kg	0.023 J	0.038 J	0.026 J	0.091 U	0.031 J	0.026 J	0.091 UJ	0.091 UJ	0.089 UJ	0.019 J
Sodium	mg/kg	127	196	497	811	588	206	1210	861	195	90.2 U
Thallium	mg/kg	0.17	0.39	0.23	0.15	0.22	0.19	0.17	0.26	0.14	0.22
Vanadium	mg/kg	16.7	11.4	19.0	16.1	17.7	14.4	17.8	19.7	15.8	17.7
Zinc	mg/kg	25.0 J	42.9 J	36.5 J	57.9 J	33.3 J	31.6 J	35.9 J	39.1 J	27.3 J	36.1 J

Notes:

- U
- Not present at or above the associated value.
- J
- Estimated concentration.
- UJ
- Estimated reporting limit.
-
- Sandy soils not encountered, no sample obtained.

TABLE 3
SITE-SPECIFIC BACKGROUND VALUE CALCULATIONS PER MICHIGAN PART 201 GUIDANCE
PONTIAC VALIDATION CENTER
PONTIAC, MICHIGAN

Parameter:	Units	Summary Statistics				Data distribution test results (Shapiro-Wilk)					Outlier test results (Dixon's test)				Calculated Background Values				Selected Background Value
		Number of samples	Percentage non-detects	Minimum value	Maximum value	Original data		Log-transformed data		Overall Conclusion	Original data		Log-transformed data		Mean (X)	S.D. (S)	Background (X+3S)	Non-parametric (maximum)	
						W-statistic	Conclusion	W-statistic	Conclusion		# Outliers	Values	# Outliers	Values					
(i) Sandy (shallower) soils																			
Metals																			
Aluminum	mg/kg	9	0%	1640	7550	0.910	Normal	0.926	Normal	Lognormal	0	--	0	--	4276	2186	10834	--	10800
Antimony	mg/kg	8	0%	0.053 J	0.080 J	0.733	Not Normal	0.757	Not Normal	Unknown	2	0.069J; 0.080J	2	0.069J; 0.080J	0.0598	0.010	0.089	0.080 J	0.080 J
Arsenic	mg/kg	9	0%	2.6 J	5.8 J	0.963	Normal	0.976	Normal	Lognormal	0	--	0	--	3.93	1.03	7.02	--	7.02
Barium	mg/kg	9	0%	4.7	214	0.592	Not Normal	0.954	Normal	Lognormal	1	214	0	--	43.7	65.5	240	--	240
Beryllium	mg/kg	9	22%	0.17 U	0.43	0.948	Normal	0.937	Normal	Normal	0	--	0	--	0.228	0.119	0.584	--	0.584
Cadmium	mg/kg	9	0%	0.064 J	0.45	0.876	Normal	0.972	Normal	Lognormal	1	0.45	0	--	0.186	0.121	0.549	--	0.549
Calcium	mg/kg	9	0%	1010	91300	0.883	Normal	0.877	Normal	Normal	0	--	0	--	30641	31666	125639	--	126000
Chromium III (Trivalent)	mg/kg	9	0%	4.6	14.2	0.922	Normal	0.967	Normal	Lognormal	0	--	0	--	8.46	3.18	18.0	--	18
Chromium Total	mg/kg	9	0%	4.6	14.7	0.932	Normal	0.970	Normal	Lognormal	0	--	0	--	8.69	3.35	18.7	--	18.7
Chromium VI (Hexavalent)	mg/kg	9	100%	0.83 U	0.95 U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.95 U	0.95 U
Cobalt	mg/kg	9	0%	2.4	9.3	0.890	Normal	0.943	Normal	Lognormal	0	--	0	--	4.68	2.30	11.6	--	11.6
Copper	mg/kg	9	0%	6.1	15.4	0.823	Not Normal	0.846	Normal	Lognormal	0	--	0	--	9.42	3.72	20.6	--	20.6
Iron	mg/kg	9	0%	5150	20500	0.856	Normal	0.945	Normal	Lognormal	0	--	0	--	9790	4872	24406	--	24400
Lead	mg/kg	9	0%	3.5	18.2	0.626	Not Normal	0.814	Not Normal	Unknown	1	18.2	1	18.2	6.47	4.55	20.1	18.2	18.2
Magnesium	mg/kg	9	0%	1160	15200	0.911	Normal	0.898	Normal	Normal	0	--	0	--	6207	4900	20907	--	20900
Manganese (Dissolved)	mg/kg	9	0%	55.7	4110	0.502	Not Normal	0.909	Normal	Lognormal	1	4110	1	4110	715	1282	4560	--	4560
Mercury	mg/kg	9	44%	0.018 J	0.048	n/a	n/a	n/a	n/a	Lognormal	3	0.048; 0.032J; 0.028J	3	0.048; 0.032J; 0.028J	0.0258	0.0094	0.054	--	0.0541
Nickel	mg/kg	9	0%	7.5 J	15.8 J	0.816	Not Normal	0.841	Normal	Lognormal	3	15.8J; 14.1J; 13.9J	3	15.8J; 14.1J; 13.9J	10.5	3.18	20.0	--	20
Potassium	mg/kg	9	0%	281 J	1010	0.889	Normal	0.942	Normal	Lognormal	2	1010; 841	0	--	547	243	1276	--	1280
Selenium	mg/kg	9	0%	0.17 J	0.76 J	0.887	Normal	0.921	Normal	Lognormal	3	0.17J; 0.21J; 0.21	3	0.17J; 0.21J; 0.21	0.381	0.180	0.922	--	0.922
Silver	mg/kg	9	67%	0.019 J	0.095 UJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.095 UJ	0.095 UJ
Sodium	mg/kg	9	22%	87.2 U	826	0.883	Normal	0.913	Normal	Lognormal	3	826; 515; 442	2	87.2U; 89.0U	301	253	1059	--	1060
Thallium	mg/kg	9	56%	0.087 U	0.19	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.19	0.19
Vanadium	mg/kg	9	0%	8.1	24.2	0.818	Not Normal	0.870	Normal	Lognormal	2	24.2; 21.4	0	--	13.2	5.87	30.8	--	30.8
Zinc	mg/kg	9	0%	18.7 J	47.5 J	0.914	Normal	0.932	Normal	Lognormal	0	--	0	--	29.4	8.94	56.3	--	56.3
(ii) Clay (deeper) soils																			
Metals																			
Aluminum	mg/kg	10	0%	3050	8930	0.929	Normal	0.869	Normal	Normal	0	--	0	--	6536	1808	11961	--	12000
Antimony	mg/kg	10	0%	0.030 J	0.16 J	0.652	Not Normal	0.768	Not Normal	Unknown	3	0.030J; 0.074J; 0.16J	3	0.030J; 0.074J; 0.16J	0.0717	0.033	0.171	0.16 J	0.16 J
Arsenic	mg/kg	10	0%	1.2 J	6.7	0.964	Normal	0.863	Normal	Normal	0	--	0	--	4.41	1.73	9.61	--	9.61
Barium	mg/kg	10	0%	12.9	56.1	0.934	Normal	0.888	Normal	Normal	0	--	0	--	37.1	14.2	79.7	--	79.7
Beryllium	mg/kg	10	0%	0.20 J	0.44	0.902	Normal	0.875	Normal	Normal	0	--	0	--	0.340	0.087	0.600	--	0.6
Cadmium	mg/kg	10	0%	0.12	0.62	0.735	Not Normal	0.920	Normal	Lognormal	1	0.62	0	--	0.248	0.142	0.673	--	0.673
Calcium	mg/kg	10	0%	54500	100000	0.921	Normal	0.934	Normal	Lognormal	0	--	0	--	72860	15799	120256	--	120000
Chromium III (Trivalent)	mg/kg	10	0%	6.4	14.7	0.883	Normal	0.813	Not Normal	Normal	0	--	0	--	12.0	2.56	19.7	--	19.7
Chromium Total	mg/kg	10	0%	6.4	15.3	0.900	Normal	0.825	Not Normal	Normal	0	--	0	--	12.2	2.67	20.2	--	20.2
Chromium VI (Hexavalent)	mg/kg	10	100%	0.88 U	1.0 U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.0 U	1.0 U
Cobalt	mg/kg	10	0%	4.6	13.3	0.777	Not Normal	0.857	Normal	Lognormal	1	13.3	0	--	6.77	2.69	14.9	--	14.9
Copper	mg/kg	10	0%	9	18	0.896	Normal	0.866	Normal	Normal	0	--	0	--	14.3	3.31	24.3	--	24.3
Iron	mg/kg	10	0%	9620	17200	0.913	Normal	0.907	Normal	Normal	0	--	0	--	13424	2874	22046	--	22000
Lead	mg/kg	10	0%	4.3	27.6	0.532	Not Normal	0.727	Not Normal	Unknown	1	27.6	2	27.6; 4.3	8.78	6.71	28.9	27.6	27.6
Magnesium	mg/kg	10	0%	11400	24900	0.912	Normal	0.954	Normal	Lognormal	0	--	0	--	16310	3999	28308	--	28300
Manganese (Dissolved)	mg/kg	10	0%	227	583	0.912	Normal	0.959	Normal	Lognormal	0	--	0	--	351	109	677	--	677
Mercury	mg/kg	10	70%	0.018 J	0.052 U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.052 U	0.052 U
Nickel	mg/kg	10	0%	13.2 J	25.1 J	0.893	Normal	0.915	Normal	Lognormal	0	--	0	--	18.1	4.39	31.3	--	31.3
Potassium	mg/kg	10	0%	726	1870	0.893	Normal	0.894	Normal	Lognormal	0	--	0	--	1404	419	2662	--	2660
Selenium	mg/kg	10	0%	0.32 J	0.71	0.937	Normal	0.953	Normal	Lognormal	0	--	0	--	0.483	0.107	0.803	--	0.803
Silver	mg/kg	10	40%	0.019 J	0.091 U	0.857	Normal	0.870	Normal	Lognormal	0	--	0	--	0.0344	0.011	0.066	--	0.0661
Sodium	mg/kg	10	10%	90.2 U	1210	0.899	Normal	0.938	Normal	Lognormal	0	--	0	--	474	387	1635	--	1640
Thallium	mg/kg	10	0%	0.14	0.39	0.842	Not Normal	0.934	Normal	Lognormal	1	0.39	0	--	0.214	0.073	0.432	--	0.432
Vanadium	mg/kg	10	0%	11.4	19.7	0.927	Normal	0.880	Normal	Normal	0	--	0	--	16.6	2.40	23.8	--	23.8
Zinc	mg/kg	10	0%	25.0 J	57.9 J	0.894	Normal	0.955	Normal	Lognormal	1	57.9J	0	--	36.6	9.17	64.1	--	64.1

Notes:

- U Not present at or above the associated value
J Estimated concentration
UJ Estimated reporting limit
R Rejected
-- Sandy soils not encountered, no sample obtained.



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: GM VALIDATION CENTER

PROJECT NUMBER: 17322

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-1

DATE COMPLETED: March 7, 2008

DRILLING METHOD: GEOPROBE

FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
2	FILL, concrete, sands, gravels SP-SANDS, trace gravels, medium to fine grained, some clay mix, brown, moist	0.58		1GP		70		0.0
4				4-6'-012				0.0
6								0.0
8	ASPHALT SP-SANDS, fine grained, trace gravels, black, moist	7.00 7.50		2GP		60		0.0
10	CI-CLAYS, trace fine sands, trace silts, moderate plasticity, soft, dark gray, moist	9.00						0.0
12				3GP		50		0.0
14	GP-GRAVELS, medium sized, angular, orange, moist CI-CLAYS, trace gravels, trace fine sands, trace silts, soft, moderate plasticity, gray, moist	13.00 14.00						0.0
16								0.0
18	CH-CLAYS, trace gravels, trace silts, moderate plasticity, moderately stiff, gray, moist	17.00		4GP 17-19'-013		50		0.0
20	SP-SANDS, medium to fine grained, trace gravels, gray, wet END OF BOREHOLE @ 20.0ft BGS	19.00 20.00						0.0
22								
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34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: GM VALIDATION CENTER
PROJECT NUMBER: 17322
CLIENT: ENCORE
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-2
DATE COMPLETED: March 7, 2008
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
	FILL, sands, gravels, mixed clays, asphalt							0.0
2	CI-CLAYS, trace fine gravels, moderate plasticity, moderately stiff, brown, moist	1.33		1GP		70		0.0
4	SM-SILTY SANDS, trace clays, trace gravels, some sand lenses < 2" thick, brown, moist	3.00						0.0
6								0.0
8		8.00		2GP		70		0.0
10	SP-SANDS, medium to fine grained, trace silts, trace fine gravels, brown, moist to very moist	9.00						0.0
12	SM-SILTY SANDS, some clays, trace gravels, soft, brown, moist	11.00						0.0
14	SP-SANDS, trace fine gravels, medium grained, brown, moist			11-13'-001 3GP		70		0.0
16	SC-SAND CLAYS, with silts, fine sands, low plasticity, soft, gray, very moist	16.00						0.0
18				4GP 16-18'-002		85		0.0
20	SP-SANDS, trace fine gravels, fine grained, gray, wet	19.42						0.0
22	END OF BOREHOLE @ 20.0ft BGS	20.00						
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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: GM VALIDATION CENTER
PROJECT NUMBER: 17322
CLIENT: ENCORE
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-3
DATE COMPLETED: March 6, 2008
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
2	FILL, sands, gravels, trace clays mixed, black, moist	1.00						0.0
4	CL-CLAYS, silty, trace sands, trace gravels, brown and gray mottled in areas, soft to medium soft, moderate plasticity, moist, some sand lenses with gravels <2" thick	7.00		1GP		80		0.0
6		8.00						0.0
8	SP-SANDS, medium to fine grained, trace fine gravels, brown, very moist to wet	10.00		2GP 7'-8'-003		70		0.0
10	CH-CLAYS, trace gravels, stiff, moderate plasticity, brown/gray mottled, moist							0.0
12	CH-CLAYS, trace gravels, very stiff, moderate plasticity, brown, moist							0.0
14				3GP 12'-14'-004		100		0.0
16	END OF BOREHOLE @ 15.0ft BGS	15.00						
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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼
CHEMICAL ANALYSIS ○

OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: GM VALIDATION CENTER
PROJECT NUMBER: 17322
CLIENT: ENCORE
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-4
DATE COMPLETED: March 6, 2008
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
	FILL, asphalt, sands, gravels, brown, moist	0.66						0.0
2	SC-SANDS, with clays, (FILL), brown/black, moist			1GP				
4	SM-SANDY SILTS, trace clays, trace fine gravels, fine grained sands, brown, moist	3.00		3-5' -001				0.0
6								
8	CL-SILTY CLAYS, trace sands, trace fine gravels, fine grained, soft, moderate plasticity, dark brown to brown, moist	6.42		2GP				0.0
10								0.0
12	CH-CLAYS, stiff, moderate plasticity, brown/gray mottled, moist	11.42		3GP 12-14' -002				0.0
14								
16	END OF BOREHOLE @ 15.0ft BGS	15.00						
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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM VALIDATION CENTER

HOLE DESIGNATION: BG-5

PROJECT NUMBER: 17322

DATE COMPLETED: March 7, 2008

CLIENT: ENCORE

DRILLING METHOD: GEOPROBE

LOCATION: PONTIAC, MICHIGAN

FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
2	FILL-gravels, concrete, sands, black, moist							0.0
4	CL-CLAYS, trace gravels, some fine sands, some silts, soft to moderately soft, debris (glass, brick), gray/black (FILL),	2.16		1GP		40		0.0
6								0.0
8				2GP		70		0.0
10								0.0
12	CH-CLAYS, trace gravels, moderate plasticity, stiff, gray, moist	10.00		11-13 -003 3GP		70		0.0
14								0.0
16	END OF BOREHOLE @ 15.0ft BGS	15.00						
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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM VALIDATION CENTER

PROJECT NUMBER: 17322

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-6

DATE COMPLETED: March 7, 2008

DRILLING METHOD: GEOPROBE

FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	N' VALUE	PID (ppm)
	FILL, gravels, concrete, sands, brick, black							0.0
2	CL-CLAYS, sandy, trace silts, trace gravels, moderate plasticity, moderately stiff, brown, moist	1.42		1GP		70		0.0
4								0.0
6	SC-SANDS, with clays, medium to fine grained, trace fine gravels, brown, moist	6.00						0.0
8				2GP 7-9 -004		95		0.0
10	CI-CLAYS, trace sands, trace gravels, moderate plasticity, soft, moist	9.50						0.0
12								0.0
14	CH-CLAYS, trace gravels, moderate plasticity, stiff, moist	13.00		3GP		90		0.0
16	END OF BOREHOLE @ 15.0ft BGS	15.00		13-15 -005				
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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 12/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM VALIDATION CENTER
PROJECT NUMBER: 17322
CLIENT: ENCORE
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-7
DATE COMPLETED: March 7, 2008
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
2	FILL, asphalt, sands, gravels, mixed clays, black	0.66		1GP		70		0.0
4	SP-SANDS, trace gravels, medium to fine grained, brown, moist			3-5' -006				0.0
6	CI-CLAYS, trace sands, trace gravels, moderate plasticity, soft, brown, very moist	6.00		2GP		90		0.0
8								0.0
10	CH-CLAYS, trace gravels, moderate plasticity, stiff, brown, moist	9.00		3GP 12-14' -007		100		0.0
12								0.0
14								0.0
16	END OF BOREHOLE @ 15.0ft BGS	15.00						
18								
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NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: GM VALIDATION CENTER
PROJECT NUMBER: 17322
CLIENT: ENCORE
LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-8
DATE COMPLETED: March 7, 2008
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
	FILL, sands, gravels, asphalt, brick, mixed clays, moist	1.50						0.0
2	SM-SANDS, with clays and silts, very soft, low plasticity, brown, moist	2.00		1.5'-2'-008 1GP		70		0.0
4	CH-CLAYS, trace gravels, moderate plasticity, stiff, brown, moist							0.0
6								0.0
8				6'-8'-009 2GP		95		0.0
10	END OF BOREHOLE @ 10.0ft BGS	10.00						0.0
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32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: GM VALIDATION CENTER

PROJECT NUMBER: 17322

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-9

DATE COMPLETED: March 7, 2008

DRILLING METHOD: GEOPROBE

FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
	FILL, concrete, sands, gravels, clay mix							0.0
2	SP-SANDS, medium to fine grained, trace gravels, brown, moist	2.00		1GP		80		0.0
4	CH-CLAYS, trace gravels, moderate plasticity, stiff, brown, moist	3.00		2-3' -010				0.0
6				4-6' -011				0.0
8	CI-CLAYS, trace sands, trace gravels, some silts, low plasticity, soft, gray, moist	7.00		2GP		90		0.0
10	END OF BOREHOLE @ 10.0ft BGS	10.00						0.0
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30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: GM VALIDATION CENTER

PROJECT NUMBER: 17322

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: BG-10

DATE COMPLETED: March 7, 2008

DRILLING METHOD: GEOPROBE

FIELD PERSONNEL: M. CORAM

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
2	FILL, asphalt, sand SC-SANDS, some clays, trace gravels, trace silts, medium to fine grained, brown, moist	0.16		1GP 2-4' -014		90		0.0
4	CH-CLAYS, trace fine gravels, moderate plasticity, stiff, brown, moist	4.00						0.0
6	CI-CLAYS, some sands, moderate plasticity, soft, moist	5.00						0.0
8	CH-CLAYS, trace fine gravels, moderate plasticity, stiff, brown, moist	6.00		2GP		80		0.0
10	END OF BOREHOLE @ 10.0ft BGS	10.00		8-10' -015				0.0
12								
14								
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32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 17322-WIN.GPJ CRA_CORP.GDT 3/12/08