Interim Measures Report

LNAPL Area No. 3

Pontiac North Campus

General Motors Corporation
Pontiac, Michigan

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ENCORE
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INTERIM MEASURES REPORT

AOI W-8, LNAPL AREA NO. 3
GENERAL MOTORS PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

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TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

2.0 BACKGROUND 2
2.1 PREVIOUS LNAPL RECOVERY EFFORTS 3
2.1.1 PNEUMATIC SKIMMERS 3
2.1.2 MPE REMEDIAL PILOT STUDY 4

3.0 FULL-SCALE IMPLEMENTATION OF MPE/PAL AND PF 8
3.1 EXTRACTION WELL/INJECTION WELL NETWORK 8
3.2 MPE/PAL AND PF OPERATION 9
3.3 MONITORING AND MEASUREMENT 11
3.3.1 MPVE UNITS 11
3.3.2 MPE/PAL WELLHEADS 11
3.3.3 SURROUNDING MONITORING WELLS 12
3.4 SAMPLING AND ANALYSIS 12
3.5 RECOVERED LNAPL/GROUNDWATER 12
3.6 EQUIPMENT AND MATERIALS 13
3.6.1 MPE/PAL EXTRACTION WELLS 13
3.6.2 PF WELLS 14
3.6.3 PIPING AND FITTINGS 14
3.6.4 MPVE SYSTEMS 14
3.6.5 AIR COMPRESSORS 16
3.6.6 INSTRUMENTATION AND MONITORING EQUIPMENT 16

4.0 FULL-SCALE MPE/PAL AND PF RESULTS 18
4.1 MPVE 2750 TITAN (SYSTEM 1) PERFORMANCE 18
4.2 MPVE 2750 (SYSTEM 2) PERFORMANCE 20
4.3 MPVE 27100 TITAN (SYSTEM 3) PERFORMANCE 21
4.4 TOTAL LNAPL RECOVERY 22
4.4.1 RECOVERY FROM FULL-SCALE MPE IMPLEMENTATION 22
4.4.2 OVERALL IM LNAPL RECOVERY RESULTS 23
4.5 POTENTIAL FOR LNAPL REBOUND EFFECTS 24

5.0 LNAPL DISCUSSION 26
5.1 FUTURE LNAPL RECOVERABILITY 26
5.1.1 SEMI-LOG PLOT EXTRAPOLATION 27
5.1.2 DECLINE CURVE ANALYSIS EXTRAPOLATION 28
5.2 LNAPL RECOVERY ENDPOINTS 28
5.2.1 SPECIFIC PERFORMANCE STANDARDS 28
5.2.2 COST CONSIDERATIONS 29
5.3 POST RECOVERY LNAPL CONDITIONS 29
5.4 MEMORANDUM TO U.S. EPA 31

6.0 RECOVERY SYSTEM DECOMMISSIONING ACTIVITIES..... 32
6.1 RECOVERY SYSTEM COMPONENTS.....32
6.2 EXTRACTION NETWORK MATERIALS 32
6.3 MONITORING/EXTRACTION WELLS 33

7.0 LONG-TERM MONITORING ACTIONS 35

8.0 REFERENCES.....36

LIST OF FIGURES
(Following Text)

FIGURE 1.1 SITE LOCATION

FIGURE 1.2 AREAS OF INTEREST AND OFFSITE AREAS

FIGURE 2.1 WELL LOCATIONS AND LAYOUT OF SYSTEMS

FIGURE 3.1 TYPICAL MPE/PAL SCHEMATIC

FIGURE 3.2 TYPICAL PF WELL SCHEMATIC

FIGURE 3.3 MPVE 2750 SYSTEM SCHEMATIC

FIGURE 3.4 MPVE 2750 SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

FIGURE 3.5 MPVE 27100 SYSTEM SCHEMATIC

FIGURE 3.6 MPVE 27100 SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

FIGURE 4.1 MPE SYSTEM 1 LNAPL RECOVERY SUMMARY

FIGURE 5.1 MPE SYSTEM 1 SEMI-LOG LNAPL RECOVERY PROJECTION

FIGURE 5.2 MPE SYSTEM 1 DECLINE CURVE ANALYSIS

FIGURE 5.3 MPE SYSTEM 1 OPERATING COST PER GALLON

LIST OF TABLES
(Following Text)

TABLE 2.1 QED FERRET LNAPL RECOVERY SUMMARY

TABLE 4.1 MPE SYSTEM 1 LNAPL RECOVERY SUMMARY

TABLE 5.1 LNAPL RECOVERY PROJECTIONS

TABLE 5.2 MPE SYSTEM 1 OPERATING COST PER GALLON DATA

TABLE 6.1 SUMMARY OF WASTE CHARACTERIZATION AND HANDLING

LIST OF APPENDICES
(Following Text)

APPENDIX A LNAPL FINGERPRINTING RESULTS

APPENDIX B MPE SYSTEM SPECIFICATIONS

APPENDIX C COMPREHENSIVE MPE SYSTEM LNAPL RECOVERY DATA

APPENDIX D MPE SYSTEM ACTIVITY LOGS

APPENDIX E POST-MPE WELL MEASUREMENTS

APPENDIX F WELL BORING LOGS FOR LNAPL AREA NO. 3

APPENDIX G MEMO TO U.S. EPA REGARDING SUSPENSION OF MPE OPERATION WITH FOLLOW-UP RESPONSES TO COMMENTS

LIST OF ACRONYMS

acfm	Actual cubic feet per minute
AIR	Area of Industrial Redevelopment
AOI	Area of Interest
AST	Aboveground Storage Tank
bgs	below ground surface
cfm	cubic feet per minute
CMP	Corrective Measures Proposal
CRA	Conestoga-Rovers & Associates
DPT	Direct Push Technology
EEC	ENCORE Environmental Consortium
ENCORE	Environmental Corporate Remediation
GAC	Granular activated carbon
GEESI	Ground Effects Environmental Services Inc
GM	General Motors Corporation
gpm	gallons per minute
"Hg	inches of mercury
"H_2O	inches of water
Hp	Horsepower
IM	Interim Measure
IMWP	Interim Measure Work Plan
ITS	Internal treatment system
LEL	Lower explosive limit
LNAPL	Light non-aqueous phase liquid
MDEQ	Michigan Department of Environmental Quality
Memo	Memorandum
MPE	Multi-phase extraction
MPVE	Multi-phase vapor extraction
O & M	Operation and Maintenance

PAL	Pneumatic air lift
PCB	Polychlorinated biphenyl
PF	Pneumatic fracturing
ppm	Parts per million
psi	Pounds per square inch
PTI	Permit to Install
PVC	Polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
scfm	standard cubic feet per minute
SVOC	Semi-volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
U.S. EPA	United States Environmental Protection Agency
USPS	United States Postal Service
VOC	Volatile organic compounds
WST	Web Server Telemetry

1.0 INTRODUCTION

Light non-aqueous phase liquid (LNAPL) was discovered in Area of Interest (AOI) W-8 during implementation of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the General Motors Corporation (GM) Pontiac North Campus facility (Site) in Pontiac, Michigan. The Site location and the location of AOI W-8 with respect to the Site are shown in Figures 1.1 and 1.2, respectively. This particular LNAPL area is referred to as LNAPL Area No. 3. An Interim Measures Work Plan (IMWP), describing the planned LNAPL recovery activities in LNAPL Area No. 3, was presented to the United States Environmental Protection Agency (U.S. EPA) in September 2004 (ENCORE, 2004a). The IMWP proposed the use of high vacuum multi-phase extraction (MPE) technology with pneumatic air-lift (PAL) and pneumatic fracturing (PF) as an aggressive LNAPL recovery option in LNAPL Area No. 3. The IMWP was prepared by Encore Environmental Consortium, L.L.C. (EEC) for Environmental Corporate Remediation Company, Inc. (ENCORE), a wholly owned subsidiary of GM.

LNAPL Area No. 3 is located in the southeast portion of AOI W-8. The area is currently undergoing industrial redevelopment which prompted the use of an aggressive LNAPL recovery effort to minimize the possibility of actual or perceived interference with redevelopment activities. This IM Report describes the LNAPL recovery conducted since the issuance of the September 2004 IMWP. In addition, previous activities and proposed further actions in LNAPL Area No. 3 will be discussed.

This IM Report is organized as follows:

- Section 1.0 – Introduction;
- Section 2.0 – Background;
- Section 3.0 – Full-Scale Implementation of MPE/PAL and PF;
- Section 4.0 – Full-Scale MPE/PAL and PF Results
- Section 5.0 – LNAPL Discussion;
- Section 6.0 – Current/Future LNAPL Activities;
- Section 7.0 – Long-Term Monitoring Actions; and
- Section 8.0 – References.

2.0 BACKGROUND

LNAPL Area No. 3 was discovered during subsurface investigation activities at the Site associated with the RFI, which was initiated in 2001. To date, the following documents have been submitted to the U.S. EPA detailing the investigations associated with characterizing and delineating the LNAPL in LNAPL Area No. 3:

- RFI Report (ENCORE, 2002) submitted to U.S. EPA on April 30, 2002;
- RFI Supplemental Report No. 1 (ENCORE, 2003a) submitted to U.S. EPA on November 26, 2003;
- Corrective Measures Proposal (CMP) submitted to U.S. EPA on November 26, 2003 (ENCORE, 2003b); and
- RFI Work Plan Addendum No. 10 (ENCORE, 2004b) submitted to U.S. EPA on January 13, 2004.

A sample of the LNAPL in LNAPL Area No. 3 (collected from monitoring well MWW8-03 on October 26, 2001) was previously submitted for hydrocarbon fingerprinting. The results of the fingerprinting indicated that the LNAPL was predominated by a weathered diesel #2 with a small amount of highly degraded No. 6 fuel oil (ENCORE, 2002). A copy of the laboratory report is provided in Appendix A.

The following documents have been previously submitted to U.S. EPA regarding IMs planned and/or implemented at LNAPL Area No. 3:

- IMWP for the implementation of the pneumatic skimmers (QED Ferret system) submitted to U.S. EPA on March 2, 2004 (ENCORE, 2004c);
- IMWP for a MPE/PAL and PF Remedial Pilot Study submitted to U.S. EPA on May 20, 2004 (ENCORE, 2004d);
- Report on the MPE/PAL and PF Remedial Pilot Study submitted to U.S. EPA on August 31, 2004 (ENCORE, 2004e);
- IMWP for full-scale implementation of LNAPL recovery by MPE submitted to U.S. EPA on September 27, 2004 (ENCORE, 2004a);
- Periodic Operational Data Reports; and
- March 20, 2006 Memorandum requesting permission to cease MPE/PAL and PF operations.

2.1 PREVIOUS LNAPL RECOVERY EFFORTS

2.1.1 PNEUMATIC SKIMMERS

Consistent with the March 2, 2004 IMWP (ENCORE 2004c), LNAPL recovery was accomplished by placing portable pneumatic skimmer-type pumps (QED Ferrets) into existing monitoring wells within LNAPL Area No. 3. Skimmer pumps were installed to allow the evaluation of LNAPL recovery rates and to observe the effect of the skimming of LNAPL on surrounding monitoring wells. The skimmers were installed and operated to allow the reconfiguration and movement of pumps to different monitoring/extraction wells as required. LNAPL recovery focused on wells that had the greatest "in-well" or "apparent" LNAPL thicknesses. During LNAPL recovery activities, the groundwater level and LNAPL thickness was monitored in each of the wells from which LNAPL was being extracted, as well as adjacent wells to assess the effects of removal on the LNAPL area. When LNAPL recovery diminished in a given well, the skimmer was removed from that well and placed in the next well with the greatest in-well LNAPL thickness. The purpose of this strategy was to attempt to maximize LNAPL recovery during pneumatic skimming.

Operation of the QED Ferret pneumatic skimmers commenced on February 24, 2004. Three skimmers were placed in three separate monitoring wells and operated simultaneously. Each skimmer discharged LNAPL to a dedicated drum. Overall, the skimmers were rotated amongst the following wells during this IM: MWW8-02, MWW8-03, MWW8-06, MWW8-07, MWW8-08, MWW8-09, MWW8-14, MWW8-15, MWW8-16, MWW8-24, RWW8-01, RWW8-02 and RWW8-08. The locations of these wells are identified in Figure 2.1. Data detailing the LNAPL recovery in each of these wells are presented in Table 2.1.

A total of approximately 588 gallons of LNAPL was recovered via pneumatic skimming from February 24 through November 19, 2004. With the exception of MWW8-24, the majority of the monitoring wells in the area exhibited a drastic decline in LNAPL recovery rate following one to two days of skimming. Based on the LNAPL recovery amounts from each well (Table 2.1), it appeared that approximately 50% of the total LNAPL recovery was obtained from monitoring well MWW8-24.

It should be noted that the maximum LNAPL recovery rates identified in Table 2.1 could only be realized through the constant rotation of skimmers to avoid the period of diminishing recovery. This allowed the slowly recharging monitoring wells to recover LNAPL to a sufficient extent to support further skimming. Average LNAPL recovery rates for most of the monitoring wells would be significantly decreased if the QED

Ferrets were to remain in the monitoring wells for periods exceeding one to two days. This indicates that pneumatic skimming (or other types of passive or hydraulic removal methods) would not have been an effective full-scale LNAPL recovery alternative.

On November 5, 2004, the air compressor responsible for running the three skimmers became inoperable due to the rigorous pumping schedule that was implemented. Consequently, LNAPL recovery in LNAPL Area No. 3 using pneumatic skimming was discontinued pending the evaluation of alternative recovery methods.

2.1.2 MPE REMEDIAL PILOT STUDY

The following presents a summary of the MPE remedial pilot study performed at LNAPL Area No. 3. A detailed report on the pilot study was previously submitted to U.S. EPA (ENCORE, 2004e).

LNAPL Area No. 3 is located within the Area of Industrial Redevelopment (AIR) at the Site. The United States Postal Service (USPS) is in the process of redeveloping the property and constructing a new USPS regional distribution facility. During initial property redevelopment negotiations, GM/ENCORE and the USPS agreed that GM/ENCORE would conduct aggressive LNAPL recovery to recover as much LNAPL as practically feasible up until the time vertical construction of the USPS building commenced, or the extraction systems and wells interfered with the progression of construction activities. That is, the purpose of the aggressive LNAPL recovery was to minimize the possibility of actual or perceived interference with redevelopment activities, rather than the existence of a potential for significant risk due to exposure to the LNAPL. As discussed in the RFI Report (ENCORE 2002), the RFI baseline risk assessment determined that potential exposure of construction workers and routine workers to the LNAPL constituents would not be significant, and therefore, would not trigger the need for corrective measures.

During the first few months of LNAPL recovery via pneumatic skimming, it became apparent that the use of skimmers was not going to meet the aggressive LNAPL recovery objectives of ENCORE and the USPS for property redevelopment. Consequently, EEC was asked to evaluate other potential aggressive LNAPL recovery alternatives.

Aggressive LNAPL recovery alternatives considered for use by EEC included: MPE with PAL and PF, soil heating, total fluids extraction, and combinations thereof. High vacuum or vacuum enhanced recovery (e.g., MPE) methods are well-established as superior technologies for recovering LNAPL from the subsurface, particularly from low

permeability soils, in comparison to conventional hydraulic methods. PAL and PF have also been used as effective enhancements for the recovery of LNAPL from low permeability soils via MPE. Soil heating, which could be used to further enhance LNAPL recovery via MPE, was deemed to be impractical based on anticipated costs versus expected benefits.

A pilot study comprising MPE/PAL and PF was conducted from May 25 through June 5, 2004 (ENCORE, 2004d) to further evaluate the use of these technologies as a full-scale LNAPL recovery alternative for LNAPL Area No. 3. The pilot study was designed to evaluate the effectiveness of MPE/PAL and assess any added benefits of utilizing PF for enhanced recovery. The pilot study also provided the opportunity to collect necessary data for the full-scale design of an MPE/PAL system, with or without PF.

The pilot study consisted of a 10-day evaluation conducted in two distinct areas of LNAPL Area No. 3. The first study area (Study Area 1) was chosen to represent the area yielding the greatest amount of LNAPL recovery during pneumatic skimming (that is, the area in the vicinity of monitoring well MWW8-24). The second study area (Study Area 2) was chosen to represent the area yielding the least amount of LNAPL recovery during pneumatic skimming (that is, the area in the vicinity of monitoring well MWW8-16). Consequently, the pilot study was utilized to evaluate potential LNAPL recoveries from a relatively high recovery area versus a relatively low recovery area.

The objectives of the pilot study were to:

- Estimate mass hydrocarbon removal rates in the free phase (LNAPL), vapor phase and dissolved phase (to obtain a total removal rate) for each of the recovery technologies;
- Determine the extent to which an induced vacuum was observed in monitoring wells surrounding the extraction and/or injection wells;
- Determine the extent to which liquid levels (LNAPL/groundwater) were influenced in monitoring wells surrounding the extraction and/or injection wells;
- Estimate the areas of hydraulic and vacuum influence for each of the two areas studied, and determine extraction and injection well spacing for a full-scale recovery alternative; and
- Estimate the costs associated with the implementation of a full-scale recovery alternative.

The pilot study was conducted using a skid-mounted Ground Effects Environmental Services Inc. (GEESI) Multi-Phase Vapor Extraction (MPVE) 2415 system.

With respect to Study Area 1, the free phase LNAPL recovery was observed to quickly level off after an initial spike when the LNAPL within and in the immediate vicinity of the extraction wells was recovered (i.e. after the storage volume of product in the well and sand pack had been evacuated). Once this LNAPL was extracted, the rate of LNAPL recovery dropped significantly, becoming a function of the limited hydraulic conductivity of the clay soils in the surrounding formation. Free phase LNAPL recovery increased significantly approximately 24 hours after the commencement of PF. At the conclusion of Week 1, the free phase LNAPL recovery rate observed during PF (14.1 gallons per hour) was over 3 times greater than the highest rate observed initially when fracturing was not conducted (3.6 gallons per hour). This result suggested that the PF was successful at increasing the hydraulic conductivity of the formation and inducing the mobilization of LNAPL towards the extraction wells.

With respect to Study Area 2, the free phase LNAPL recovery was also observed to quickly level off after an initial spike when the LNAPL within and in the immediate vicinity of the extraction wells was recovered. Free phase LNAPL recovery began to increase approximately 6 hours after the commencement of PF. However, a malfunctioning air compressor prevented fracturing from being performed over the final 2 days of the monitoring period (week 2). Notwithstanding the compressor failure (and similar to what was observed for Study Area 1), the highest free phase LNAPL recovery rate observed during PF (0.34 gallons per hour) was approximately 2.5 times greater than the highest rate observed initially when fracturing was not conducted (0.14 gallons per hour). This result suggests that the PF was successful at artificially increasing the hydraulic conductivity of the formation and inducing the mobilization of LNAPL towards the extraction wells. However, the free phase LNAPL recovery rates observed for Study Area 2 were significantly lower than for Study Area 1, suggesting that the relative permeability and hydraulic conductivity of the LNAPL in Study Area 2 is much lower than that in Study Area 1, and/or that there is less available LNAPL for recovery in Study Area 2. This was further evidenced by a lower observed water production rate in Study Area 2 compared with Study Area 1.

The total amount of LNAPL-equivalent recovered from LNAPL Area No. 3 during the pilot study was approximately 147 gallons over a period of two weeks. The overall LNAPL recovery exhibited the following partitioning between the different phases:

- 93-98% of the LNAPL was recovered in the free phase;

- 2-7% of the LNAPL was recovered in the vapor phase; and
- < 1% of the LNAPL was recovered in the dissolved phase.

The results of the pilot study indicated that a full-scale MPE/PAL and PF system would be an effective and aggressive option for the recovery of LNAPL in LNAPL Area No. 3. Consequently, EEC recommended that ENCORE proceed with the implementation of a full-scale MPE/PAL and PF system at LNAPL Area No. 3.

3.0 FULL-SCALE IMPLEMENTATION OF MPE/PAL AND PF

As previously discussed, GM/ENCORE and the USPS agreed that GM/ENCORE would implement an aggressive LNAPL recovery measures to recover as much LNAPL as practically feasible up until the time vertical construction of the USPS building commenced. This section presents the methodology, schedule, materials and equipment used in the full-scale implementation of MPE/PAL and PF at LNAPL Area No. 3. The results of the LNAPL recovery program are presented in Section 4.0.

3.1 EXTRACTION WELL/INJECTION WELL NETWORK

The results of the MPE/PAL and PF pilot study indicated that various monitoring wells near the MPE/PAL wells experienced significant increases in well headspace pressures during the period of active fracturing (air injection). As indicated in the pilot study report (ENCORE, 2004e), the pressure in many of these wells eventually decreased with some wells subsequently experiencing a vacuum as the fracturing continued over time. In an effort to minimize the potential for the short-circuiting of injected air in the subsurface (that is, air that is injected and not recovered by the extraction well network), EEC installed an additional row(s) of extraction (MPE/PAL) wells along the outer perimeter of the extraction well network. The purpose of the outer perimeter wells was to prevent the fracturing process from "pushing" LNAPL beyond the zone of recovery of the extraction wells, and to minimize the potential for significant subsurface pressurization beyond LNAPL Area No. 3.

The proposed extraction well and injection well network originally consisted of 34 extraction wells and six PF wells (ENCORE, 2004a). However, other Site investigation activities determined that LNAPL Area No. 3 was larger than originally thought. Consequently, additional extraction and injection wells were placed throughout the larger LNAPL Area No. 3 (i.e., to the west and northwest of the original area). In total, 89 MPE/PAL extraction wells and 21 PF wells were installed in LNAPL Area No. 3. The approximate extent of the extended LNAPL area and the locations of extraction and injection wells are provided in Figure 2.1.

The extraction wells were installed at spacings of approximately 30-50 feet (i.e., radius of influence of 15-25 feet). The exact configuration of the extraction well network was dependent upon the locations of existing extraction and monitoring wells, resulting in an irregular grid. The PF wells were installed at various locations in the middle portion of the LNAPL area such that each injection well was surrounded by extraction wells. All extraction and injection wells were individually piped with shut-off valves to/from

header pipes connected to the system to allow maximum operational flexibility throughout the operation of the system.

3.2 MPE/PAL AND PF OPERATION

The MPE was originally intended to be performed using one GEESI MPVE 2750 Titan system (System) capable of providing a maximum vacuum of 27 inches of mercury ("Hg, or 30 feet of water) with a maximum air flowrate of approximately 1,300 standard cubic feet per minute (scfm). The System was to be used to apply a constant vacuum to a maximum of 12 extraction wells at any given time. However, due to the more current understanding of a larger LNAPL Area No. 3, two additional GEESI MPVE Systems were added to the recovery efforts. The three MPVE Systems included:

- MPVE 2750 Titan (System 1);
- MPVE 2750 (System 2); and
- MPVE 27100 Titan (System 3).

Systems 1 and 2 were used to apply a constant vacuum to a maximum of 12 wells simultaneously. System 3 was used to apply a constant vacuum to a maximum of 24 wells simultaneously.

PAL was conducted by injecting air into smaller diameter drop tubes/hoses that ran to the bottom of the extraction wells. The injected air was pulsed into the extraction wells on a cycled basis with the pulse duration lasting approximately 30-90 seconds, and the time between pulses lasting approximately 2-3 minutes. The PAL was conducted such that air is pulsed into each operational extraction well on a rotating basis.

The purpose of the PAL was to increase the pressure differential that drives the column of liquid (LNAPL and groundwater) upward, and to reduce the effective density to promote flow under the pressure differential. This enabled the effective evacuation of liquid from each extraction well while applying a constant high vacuum to the subsurface. It also created a degree of hydraulic control by maintaining the wells in a near evacuated state for a prolonged basis.

The PF was accomplished using an air compressor(s) to inject air into 1-inch diameter steel injection wells that penetrated the entire thickness of LNAPL in the formation, into the saturated zone. The injection wells were situated in the middle of the extraction well network.

The PF was conducted by pulsing air into the steel injection wells on a cycled basis. The pulse duration lasted approximately 30-90 seconds, with the time between pulses lasting approximately 2-3 minutes.

The purpose of the PF was to enhance the potential for mass hydrocarbon recovery from the subsurface. The continual injection of air (on a pulsed basis) causes fractures to propagate radially outward from the air injection (fracturing) well. The air injection also creates a substantial increase in the pressure differential between the fracturing well and surrounding MPE/PAL extraction wells. This creates a "push-pull" type of system that enhances the potential for mass hydrocarbon recovery.

The automated MPVE Systems operated up to 24 hours per day, 7 days per week, pending scheduled shutdowns for maintenance, sampling, extended holiday schedules and/or unscheduled downtimes. Based on the schedule for industrial redevelopment, LNAPL extraction in LNAPL Area No. 3 (and in particular, beneath the proposed USPS building footprint) was originally intended for approximately one year (from March 2005 to March 2006).

Recovery performance was optimized by operating each respective System, powered by either a 50 Horsepower (Hp) or 100 Hp rotary lobe blower, at maximum operating capacity (i.e., vacuum and air flowrate). In addition, the PAL lines were generally extended to the bottom of each extraction well to ensure that each well would be completely evacuated during each PAL cycle. Visual observations at each well were utilized to ensure the respective PAL cycle was sufficient to completely evacuate the well (i.e., compressed air was injected into the well until the flow of extracted liquids was observed to cease). Consequently, the extraction systems were optimized by maintaining the extraction wells in a near-evacuated state, rather than focus on pumping rates (which would not be accurately quantitative with this type of pulsed operation). This was done to maximize drawdown in the vicinity of each extraction well in order to expose the maximum amount of LNAPL for recovery. In addition, the PF was utilized to enhance and optimize recovery.

In order to make maximum use of the available time, the Systems were always used to extract from multiple extraction wells at any given time. As such, extraction rates were not quantified at any individual well. However, the extraction wells being operated were constantly rotated as LNAPL recovery was observed to be poor or to decrease over time in a given area. If an area was found to perform well, extraction was continued. Furthermore, a full-time field technologist was dedicated to the operation of the Systems

in order to monitor the recovery operations, maximize system up-time, and alternate extraction wells as necessary to optimize recovery.

All associated monitoring, sampling and data collection completed during the operation of the Systems is described in the following subsections.

3.3 MONITORING AND MEASUREMENT

Monitoring and measurement of various System(s) parameters, extraction/injection well parameters, and monitoring well observations were recorded to optimize the operation of the MPVE units and collect necessary data regarding hydrocarbon recovery rates and System effluent liquid and vapor-phase streams. All system monitoring is summarized in Table 3.1. The details of this monitoring and measurement are discussed in the following subsections.

3.3.1 MPVE UNITS

Operation of the MPVE Systems was monitored on a near continuous basis. Specifically, the following parameters were monitored:

- Applied vacuum ("Hg);
- Air flow rate cubic feet per minute (cfm);
- Total hydrocarbon concentration in vapor phase (% Lower Explosive Limit (LEL) or parts per million (ppm), on a continuous basis via infrared sensor);
- Total LNAPL removed (gallons);
- Separated groundwater discharge flowrate gallons per minute (gpm); and
- Applied air injection pressure for PAL and PF pounds per square inch (psi).

These data were used to calculate mass hydrocarbon recovery rates, optimize the System(s) operating parameters, and calculate the liquid and vapor-phase emission rates of all relevant chemical constituents. Monitoring equipment used to record and/or collect the necessary data is discussed in Section 3.6.6.

3.3.2 MPE/PAL WELLHEADS

The MPE/PAL wellheads were monitored periodically during System(s) operation for the optimization of operating conditions. Specifically, the following parameters were monitored as required:

- Applied vacuum ("Hg); and
- Depth to LNAPL/groundwater.

Monitoring equipment used to record and/or collect the necessary data is discussed in Section 3.6.6.

3.3.3 SURROUNDING MONITORING WELLS

Extraction wells not being actively extracted from were used as monitoring wells, and were monitored regularly during System operation for the optimization of operating conditions. Specifically, the following parameters were monitored on a regular and as-needed basis:

- Induced vacuum inches of water ("H_2O); and
- Depth to LNAPL and groundwater.

3.4 SAMPLING AND ANALYSIS

Discrete extracted vapor and water samples were collected from the MPVE System(s) on a periodic basis and submitted for laboratory analysis (see Table 3.1). A State of Michigan Air Permit to Install (PTI No. 218-04) for the air emissions from the System was issued by the Michigan Department of Environmental Quality (MDEQ) for the LNAPL recovery program. The PTI application included calculations estimating the air emissions from the System's gas-phase exhaust stream. In addition, dispersion modeling was utilized to perform a screening of the System's emissions against MDEQ human health-based criteria. Emissions estimates were based on the direct venting of the System's gas-phase exhaust stream to the ambient air.

3.5 RECOVERED LNAPL/GROUNDWATER

Each MPVE System was equipped with an oil/water separator with an internal storage tank for temporary storage of separated LNAPL. Recovered LNAPL was subsequently transferred via transfer pump to 1,000-gallon double walled steel aboveground storage tanks (ASTs). Recovered groundwater that exited the oil/water separator was subject to an air stripping process, treatment with granular activated carbon (GAC), and subsequently transferred to on-Site storage tanks (20,000-gallon capacity Fractionation or Frac-tanks).

Treated groundwater stored in the Frac-tanks was tested (one sample per Frac-tank once full) for polychlorinated biphenyls (PCBs) prior to being shipped off-Site by Inland Waters Pollution Control to the Environmental Quality Company's (EQ) Detroit facility for disposal.

Waste characterization analyses (Toxicity Characteristic Leaching Procedure or TCLP) were previously performed on LNAPL samples from LNAPL Area No. 3. The analyses could not achieve low enough detection limits for comparison against the hazardous waste regulatory levels. Consequently, the LNAPL required disposal as a hazardous waste. LNAPL recovered during the IMs implemented to date was manifested as a hazardous waste and transported off-Site. Recovered LNAPL was stored in 1,000-gallon tanks and each tank was sampled for PCBs to determine Toxic Substances Control Act (TSCA) requirements. LNAPL collected from the original LNAPL Area No. 3 contained less than 2 ppm PCBs and was not classified as a TSCA waste. LNAPL collected from the original LNAPL Area No. 3 was shipped to EQ's Detroit facility for fuel blending. LNAPL collected from the extended (western) portion of LNAPL Area No. 3 contained greater than 2 ppm PCBs and was therefore classified as a TSCA waste. LNAPL collected from extended LNAPL Area No. 3 was shipped to ONYX in Port Arthur, Texas for incineration in accordance with TSCA regulations.

3.6 EQUIPMENT AND MATERIALS

3.6.1 MPE/PAL EXTRACTION WELLS

The boreholes for the MPE/PAL wells were advanced using rotosonic drilling techniques. The boreholes were advanced to a maximum depth of approximately 40 feet below ground surface (bgs). All drill cuttings were placed in roll-off boxes for subsequent characterization and disposal at the Oakland Heights Development non-hazardous waste landfill in Auburn Hills, Michigan.

The MPE/PAL wells were constructed in accordance with the requirements stipulated in the RFI Work Plan (ENCORE, 2001). The MPE/PAL wells consisted of 4-inch diameter, Schedule 40 polyvinyl chloride (PVC) piping materials. The well screens consisted of Number 10-slot well screens extending from approximately 10 feet above the water table to 10 feet below the water table. The riser pipes extended from the top of the well screens up to approximately 3 feet above ground surface. Each well was equipped with a well head assembly including a PVC gate valve. The MPE/PAL wells were constructed with a sand filter pack to prevent the introduction of native soil into

the well screens. Each well was equipped with a filter sand pack from the bottom of the well up to 2 feet above the top of the well screen. A 2-foot bentonite seal was placed above the sand pack and sufficiently hydrated to allow swelling. Cement-bentonite grout (Neat cement with 3-5% bentonite powder) was placed above the bentonite seal up to 2.5 feet bgs. The remaining borehole annulus was filled with concrete to properly secure the well. A typical MPE/PAL well schematic is provided in Figure 3.1.

3.6.2 PF WELLS

The PF wells were driven directly into the ground using Geoprobe direct push technology (DPT) techniques. GEESI was on-Site to oversee the installation of the PF wells.

The PF wells consisted of 1-inch diameter steel piping materials. The bottom portion of the well piping (from approximately 10 feet above the water table to 10 feet below the water table) was specifically perforated by GEESI to enable fracturing at the desired depth range within the formation. The riser pipe extended from the top of the slotted portion up to approximately 3 feet above ground surface. All PF well piping materials were provided by GEESI. A typical PF well schematic is provided in Figure 3.2.

3.6.3 PIPING AND FITTINGS

All piping materials used to convey extracted vapors and fluids from the MPE/PAL wells to the MPVE System(s) consisted of 4-inch diameter, Schedule 40 PVC piping materials. The piping was secured at the top of each MPE/PAL wellhead using adjustable metal clamps or connectors. A PVC gate valve was installed at each MPE/PAL wellhead to allow for flow control and wellhead monitoring. Extraction pipes ran into common 4-inch diameter PVC header pipes that ran back to the System(s). All piping materials were completed above ground and were sufficiently heat-traced and insulated to enable continuous year round operation.

The pipe network utilized to convey compressed air to the PALs and the PF wells was comprised of a mixture of 2-inch diameter, Schedule 80 PVC piping and pressure-rated flexible hose. Tigerflex reinforced flexible hose was utilized to supply compressed air from the MPE/PAL wellheads to the PAL head at the bottom of the each well.

3.6.4 MPVE SYSTEMS

As previously stated, the three GEESI MPVE Systems used in LNAPL Area No. 3 included:

- MPVE 2750 Titan (System 1);
- MPVE 2750 (System 2); and
- MPVE 27100 Titan (System 3).

The two MPVE 2750 units were each comprised of a 50 Hp rotary lube vacuum pump capable of exerting a maximum vacuum of 27 "Hg and achieving a maximum airflow rate of 1,300 scfm. The MPVE 27100 unit was comprised of a 100 Hp rotary lobe vacuum pump capable of exerting a maximum vacuum of 27 "Hg and achieving a maximum airflow rate of 2,000 scfm. The two Titan units were equipped with wireless remote telemetry capabilities that were used to both monitor and optimize System(s) operations. Technical specifications for each of the MPVE units are provided in Appendix B. System schematics and Process and Instrumentation Diagrams are provided in Figures 3.3 through 3.6. A general description of the units is provided below.

Each MPVE System was equipped with an Integrated Treatment System (ITS) that included an air/water separator (knockout) tank, oil/water separator, and a high efficiency, low maintenance vacuum air stripper. The air stripper was equipped with two low-profile air stripping trays complete with diffusers. The ITS design is completely enclosed, which eliminates the additional blower, level controls and transfer pumps typically required for the operation of the air stripper. The vacuum applied at the knockout tank within the ITS was used to operate the air stripper under vacuum.

Each System was equipped with a silt removal system upstream of the MPVE unit. A high-efficiency mud separator tank was utilized as a silt knockout to reduce the solids loading to the System. The silt collected in the knockout tank was periodically removed, characterized, and appropriately disposed of off-Site. In addition, two liquid phase GAC units in series were utilized downstream of the ITS for water polishing purposes.

Each System oil/water separator was equipped with an internal storage tank for temporary storage of separated LNAPL. Recovered LNAPL was subsequently transferred via transfer pump to the external 1,000-gallon double-walled steel ASTs. The oil/water separator was also equipped with a sludge hopper and progressive cavity mud pump to remove solids within the extracted liquid stream.

The Systems were equipped with three conductivity level switches for the transfer pump and low-level, high-level, and high high-level shut down controls. The Systems also contained two clean-out ports and two drain ports. A liquid level sight glass was mounted on each unit for easy viewing of internal processes.

Influent and effluent liquid sampling ports were located at the inlet and liquid outlet of each MPVE unit. Intermediate liquid sampling ports were located within the knockout tank and after the oil/water separator within the Systems. A vapor sampling port was located at each System's gas stream exhaust point.

All Systems were powered by diesel generators. Diesel fuel ASTs (1,000-gallon diesel fuel tanks with integrated covered secondary containment) were utilized to supply fuel to the generators.

All MPVE Systems and associated equipment were located within fully enclosed sound attenuated buildings.

3.6.5 AIR COMPRESSORS

Air compressors were used for PAL and PF purposes. The PAL compressors on the MPVE 2750 units consisted of 10 Hp electric compressors capable of providing a maximum airflow rate of 85 actual cubic feet per minute (acfm) at a pressure of 20 psi. The PF compressors on the MPVE 2750 units consisted of 25 Hp electric compressors capable of providing a maximum airflow rate of 100 acfm at a pressure of 100 psi. Compressed air for the MPVE 27100 unit was supplied by a single compressor for both PAL and PF purposes. This compressor is a 50 Hp electric unit capable of providing a maximum airflow rate of 200 acfm at a pressure of 100 psi.

3.6.6 INSTRUMENTATION AND MONITORING EQUIPMENT

The Systems were equipped with the following instrumentation to allow process monitoring and optimization:

- Water Flowmeter: All systems utilized ABB 10DX4311 magnetic flow meters to measure the discharge of separated groundwater. The flow meters are capable of measuring flow in the range of 3-50 gpm;
- Air Flowmeter: All systems utilized Rosemount 3051SFA annubar flowmeters to measure gas stream exhaust volumetric flowrates;
- LEL Sensor: The MPVE 2750 units utilized Net Safety MLP-AR-SIR100 infrared sensors to continuously monitor the total hydrocarbon concentration in the exhaust gas stream. The sensor operates in the 0-100% LEL range. The MPVE 27100 unit utilized a Draeger Polytron IREXIL infrared sensor to continuously monitor the total hydrocarbon concentration THC concentration in the exhaust gas stream. The sensor was operated in the 0-10,000 (ppm) range; and

- Web Server Telemetry (WST) System: The WST system (Titan units only) was used for wireless remote operation and monitoring of the system from any location through a secure website. The WST system operated in conjunction with the vacuum transmitter and vapor temperature transmitter described below:
  - Vacuum Transmitter: A Wika 892.13.500 vacuum transmitter was used to transmit the System applied vacuum to the WST system, and
  - Vapor Temperature Transmitter: A Rosemount 644H SMART system is used complete with a Rosemount Series 644 Temperature Transmitter, direct mount with Rosemount Instruments Model 0183 Thermocouple Sensor.

The following monitoring equipment was used as needed for the purposes of System optimization, effluent monitoring (both liquid and gas/vapor streams), and data collection from the extraction/monitoring well network:

- Oil/Water Interface Probe: A Solinst Model 122 oil/water interface probe was used as needed to record the depths to LNAPL/groundwater in the MPE/PAL wells and surrounding monitoring wells. The probe is equipped with an infrared sensor and conductivity sensor and is capable of measuring LNAPL thicknesses of 0.005 feet or greater. The presence of LNAPL is indicated via an audible steady tone with a visual steady red light. The presence of groundwater is indicated via an audible pulsed tone with a visual blinking red light; and
- Vacuum Gages: Various vacuum gages (Magnehelic or equivalent) were used to record applied and/or induced vacuum or pressure on MPE/PAL wells and surrounding monitoring wells. Gages for MPE/PAL wellheads are capable of reading applied vacuums ranging from 0-30 "Hg. Gages for monitoring wells were capable of reading induced vacuums ranging from 0-10 "H_2O, and 0-1" H_2O. All vacuum readings from monitoring wells were obtained under sealed conditions using air-tight fittings.

4.0 FULL-SCALE MPE/PAL AND PF RESULTS

The EEC collected pertinent data and performed various calculations throughout the MPE/PAL and PF operations to monitor and optimize the progress of the LNAPL recovery efforts. Specifically, the following information was generated for each MPVE System:

- Table of effluent vapor hydrocarbon concentrations with corresponding LNAPL equivalent removal rates and cumulative removals over time;
- Table of free phase LNAPL removal quantities over time;
- Graphs of vapor phase LNAPL equivalent removal rates and cumulative removals over time;
- Graph of free phase LNAPL cumulative removals and cumulative water production over time; and
- Graph of vapor phase, free phase, and total cumulative LNAPL removal over time.

These tables and graphs are provided in Appendix C. Dissolved (aqueous) phase hydrocarbons were shown to be a negligible fraction of total LNAPL recovery during the MPE pilot study. Consequently, LNAPL recovery in the dissolved phase was not tracked during operation.

In addition to performance data, the EEC also kept track of pertinent operation and maintenance information including System up-times and down-times, scheduled and unscheduled maintenance, and other information. This information is provided in Appendix D.

4.1 MPVE 2750 TITAN (SYSTEM 1) PERFORMANCE

System 1 was mobilized to the Site in late February 2005. The system was connected (via aboveground piping) to an extraction well network of 34 wells (thirty-two 4-inch PVC wells and two 2-inch PVC wells) in the southeast corner of LNAPL Area No. 3. The System initially operated from 12 MPE/PAL wells and 2 PF wells. Throughout the ensuing months, the System was periodically connected to other wells (maximum of 14 at one time) and allowed to operate. The objective for rotating extraction wells was to identify the wells that yielded the most LNAPL for optimum recovery. Ultimately, it was determined that the wells in the extreme southeast corner of LNAPL Area No. 3 yielded the most LNAPL. This was consistent with observations during pneumatic

skimming and the MPE/PAL and PF pilot study (see Section 2.1). Consequently, most of the focus for LNAPL recovery by System 1 was directed in this area.

System 1 operated in the southeast portion of LNAPL Area No. 3 from February 26, 2005 to February 13, 2006. The System operated at an average vacuum of 15-20"Hg and air flow rate of 460 scfm. The following is a summary of the operational information for System 1:

- February 24, 2005 - February 13, 2006: 12 months operation in southeast portion of LNAPL Area No. 3 (eastern portion of original LNAPL area);
  - Operating between 4-12 extraction wells at a time,
  - Operating between 1-2 PF wells at a time;
- November 25, 2005 - December 20, 2005: shut down for methane monitoring; and
- January 4, 2006 – February 13, 2006;
  - Operating between 4-12 extraction wells at a time, and
  - Operating between 1-2 PF wells at a time.

The approximate location of the System and associated aboveground piping is presented in Figure 2.1.

System 1 recovered a total of 3,685 gallons of LNAPL-equivalent with 90,000 gallons of groundwater over 5,400 hours of operation. The phase-specific breakdown of LNAPL recovery is as follows:

- 92% of LNAPL recovered in the free phase;
- 7% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase (assumed from pilot study results).

Table 4.1 and Figure 4.1 summarize the performance of System 1. The cumulative recovery curve shown in Figure 4.1 shows that recovery for System 1 was initially high (represented by a more vertical slope), and gradually decreased over time to near zero slope (i.e., the LNAPL recovery rate approached zero). The recovery rates detailed in Table 4.1 show a gradual decrease over time to values less than 1 gallon per day near the end of the operating period. The change in recovery rate over time is further described by the asymptotic trend in recovery rate shown in Figure 4.1.

Evidence of both emulsification and biological growth created blockages within the ITS and high pressures and blockages in carbon vessels. A comprehensive equipment cleaning and maintenance program was implemented to power wash the interior elements of the system creating periodic downtimes. An emulsion breaker (Droycon Bioconcepts CB-4) was added to break up emulsification and act as a biocide. Several different environments were created in attempt to optimize the effectiveness of CB4. However, the results were not sufficient to avoid the need for periodic system cleanings.

4.2 MPVE 2750 (SYSTEM 2) PERFORMANCE

System 2 was mobilized to the Site in May 2005. This System was also connected (via aboveground piping) to a portion of the extraction well network (thirty-two 4-inch PVC wells and two 2-inch PVC wells) in the southeast corner of LNAPL Area No. 3. The System operated for a period of 1.5 months at an average vacuum of 15-20 "Hg and an average air flow rate of 600 scfm. However, only a small amount of LNAPL (less than 30 gallons or 110 litres) was recovered from this area. It should be noted that this area coincided with Pilot Study Area 2, which exhibited relatively low LNAPL recovery during the pilot study. Consequently, the System was temporarily shut down and re-piped to service the northwest portion of LNAPL Area No. 3. Ultimately, the System was relocated to the west portion of LNAPL Area No. 3 in September 2005 to service the entire western portion of the area. The following is a summary of the operational information for System 2:

- May 4, 2005 - June 17, 2005: operation in southeast portion of LNAPL Area No. 3 (western portion of original LNAPL area);
  - Operating between 4-12 extraction wells at a time,
  - Operating between 1-2 PF wells at a time,
- September 15, 2005 - October 18, 2005: operation in northwest portion of LNAPL Area No. 3;
- October 18, 2005: shut down for methane monitoring;
- December 20, 2005 - February 13, 2006: moved to previous location of System 3 (see Figure 2.1) and operated in west portion of LNAPL Area No. 3 (west of original LNAPL area);
- January 9, 2006 - January 12, 2006: running on four wells on the northwestern portion of LNAPL Area No. 3,

- January 12, 2006 - January 16, 2006: running on seven wells on the northwestern portion of LNAPL Area No. 3,
- January 16, 2006 - January 23, 2006: running on four wells in the center of west portion of LNAPL Area No. 3, and
- January 23, 2006 - February 13, 2006: running on four wells on the north end of surcharge pile.

The approximate location of the System and associated aboveground piping is presented in Figure 2.1.

The performance of System 2 was poor in comparison with System 1 (Systems 1 and 2 have the same operational capabilities). System 2 was only able to extract a total of 298 gallons of LNAPL-equivalent along with more than 65,000 gallons of groundwater over 2,000 hours of operation. The phase-specific breakdown of LNAPL recovery is as follows:

- 73% of LNAPL recovered in the free phase;
- 26% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase (assumed from pilot study results).

4.3 MPVE 27100 TITAN (SYSTEM 3) PERFORMANCE

The third MPVE unit (MPVE 27100 Titan) was mobilized to the Site in September 2005 and connected (via aboveground piping) to the extraction well network (sixty-two 4-inch PVC wells) in the west portion of LNAPL Area No. 3. The System operated for a period of 2 months (from August 29th to October 18th, 2005) at an average vacuum of 15-20 "Hg and average air flow rate of 920 scfm. However, little LNAPL (less than 30 gallons or 110 litres) was recovered from this area. Consequently, the system was shut down and relocated to another part of the Site. The following is a summary of the operational information for System 3:

- August 29, 2005 - October 18, 2005: operation in west portion of LNAPL Area No. 3 (west of original LNAPL area);
  - Operating between 4-12 extraction wells at a time, and
  - Operating between 1-3 frac wells at a time,
- October 18, 2005: shut down for methane monitoring; and

- Subsequently moved to LNAPL Area No. 9/10.

The approximate location of the System and associated aboveground piping is presented in Figure 2.1.

The performance of System 3 was poor in comparison with System 1 (System 3 has double the operational capability of Systems 1 and 2). System 3 was only able to extract a total of 38 gallons of LNAPL-equivalent along with more than 85,000 gallons of groundwater over 550 hours of operation. The phase-specific breakdown of LNAPL recovery is as follows:

- 27% of LNAPL recovered in the free phase;
- 72% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase (assumed from pilot study results).

4.4 TOTAL LNAPL RECOVERY

4.4.1 RECOVERY FROM FULL-SCALE MPE IMPLEMENTATION

Based on the results of the three MPVE Systems, a total of 4,023 gallons of LNAPL-equivalent was recovered from LNAPL Area No. 3. The phase-specific breakdown of LNAPL recovery is as follows:

- 91% of LNAPL recovered in the free phase;
- 8% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase (assumed from pilot study results).

LNAPL extraction was performed for the longest duration (i.e., February 26, 2005 through February 10, 2006) at and in the vicinity of well MWW8-24, where extraction well screens intersected sand seams that exhibited evidence of LNAPL. As previously discussed, this was found to be an area of relative high LNAPL recovery during the previous pneumatic skimming activities and MPE remedial pilot study. The majority of the total recovery of LNAPL in LNAPL Area No. 3 is likely attributable to the area in the vicinity of MWW8-24. That is, the majority of the recovery illustrated in Figure 4.1 (by System 1) was extracted from this area. Consequently, the drop-off in recovery rates to less than 3 gallons per day is also attributable to this 'worst-case' area.

Full area coverage was achieved due to an extraction well spacing of approximately 40 feet, and extraction wells typically having 20-foot screens across the water table/LNAPL-water interface. Influence was also enhanced through the use of PF to enhance the permeability of the formation. Evidence of the System(s)' ability to produce a significant zone of influence was most notably documented during the MPE remedial pilot study conducted in May/June, 2004. The following observations detail these effects:

- Vacuum influence was documented by well headspace pressure readings that exhibited a negative pressure at distances greater than 60 feet from the active extraction area; and
- Hydraulic influence was documented by measured drawdown of liquid levels in wells at distances greater than 100 feet from the active extraction area.

The pilot study was conducted by operating a maximum of four extraction wells at any given time. Conversely, at least 12 extraction wells were operated simultaneously at any given time during the year of operation of the full-scale System(s). Well headspace pressure measurements taken during the operation of the full-scale recovery System(s) confirmed the observations of the pilot study.

Extraction wells were maintained in a near-evacuated state while simultaneously applying a high vacuum to the well. Maintaining each well in a near-evacuated state corresponds to the maximum achievable liquid extraction rate (especially given the aggressiveness of the extraction method including PF). A decrease in liquid extraction could have been achieved by raising the PAL lines within the well (i.e., raise the elevation of the extraction point) or scaling back the operating condition of the System(s) (i.e., decrease the applied vacuum). Either one of these effects would have resulted in less influence on liquids in the well, and less drawdown, with the expected result that more LNAPL would become entrapped and immobile/unrecoverable. This is due to the fact that LNAPL residual saturation is typically much higher beneath the water table in the saturated zone than in the unsaturated zone (API, 2004).

4.4.2 OVERALL IM LNAPL RECOVERY RESULTS

As previously discussed, pneumatic skimmers were operated in the original LNAPL Area No. 3 for approximately 8 months in 2004. The total amount of LNAPL-equivalent recovered from LNAPL Area No. 3 from the operation of the pneumatic skimmers in 2004, the MPE/PAL and PF pilot study in 2004, and the operation of the three full-scale

MPVE Systems in 2005-2006 is approximately 4,758 gallons. A summary of LNAPL recoveries and operation times are as follows:

- Pneumatic skimmer system recovery (8 months) – 588 gallons;
- MPE/PAL and PF remedial pilot study (2 weeks) – 147 gallons; and
- Full-scale MPE/PAL and PF recovery (1 year) – 4,023 gallons.

It is important to note that EEC has made no attempt to quantify the amount of biodegradation of LNAPL that has occurred in the subsurface before and during the operation of MPE/PAL and PF. However, there is evidence that biodegradation of LNAPL was taking place before and during the operation of the MPE systems. The presence of methane at the Site (geographically correlated with certain LNAPL areas) and the glacial till soil (that is likely under anaerobic conditions) are both suggestive that a significant amount of anaerobic LNAPL degradation was taking place prior to operation of the MPE systems via methanogenesis (conversion of organic compounds to methane under anaerobic conditions). Methane has been previously identified within the AIR and is being addressed under separate cover (ENCORE, 2006). During the operation of the MPE systems, large quantities of high-pressure air were injected at depth via the performance of PF. In addition, evidence of biofouling was identified in the various MPVE Systems, particularly System 1. Research shows that high vacuum MPE operations have the ability to enhance significant hydrocarbon degradation in the subsurface due to the supply of air (oxygen) to previously oxygen-depleted zones (i.e., anaerobic conditions converted to aerobic conditions). Due to the high vacuums and airflow rates exerted by the systems, in addition to the air injections provided by PF, EEC believes that aerobic biodegradation has likely played a significant role in reducing the overall presence of LNAPL and petroleum hydrocarbons in LNAPL Area No. 3 during the operation of the MPVE Systems.

4.5 POTENTIAL FOR LNAPL REBOUND EFFECTS

EEC does not believe that any significant rebound effect would be experienced should the Systems be restarted in the future. There were several periods of extended downtime (2-3 weeks) for System 1 during methane monitoring activities and various maintenance activities. There were no significant spikes in recovery observed upon restarting the System (even while operating in the best-performing recovery area). Furthermore, EEC believes that given the aggressive nature of the extraction Systems, and the eventual drop-off in recovery rates, the LNAPL in the extraction area is near field residual saturation levels. The recovery rates achieved by the System(s) near the

end of the operating period were poor. It is reasonable to assume that if a recovery system that induces such an exaggerated gradient in the subsurface cannot achieve a good recovery rate, then the LNAPL is very unlikely to be mobile under normal hydraulic conditions (i.e., normal hydraulic gradient, unfractured soil). Furthermore, fractures that were kept open due to dessication by the periodic injection of dry air during PF activities will rehydrate, swell and close when PF is terminated. This will further limit the potential for LNAPL mobility in the area.

The actual LNAPL recovery results indicate that a significant in-well LNAPL thickness does not necessarily correlate to a high degree of LNAPL recoverability. A well screened within a predominantly fine-grained formation creates a low-pressure macropore that may induce the flow of LNAPL into the well. The LNAPL may be under hydraulic pressure given the heterogeneous conditions, which could create a large LNAPL thickness in a well that is not reflective of the formation. EEC maintains that the actual recovery data showing that recovery has reached an asymptotic plateau is the best possible line of evidence of an extremely low future LNAPL recovery potential.

5.0 LNAPL DISCUSSION

This section presents discussion on conditions during and following the suspension of active recovery via MPE at LNAPL Area No. 3, potential future recoverability of LNAPL from the area, as well as remedial end-points appropriate to an LNAPL recovery program.

5.1 FUTURE LNAPL RECOVERABILITY

Although LNAPL recoverability can be estimated using model simulations, a more direct line of evidence for evaluating LNAPL recoverability is site-specific recovery data. This, in large part, is due to the numerous soil heterogeneities in the subsurface, including heterogeneities within and throughout a given LNAPL plume. The longer the recovery data spans (for a given technology), the better the understanding for future recovery potentials.

It is EEC's experience that a plot of LNAPL recovery rate, from plumes where there is no continuing release, generally follows an exponential decay pattern over time. Similarly, cumulative LNAPL recoveries also tend to display an exponential decay pattern. This trend reflects the concept that as free-phase is removed, the LNAPL saturation levels in the subsurface approach residual levels, which are unrecoverable. LNAPL recovery data collected over time can be used to approximate future LNAPL recoveries. Based on the performance data and information presented in this memorandum, only System 1 (MPVE 2750 Titan) was able to recover a sufficient amount of LNAPL to warrant continued operation (beyond a 6-month timeframe) in LNAPL Area No. 3. Based on initial LNAPL recovery results, it appeared as though System 1 may have been extracting LNAPL from more permeable sand seams in the extreme southeast portion of LNAPL Area No. 3.

The total cumulative LNAPL recovery for System 1 exhibits a classic exponential decay pattern with decreased LNAPL recovery over time. Figure 4.1 displays the cumulative LNAPL recovery curve and the recovery rate data for System 1. The recovery rate data is representative of 'real-time' recovery rates calculated for the intervals between each system monitoring event (approximately daily), as opposed to dividing the total LNAPL collected at any point by the total operating time at that point (which produces an average recovery rate over the entire operational period, and does not account for fluctuations in recovery rate that would be more pronounced as the time-scale is reduced). The latter portion of the System 1 cumulative recovery curve shown in Figure 4.1 is representative of an LNAPL recovery rate that has dropped below 2 gallons per day (see Table 4.1). Furthermore, the change in recovery rate over time displayed in

Figure 4.1 shows an asymptotic trend. It is reasonable to assume that System 1 recovery rates would continue to approach zero with continued operation of the system. The recoveries achieved by Systems 2 and 3 were so poor that no meaningful graphical representation can be made, as recovery rates were less than 2 gallons per day for most of their operation.

5.1.1 SEMI-LOG PLOT EXTRAPOLATION

In an effort to predict future recoveries by System 1, EEC plotted the cumulative total LNAPL recovery on a semi-log graph, with time (operating time) being shown on the log scale. In addition, EEC extended the graph forward in time for an additional nine-year period, thus estimating what a ten-year active recovery period could achieve. The cumulative LNAPL recovery data is presented in Table 4.1. The semi-log graph is provided in Figure 5.1. The actual LNAPL recovery for Year 1 and projected LNAPL recoveries for Years 2 through 9 were taken from the graph and recorded in Table 5.1, along with the percentage of total LNAPL recovery.

The semi-log graph in Figure 5.1 suggests that a cumulative total of approximately 4,700 gallons of LNAPL could be recovered over ten years (of operation) using System 1 in the extreme southeast portion of LNAPL Area No. 3. However, Figure 5.1 and Table 5.1 indicate that:

- Approximately 76% (3,670 gallons) of the total recoverable LNAPL in ten years of system operating time was recovered in the first 7 months of operating time alone; and
- The annual percentage of LNAPL recovery for each successive year (Years 2 through 10) yields greatly diminished returns.

Figure 5.1 presents a semi-log recovery plot for System 1. The curve follows a relatively straight line constant slope, and then changes to a flatter slope after approximately 5 to 6 months of operation. This change in slope suggests that a boundary condition or limiting condition was encountered such that the LNAPL recovery rate was drastically reduced from its initial exponential decay pattern. This suggests that the availability of LNAPL for extraction was greatly diminished throughout the one-year period of aggressive extraction by System 1. The 4,700 gallon estimate (after 10 years of operating time) likely represents an overestimate or upper limit of potential LNAPL recovery.

The 10 year operating period was used for the purposes of the semi-log extrapolation since 10 years represents one full interval on the log scale. However, due to the greatly

diminished returns identified in Figure 5.1 and Table 5.1, it would not be practical or reasonable to even consider operating System 1 for such a duration.

5.1.2 DECLINE CURVE ANALYSIS EXTRAPOLATION

In an effort to predict the total practical amount of LNAPL that could be recovered by System 1 in the future, EEC plotted the latter portion of the LNAPL recovery rates against the cumulative LNAPL recovery. In addition, EEC extended a line of best fit through the data and down to the x-axis intercept. The x-axis intercept is considered the total amount of LNAPL that can be practically recovered from the area. The decline curve analysis plot is identified in Figure 5.2.

Figure 5.2 suggests that the maximum recoverable volume of LNAPL in the area is approximately 3,725 gallons. The MPVE System (System 1) recovered 3,670 gallons of LNAPL. This suggests that approximately 55 gallons of recoverable product remains in the ground. Assuming a recovery rate of 1 gallon per day, which is slightly higher (i.e. more conservative) than what was actually achieved near the conclusion of the MPE operating period, 55 days would be required to recover this LNAPL. The operations and maintenance (O&M) costs to operate the MPVE system for an additional 55 days would be on the order of $84,000. Relocation of the system components and reinstallation of an extraction network following USPS construction could incur a cost in excess of $100,000. The resulting cost per gallon would be in excess of $3,000. Given that recovery of the LNAPL is not based on a need to mitigate potentially significant exposures, this cost is well beyond what would be considered reasonable to achieve this recovery.

5.2 LNAPL RECOVERY ENDPOINTS

5.2.1 SPECIFIC PERFORMANCE STANDARDS

The U.S. EPA, in its document entitled *A Decision-Making Framework for Cleanup of Sites Impacted with Light Non-Aqueous Phase Liquids (LNAPL)* (U.S. EPA, 2005), discusses recovery endpoints in the context of LNAPL management goals. Some endpoints may be specific in nature. One of the examples listed is based on the recovery rate for an LNAPL recovery system being reduced to an established value of three gallons per day. EEC established no such specific endpoints prior to commencement of recovery operations because the objective simply was to extract as much LNAPL as feasible until vertical construction commenced or until the extraction system interfered with construction activities, as discussed in Section 2.1.2. However, the data presented in this

report shows that the LNAPL recovery rate achieved by System 1 has dropped below the example threshold (U.S. EPA, 2005). Recovery rates for Systems 2 and 3 were below this example threshold for most of their operating time. Consequently, EEC believes this is supportive that an appropriate endpoint for active LNAPL recovery has been achieved.

5.2.2 COST CONSIDERATIONS

In terms of cost, EEC plotted O&M costs per gallon of LNAPL recovered for System 1. The plot is shown in Figure 5.3. The supporting data is provided in Table 5.2. The cost plot indicates that the O&M costs associated with System 1 have increased over time to the point where it is cost prohibitive to continue running the system. Cost per gallon plots for Systems 2 and 3 were not developed as the low recoveries achieved by these Systems indicate infinitely high cost per gallon numbers by default. The current prohibitive O&M cost further demonstrates the greatly diminished returns associated with continued LNAPL recovery in LNAPL Area No. 3. Consequently, EEC believes that this is also supportive that an appropriate endpoint for active recovery has been reached.

5.3 POST RECOVERY LNAPL CONDITIONS

EEC recorded the depth to product and depth to water measurements in all monitoring and extraction wells in LNAPL Area No. 3 throughout the RFI and the various IMs implemented to date. Product/water levels were recorded on February 14-15, 2006, one day after LNAPL recovery operations via MPE were discontinued. The depth to product/water measurements, and corresponding LNAPL in-well thicknesses, where applicable, are provided in Appendix E. Well boring logs for LNAPL Area No. 3 are provided in Appendix F.

As indicated in Appendix E, a number of monitoring and extraction wells contained LNAPL with apparent thicknesses ranging from a sheen to 8.6 feet. Throughout the course of the recovery program, EEC focused LNAPL recovery efforts on wells containing the greatest in-well or apparent LNAPL thicknesses. However, often times, the amount of LNAPL recovered from these wells was minimal, thereby suggesting that: (1) the LNAPL in the vicinity of these wells was not present at saturations much higher than residual; (2) the LNAPL in the vicinity of these wells was not likely mobile; and/or (3) the LNAPL in the vicinity of the wells may have been present under a confined condition whereby the in-well thickness represented equilibrium with the potentiometric head in the soil formation, and not the true thickness of LNAPL in the

formation. EEC's experience at the Site has indicated that a significant apparent LNAPL thickness does not necessarily indicate that the LNAPL in the area is recoverable. When evaluating potential LNAPL recoverability, apparent LNAPL thickness alone is not meaningful unless considered along with the physical properties of the soil and LNAPL, which largely determine LNAPL recoverability. This concept can be illustrated by 3 example model runs using the recoverability module contained within the API Interactive Guide (Version 2.0, Subversion 2.0.3). The following assumptions were made to provide inputs for the three model runs:

- LNAPL type – diesel;
- Soil types – medium sand, silt, and clay;
- LNAPL area dimensions – 200 feet by 200 feet;
- Apparent LNAPL thickness – 8 feet (model assumes 8 feet LNAPL thickness across the entire 200 feet by 200 feet area);
- Recovery time – 1 year; and
- Recovery system – high vacuum extraction applying 18"Hg to 30 extraction wells.

The model results for each of the three assumed soil types were as follows:

Soil Type	Estimated 1-year LNAPL Recovery (gallons)
Medium Sand	295,000
Silt	4,100
Clay	130

These model results illustrate the importance that soil type plays in the potential LNAPL recoverability associated with a given apparent LNAPL thickness. The results for the silt indicate that the potential LNAPL recovery is 1-2 orders of magnitude less than that of a medium sand with an equivalent apparent LNAPL thickness. The potential LNAPL recovery from clay is 3-4 orders of magnitude less than the medium sand for an equivalent apparent LNAPL thickness. In general, the results show that a very small volume of recoverable LNAPL may exist even when the apparent LNAPL thickness is large. The soils within LNAPL Area No. 3 predominantly consist of silts and clays with occasional sand seams, with the highest density of sand seams occurring in the southeast portion of the area where the greatest LNAPL recovery was observed. Given the model results presented above, it would be expected that limited recoverable LNAPL would be present in soils of this type even though significant LNAPL thicknesses may be observed

in wells. This is supported by the actual recovery results for the area and subsequent in-well LNAPL observations that showed significant LNAPL thicknesses still existed in certain wells even though the achievable LNAPL recovery by an aggressive in-situ technique (i.e., MPE/PAL with PF) had dwindled.

5.4 MEMORANDUM TO U.S. EPA

On March 20, 2006, EEC submitted a technical memorandum (Memo) to the U.S. EPA detailing the status of the LNAPL recovery program in LNAPL Area No. 3. In that Memo, EEC requested a decision from U.S. EPA on the suspension of active recovery at LNAPL Area No. 3. The request was predicated on the diminished LNAPL recoveries in LNAPL Area No. 3 and the prohibitive costs associated with the continued operation of the aggressive MPE/PAL and PF Systems. U.S. EPA responded via email on April 6, 2006 with comments. EEC responded on April 21, 2006 to U.S. EPA's comments. Based on the correspondence between EEC and U.S. EPA, U.S. EPA authorized EEC that it could terminate MPE/PAL and PF activities in LNAPL Area No. 3. The original memo and subsequent responses to U.S. EPA comments are included in Appendix G.

6.0 RECOVERY SYSTEM DECOMMISSIONING ACTIVITIES

Decommissioning of all MPE systems, monitoring/extraction wells, and associated extraction network materials in LNAPL Area No. 3 is complete. The following discussion details the various activities performed in order to complete the decommissioning.

6.1 RECOVERY SYSTEM COMPONENTS

All system components (MPE units, generators, storage tanks) have been decommissioned and removed from the Site, with the exception of the MPE unit for System 1. The System 1 MPE unit will remain staged at the Site until future use is confirmed.

The 1,000-gallon recovered LNAPL ASTs and the process vessels of each system were decontaminated in accordance with Toxic Substances Control Act (TSCA) procedures. PCB wipe samples were taken to confirm the decontamination before being removed off-Site. Plastic cage totes (330-gallon capacity) were used to store the wastewater produced from the cleaning/decontamination of the systems. The wastewater totes were moved to the decontamination pad on-Site pending the results of waste characterization analysis. In addition to cleaning the process vessels of each system, the interior of the system buildings were also cleaned. A mixture of Alconox and warm water was used to clean all interior areas of the system buildings. Wastewater generated from this cleaning was disposed of in the Site frac-tank.

The frac-tanks used for treated groundwater were emptied, cleaned and returned to NES Equipment Rentals. PCB wipe samples were taken to ensure the tanks were properly decontaminated before being removed from Site.

A summary of the volumes of wastes produced, method of storage, waste characterization, and ultimate disposal facility for each waste material type is provided in Table 6.1.

6.2 EXTRACTION NETWORK MATERIALS

All piping and fittings associated with the extraction pipe networks (that came in contact with LNAPL) have been removed from the Site for disposal at a non-hazardous waste landfill as discussed below. Prior to dismantling the system, representative worst-case (i.e., most highly stained) samples of piping from different points in LNAPL Area 3 were

sent for waste characterization to determine disposal options, and whether any segregating of waste materials would be necessary during dismantling. Samples of PVC piping and Tigerflex hose were collected from the most frequently used recovery wells (i.e. wells with the greatest product recoveries) in original LNAPL Area No. 3 and extended (western) portion of LNAPL Area No. 3 in order to provide the worst-case scenario for waste characterization. Wipe samples were taken for additional PCB waste characterization. Analytical results from the PVC piping and Tigerflex indicate that the material is non-hazardous with low levels of PCBs detected (non-TSCA). Consequently, the respective piping/hose was removed off-Site for disposal at a non-hazardous waste landfill.

All salvageable fittings, insulation, piping/hose and heat-trace tape that did not contact LNAPL were stockpiled for potential future use at the Site. All piping and hoses (that did not contact LNAPL) and pipe insulation that were not salvageable, along with miscellaneous debris, were removed off-Site and disposed of at the Oakland Heights Development non-hazardous waste landfill in Auburn Hills, Michigan.

A summary of the volumes of wastes produced, method of storage, waste characterization, and ultimate disposal facility for each waste material type is provided in Table 6.1.

6.3 MONITORING/EXTRACTION WELLS

All MPE/PAL and monitoring wells in LNAPL Area 3 have been abandoned per Michigan Department of Environmental Quality (MDEQ) guidance.

All MPE/PAL wells located on the pre-load pile were abandoned by over-drilling to 2.0-3.0 feet below the original ground surface (bgs), then grouted in place. This was performed to ensure that all well materials within the pre-load pile are removed prior to the USPS grading out the pre-load pile. MPE/PAL and monitoring wells located at Site grade were cut 2.0-3.0 feet bgs before being grouted in place. All liquids (groundwater and LNAPL) in each of the wells were containerized for proper characterization and off-Site disposal. All well materials removed (for those wells that will be over-drilled) were containerized for off-Site disposal. Grouting of wells was accomplished using a bentonite slurry as per Michigan Department of Environmental Quality (MDEQ) guidelines. All PF wells were removed (pulled) from their respective locations concurrently with the MPE/PAL well abandonment activities.

A summary of the volumes of wastes produced, method of storage, waste characterization, and ultimate disposal facility for each waste material type is provided in Table 6.1.

7.0 LONG-TERM MONITORING ACTIONS

Site groundwater flow is predominantly towards the south-southwest. EEC proposes to install and monitor a series of downgradient monitoring wells (south and west of the proposed building) to determine any instability of the LNAPL area. The location of the monitoring wells will be determined in coordination with USPS based on final construction of the facility. Specifically, EEC proposes that initially, quarterly monitoring for LNAPL be conducted for a period of two years, followed by semi-annual monitoring up to five years. The monitoring will consist of lowering an oil/water interface probe into each well and checking for the presence of LNAPL. If at any time LNAPL is detected, EEC will notify the U.S. EPA and implement contingency measures as appropriate.

8.0 REFERENCES

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Ground Effects Environmental Services Inc., various personal correspondence.

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Figures

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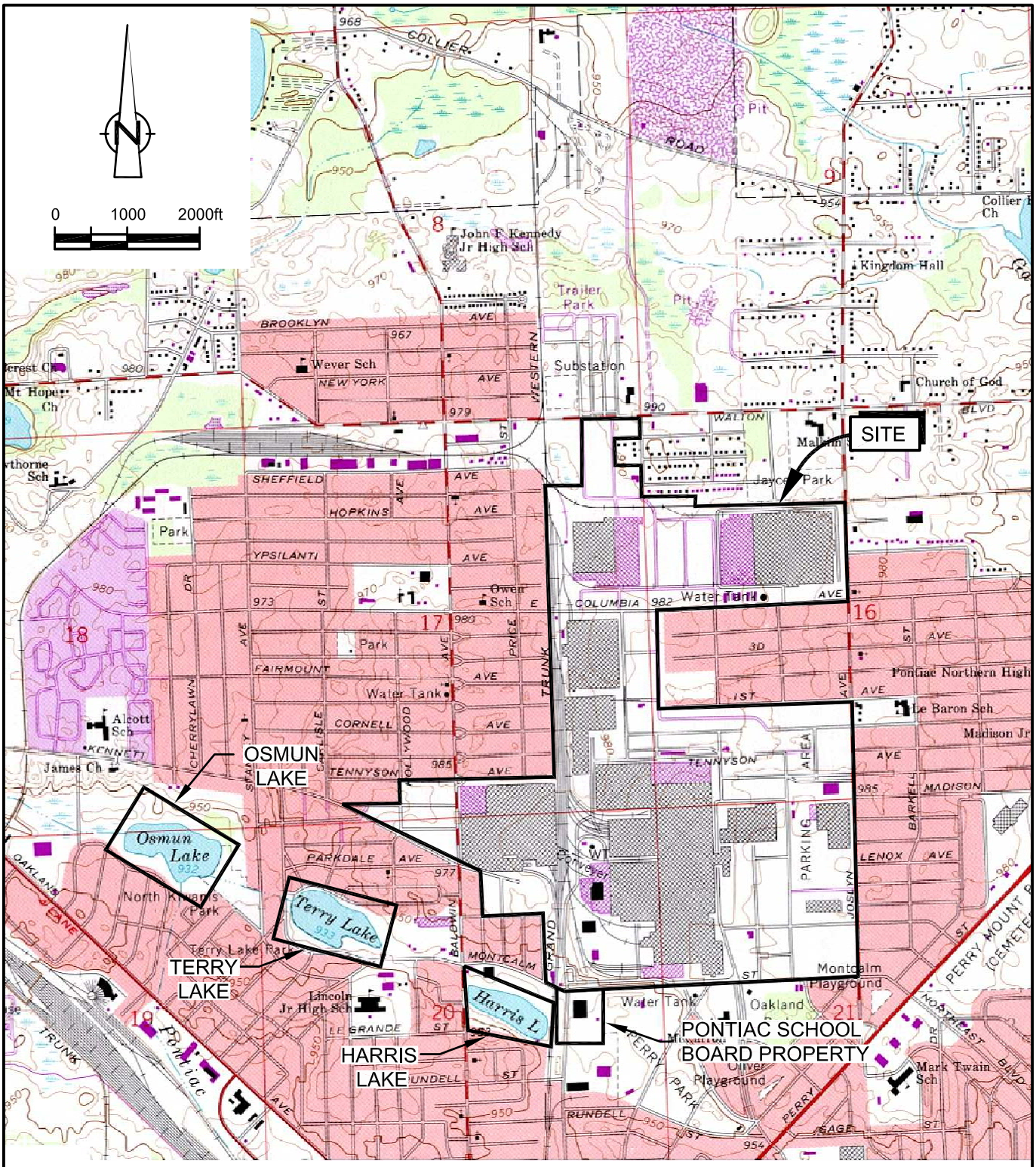

SOURCE: USGS QUADRANGLE MAP;
PONTIAC NORTH, MICHIGAN

GENERAL MOTORS
PONTIAC, MICHIGAN

INTERIM MEASURES REPORT:
LNAPL AREA No.3

SITE LOCATION

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FIGURE
1.1

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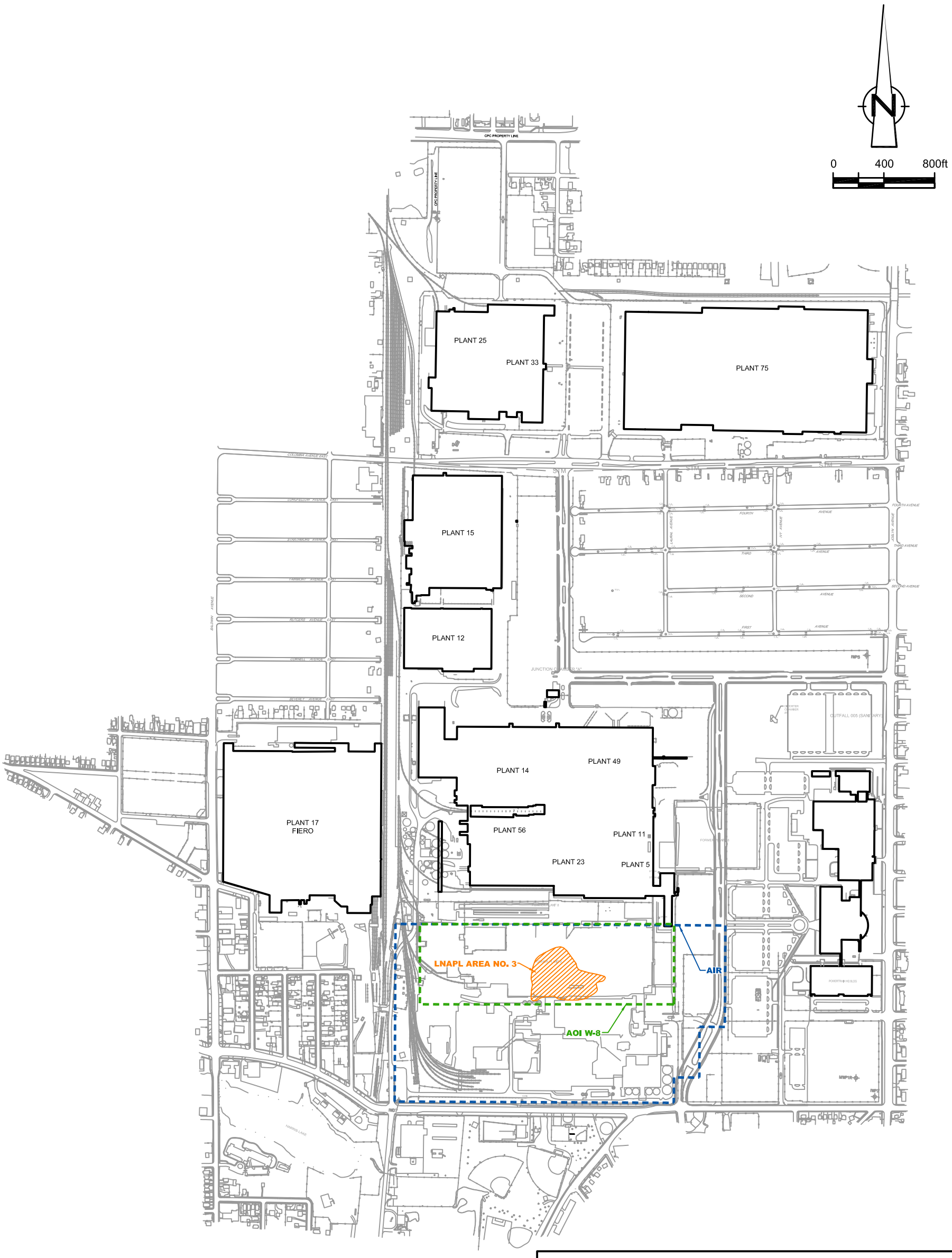

GENERAL MOTORS
PONTIAC, MICHIGAN
INTERIM MEASURES REPORT:
LNAPL AREA No.3

AOI 8 W-8, LNAPL AREA No.3 AND AIR LOCATIONS

ENCORE

FIGURE
1.2

17487-38(028)GN-WI015 DEC 18/2006

RWW8-72 RWW8-73 RWW8-74 RWW8-75 RWW8-76 RWW8-77
RWW8-83 RWW8-82 RWW8-81 RWW8-80 RWW8-79 RWW8-78
RWW8-84 RWW8-85 RWW8-86 RWW8-87 RWW8-88 RWW8-89
RWW8-51 RWW8-52 RWW8-53 RWW8-54 RWW8-55 RWW8-56
RWW8-50 RWW8-49 RWW8-48 RWW8-47 RWW8-46 RWW8-45
RWW8-39 RWW8-40 RWW8-41 RWW8-42 RWW8-43 RWW8-44
RWW8-38 RWW8-36 RWW8-37 RWW8-35 RWW8-34 RWW8-33
RWW8-71 RWW8-57 RWW8-58 RWW8-59 RWW8-60 RWW8-61 RWW8-62
RWW8-70 RWW8-68 RWW8-67 RWW8-66 RWW8-65 RWW8-64
RWW8-69 RWW8-63
RWW8-32
RWW8-10 RWW8-11 RWW8-12 RWW8-17 RWW8-18
RWW8-09 RWW8-19 MWW8-09
RWW8-06 MWW8-06 RWW8-13 RWW8-14
RWW8-47 RWW8-08 RWW8-16 RWW8-15 RWW8-02 RWW8-20
RWW8-07 MWW8-27
RWW8-24 RWW8-23 RWW8-21
RWW8-31 MWW8-03 RWW8-01 MWW8-07 RWW8-30 MWW8-15
RWW8-29 RWW8-25 RWW8-28 MWW8-14 RWW8-03 RWW8-04 RWW8-22 MWW8-26
RWW8-27 MWW8-08 RWW8-26 MWW8-24 RWW8-05
MWW8-19
MWW8-18
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MWW8-10
MWW8-16
MWW8-15
MWW8-02
MWW8-20
MWW8-27
MWW8-03
MWW8-07
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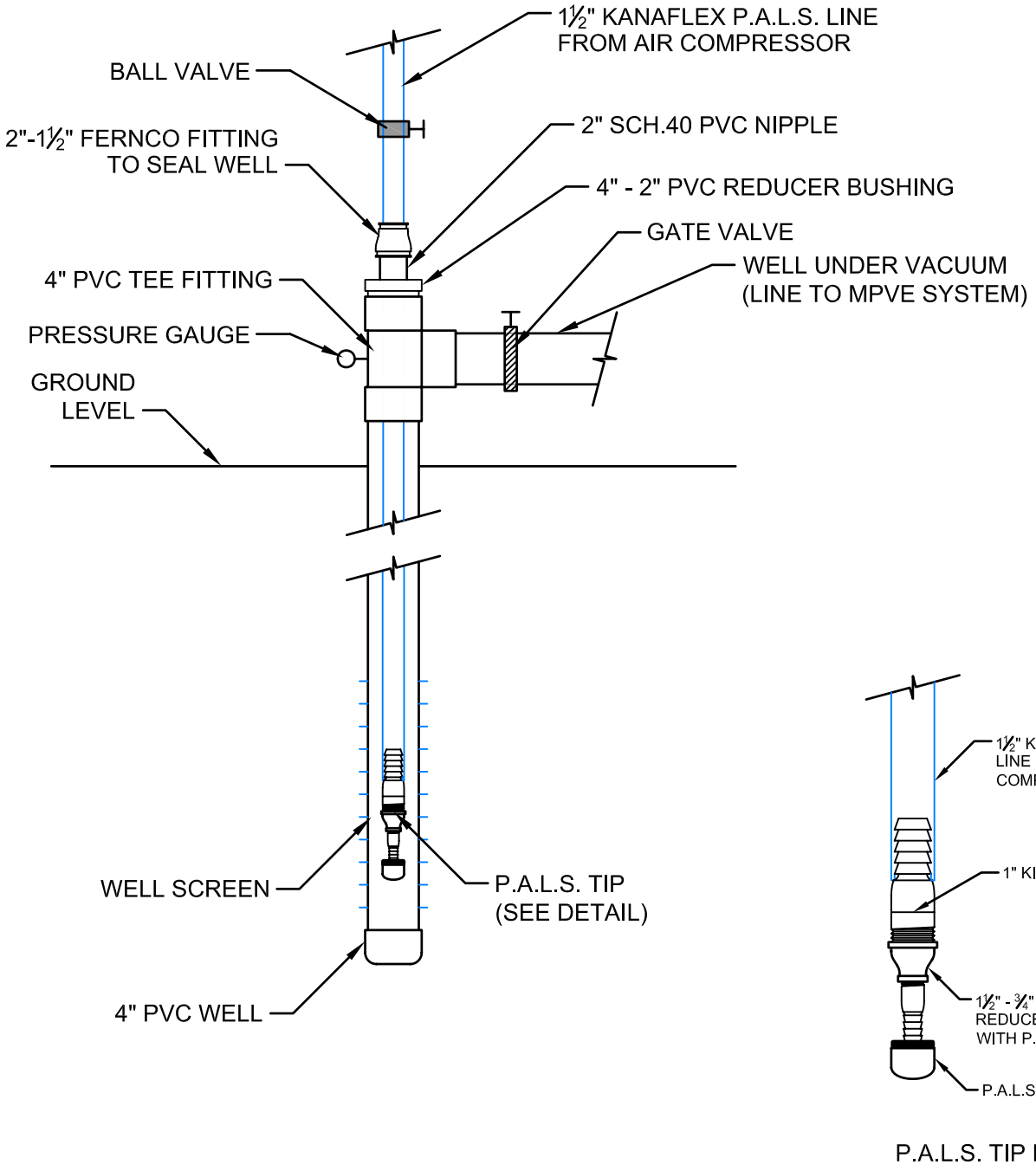
MWW8-47
MWW8-10



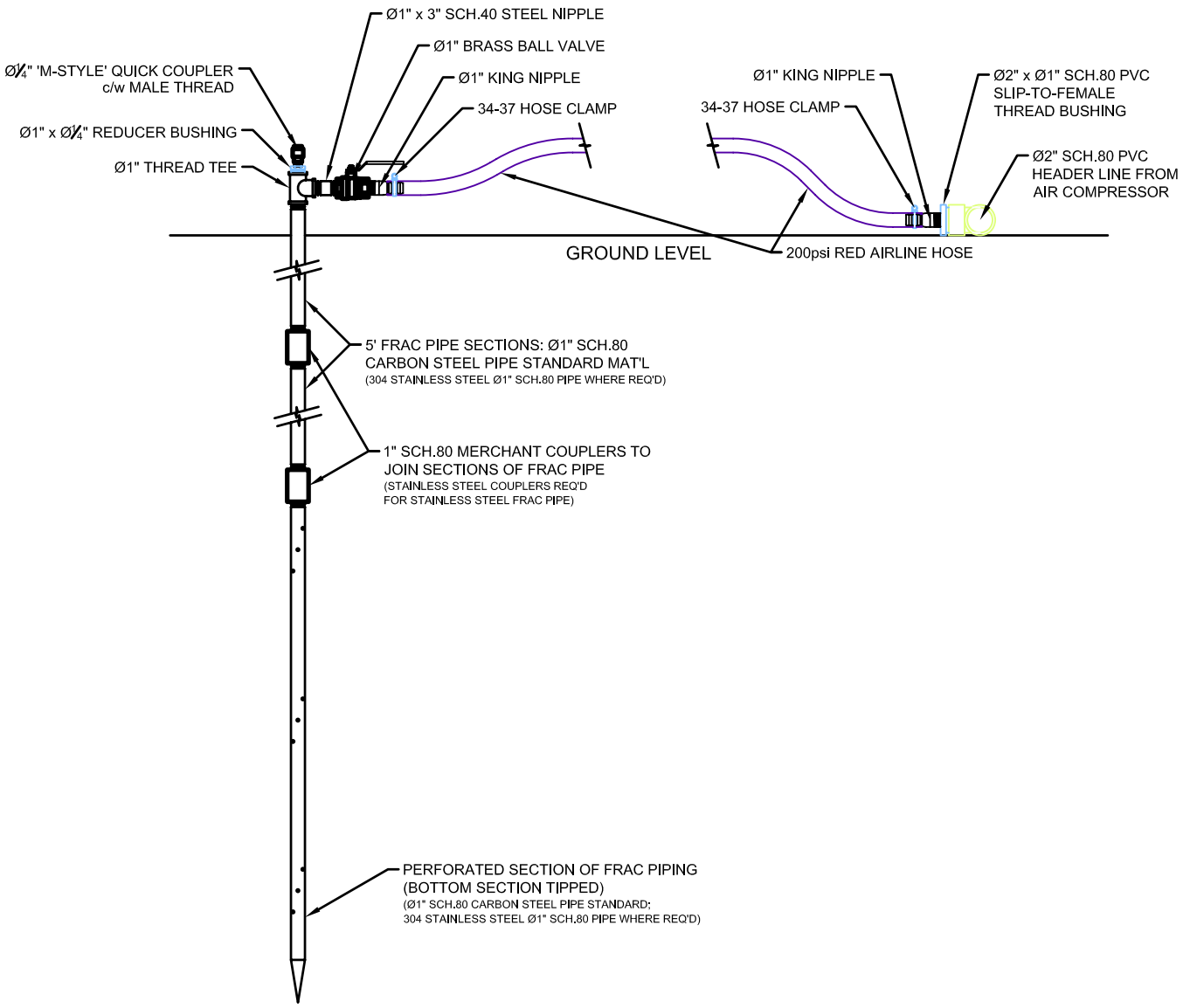
P.A.L.S. TIP DETAIL

GENERAL MOTORS
PONTIAC, MICHIGAN
INTERIM MEASURES REPORT:
LNAPL AREA No.3

TYPICAL MPE/PAL SCHEMATIC

ENCORE

FIGURE
3.1



GENERAL MOTORS
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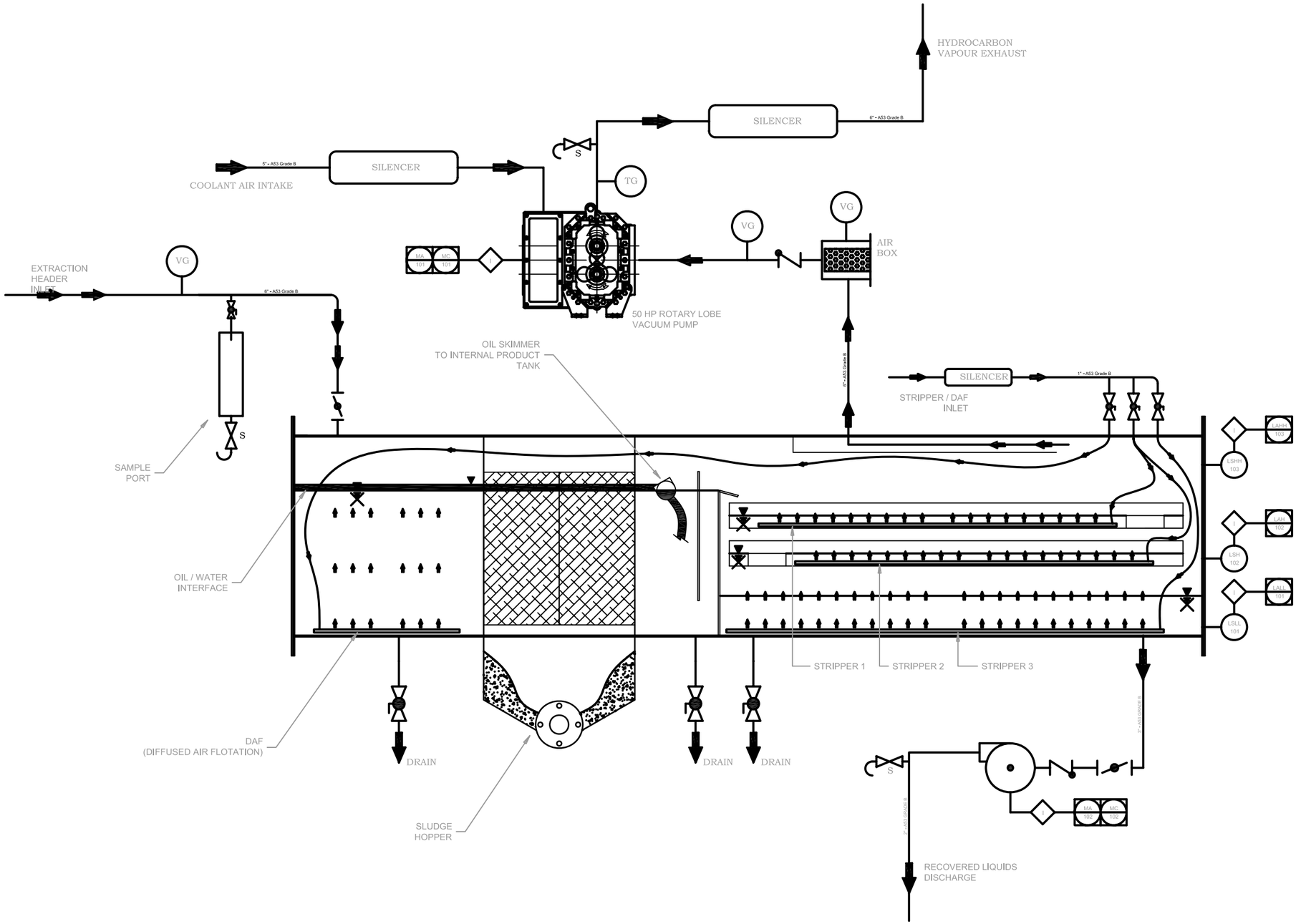
INTERIM MEASURES REPORT:
LNAPL AREA No.3

TYPICAL PF WELL SCHEMATIC

ENCORE

FIGURE
3.2



GENERAL MOTORS
PONTIAC, MICHIGAN

INTERIM MEASURES REPORT
LNAPL AREA NO. 3

MPVE 2750 SYSTEM SCHEMATIC

ENCORE

FIGURE
3.3

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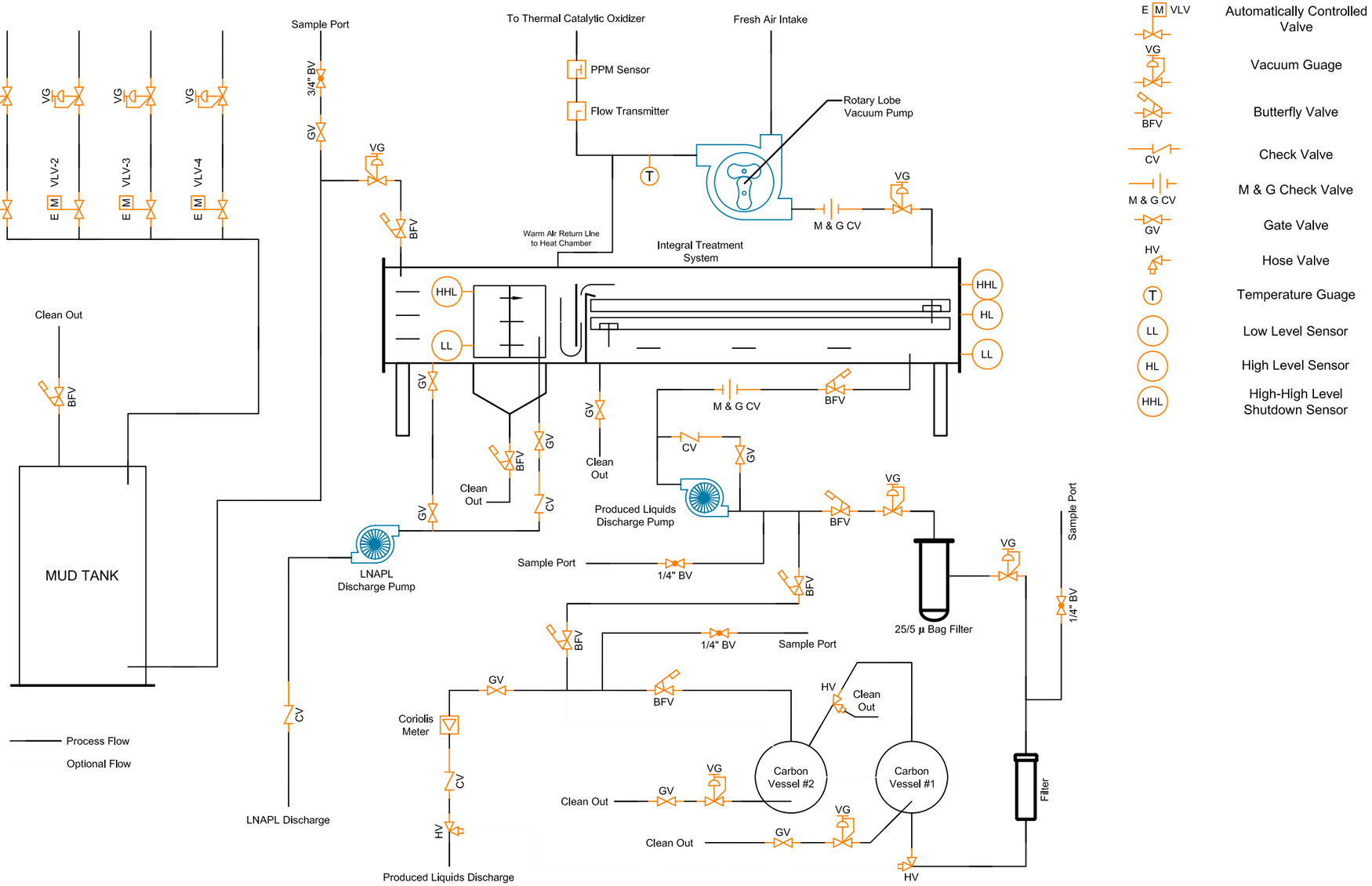


SOURCE: Ground Effects Environmental Services Inc.

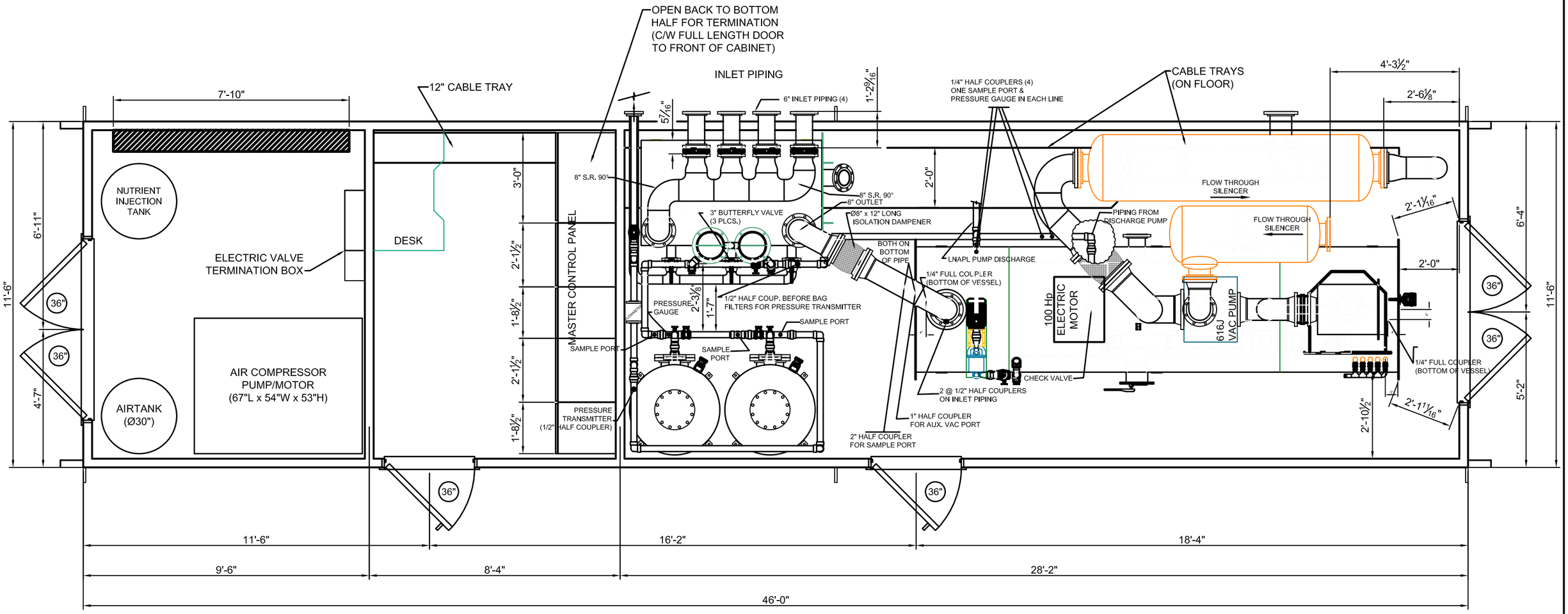
GENERAL MOTORS
PONTIAC, MICHIGAN
INTERIM MEASURES REPORT
LNAPL AREA NO. 3

MPVE 2750 SYSTEM PROCESS & INSTRUMENTATION DIAGRAM

ENCORE

FIGURE 3.4

17487-38(028)GN-WI008 DEC 15/2006



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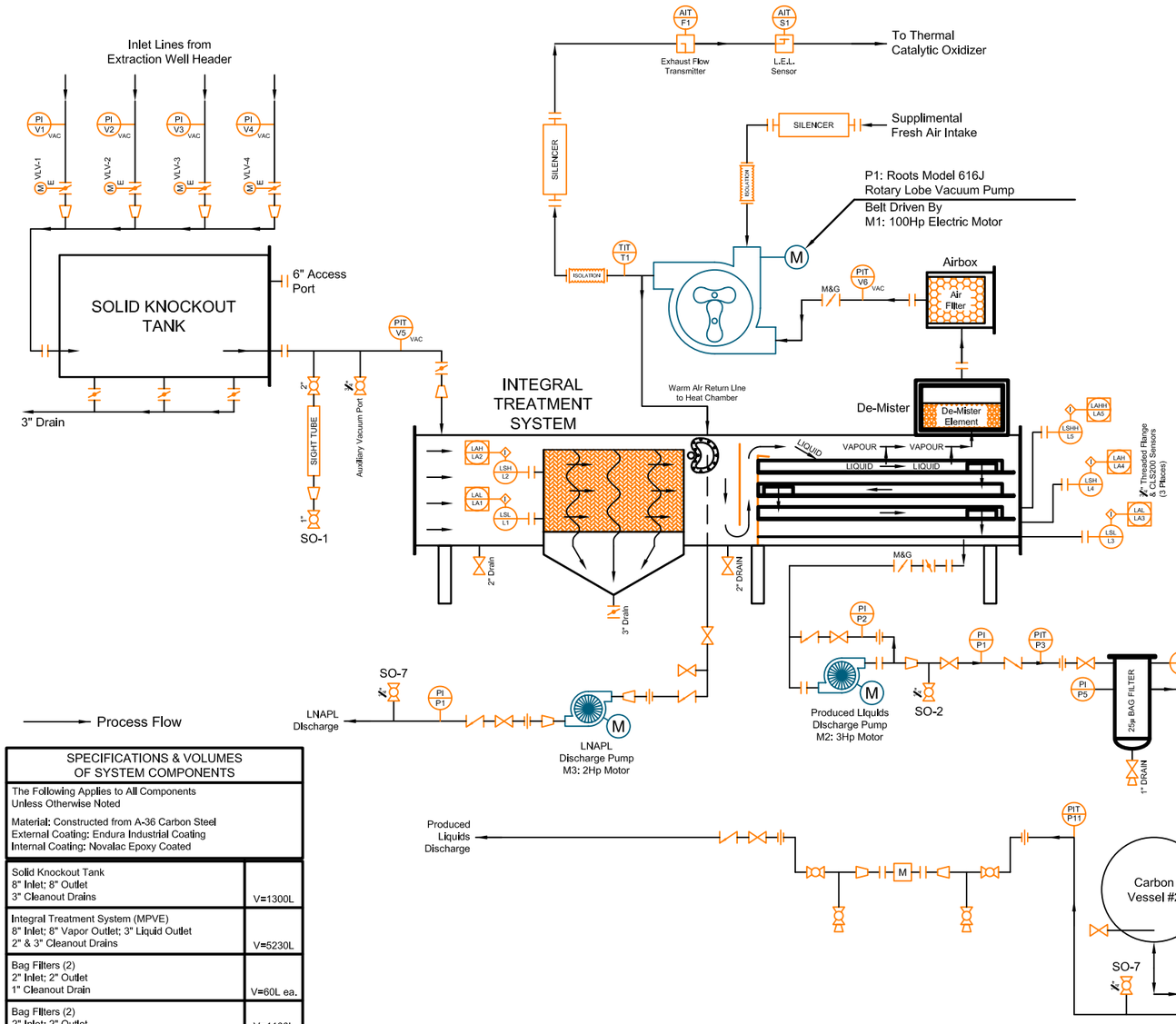
PONTIAC, MICHIGAN
INTERIM MEASURES REPORT
LNAPL AREA NO. 3

MPVE 27100 SYSTEM SCHEMATIC

ENCORE

FIGURE 3.5



M E	Motorized Butterfly Valve (Electronically Controlled)
	Gate Valve
	Gate Valve c/w Plug
	Ball Valve
	Ball Valve c/w Plug
	Butterfly Valve
	Swing Check Valve
M&G	M & G Wafer Check Valve
	Concentric Reducer
	Flanged Connection
	Union
M	Electric Motor
M	Magnetic Flowmeter
ISOLATION	Isolation Dampener
	Coalescing Media Pack

TIT T#	Temperature Indicating Transmitter
PI P#	Pressure/Vacuum Indicator (Pressure)
PI V# VAC	Pressure/Vacuum Indicator (Vacuum)
PIT V# VAC	Pressure/Vacuum Indicating Transmitter (Vacuum)
LSHH L#	Level Switch - High High
LSH L#	Level Switch - High
LSL L#	Level Switch - Low
LAHH LA#	Level Alarm - High High
LAH LA#	Level Alarm - High
LAL LA#	Level Alarm - Low
AIT F#	Analysis Indicating Transmitter - Exhaust Flow Transmitter
AIT S#	Analysis Indicating Transmitter - L.E.L. Sensor

SPECIFICATIONS & VOLUMES OF SYSTEM COMPONENTS	
The Following Applies to All Components Unless Otherwise Noted Material: Constructed from A-36 Carbon Steel External Coating: Endura Industrial Coating Internal Coating: Novalac Epoxy Coated	
Solid Knockout Tank 8" Inlet; 8" Outlet 3" Cleanout Drains	V=1300L
Integral Treatment System (MPVE) 8" Inlet; 8" Vapor Outlet; 3" Liquid Outlet 2" & 3" Cleanout Drains	V=5230L
Bag Filters (2) 2" Inlet; 2" Outlet 1" Cleanout Drain	V=60L ea.
Bag Filters (2) 2" Inlet; 2" Outlet 1" Cleanout Drain	V=1100L each

17487-38(028)GN-WI005 DEC 15/2006

GENERAL MOTORS
PONTIAC, MICHIGAN
INTERIM MEASURES REPORT
LNAPL AREA NO. 3

MPVE 27100 SYSTEM PROCESS & INSTRUMENTATION DIAGRAM

ENCORE

FIGURE 3.6

FIGURE 4.1
MPE SYSTEM 1 LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

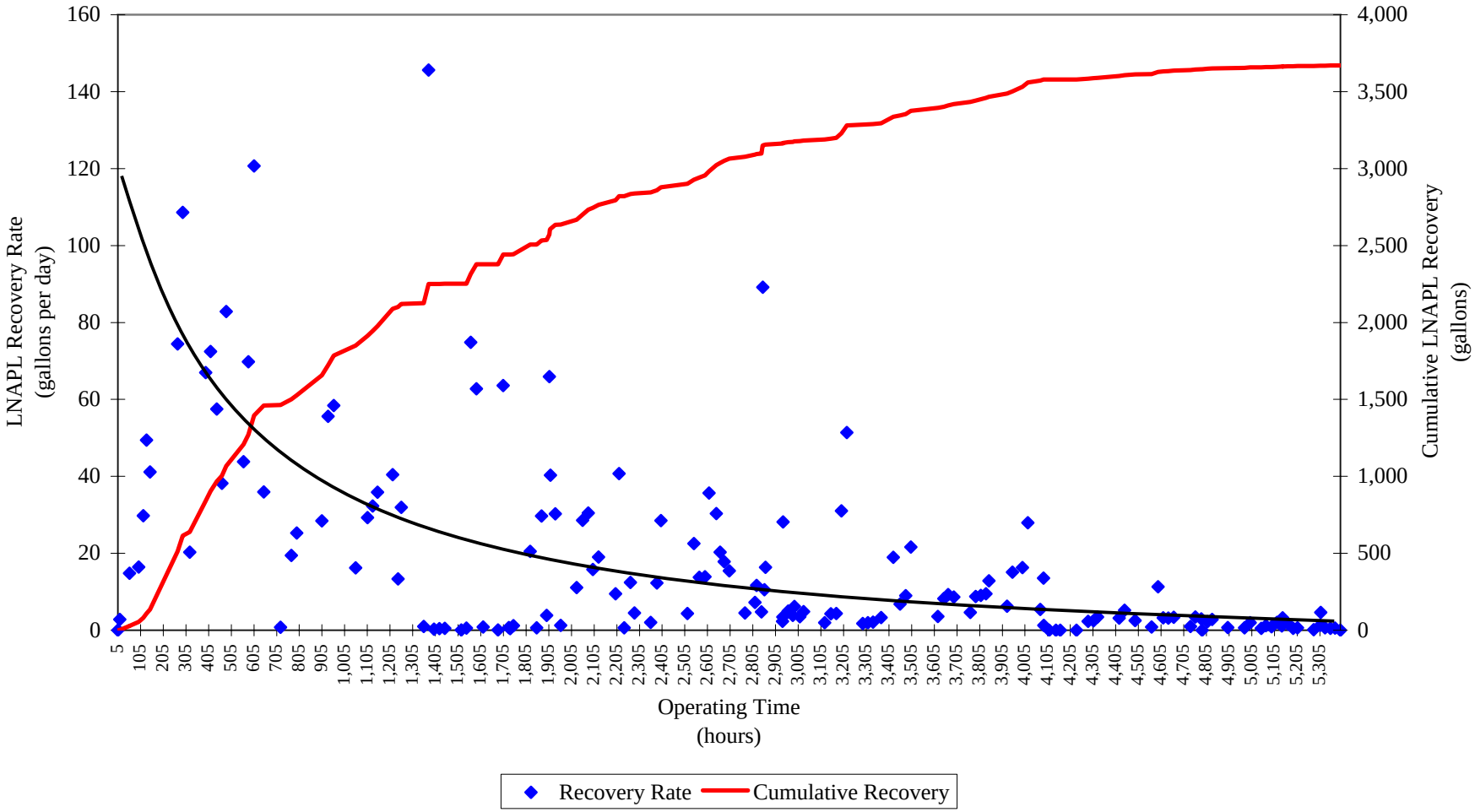


FIGURE 5.1
MPE SYSTEM 1 SEMI-LOG LNAPL RECOVERY PROJECTION
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

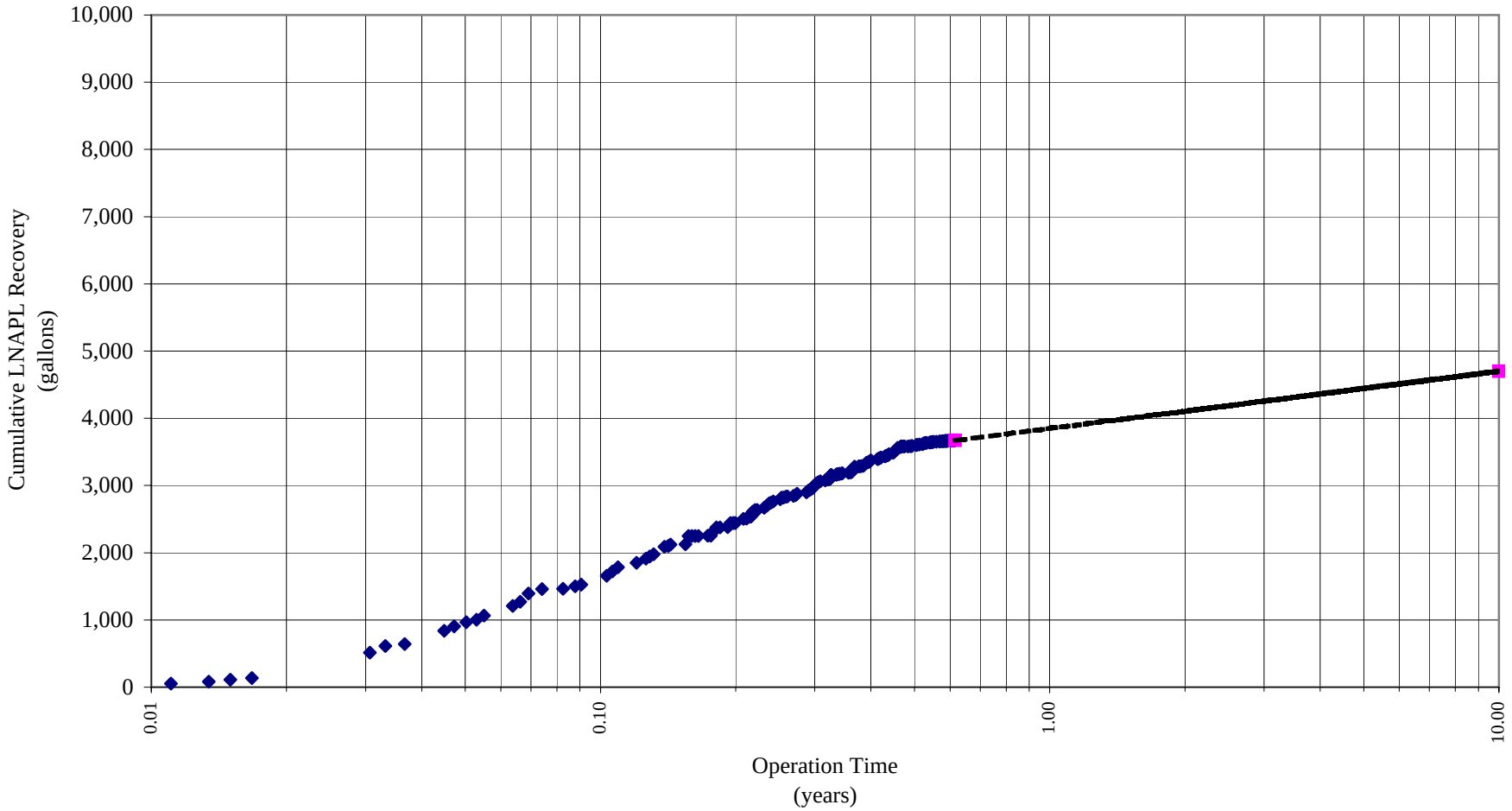


FIGURE 5.2
MPE SYSTEM 1 DECLINE CURVE ANALYSIS
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

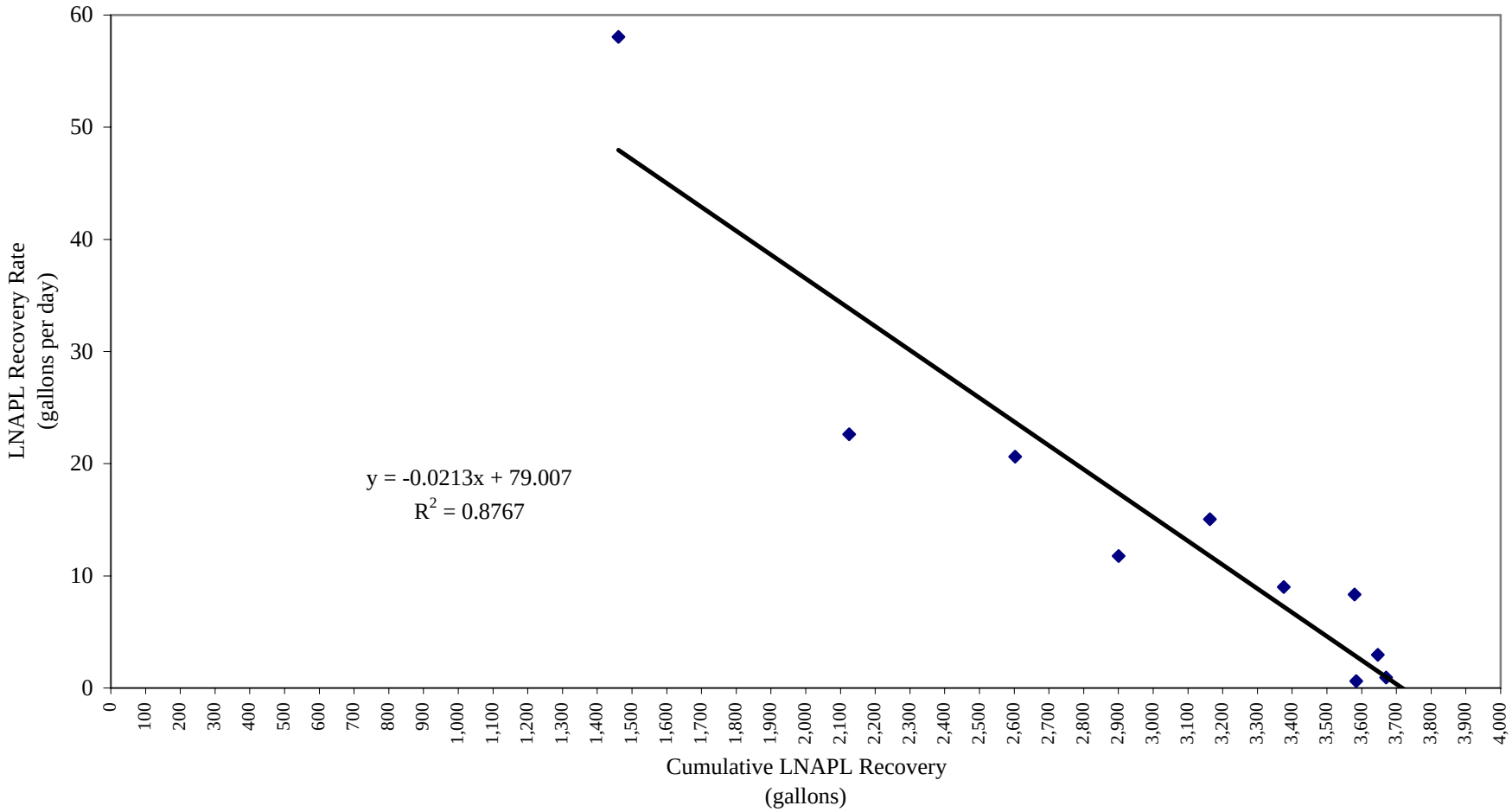
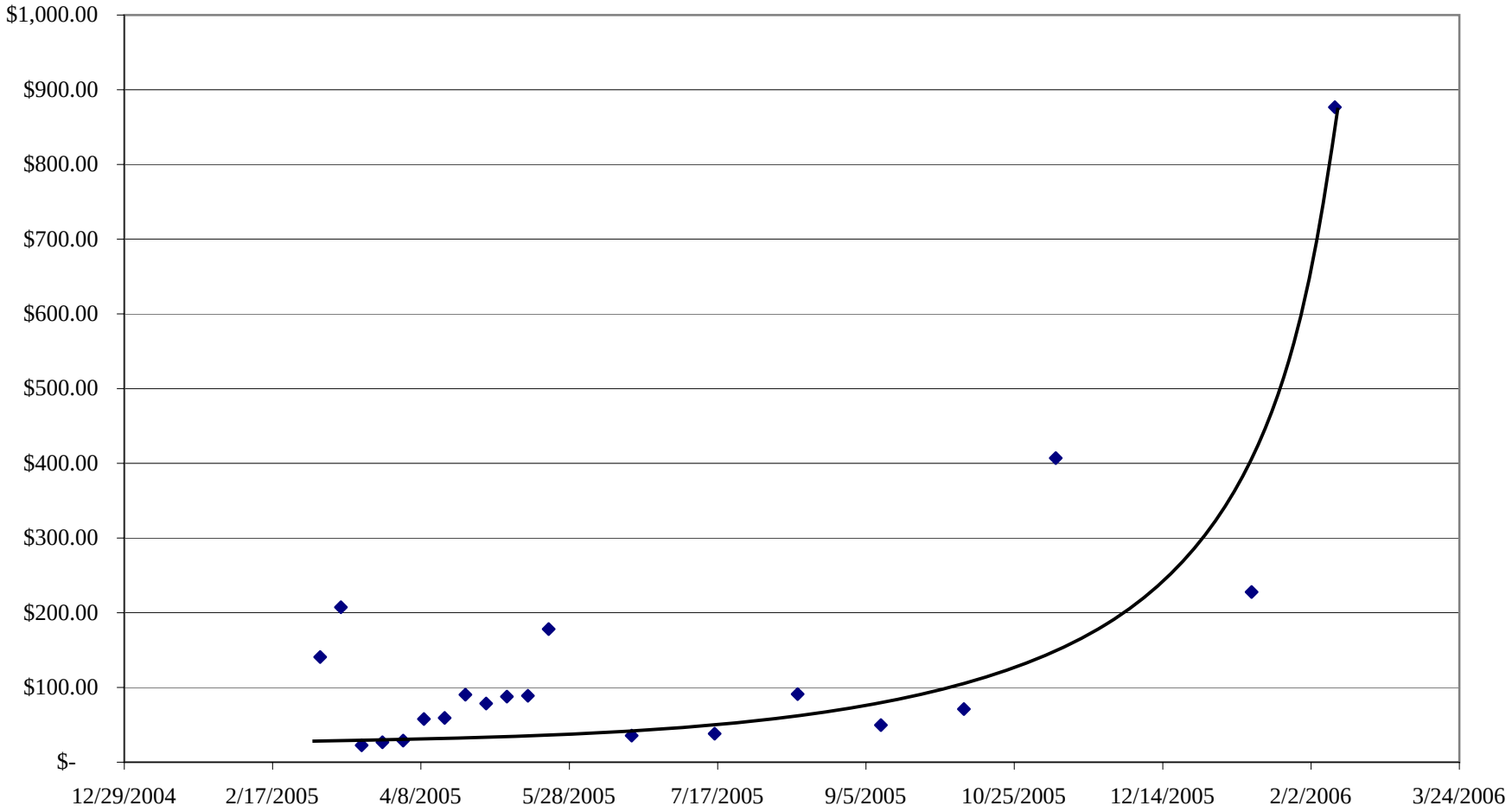


FIGURE 5.3
MPE SYSTEM 1 OPERATION COST PER GALLON
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN



Tables

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TABLE 2.1

QED FERRET LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Summary by Well as of 11/03/04

Associated Well No.	Total Volume (gal)	Approximate Pumping Time	Average LNAPL Recovery Rate
MWW8-02	5.2	72	0.07
MWW8-03	25	601.5	0.04
MWW8-06	53	975.5	0.05
MWW8-07	104	2164.5	0.05
MWW8-08	3	276.5	0.01
MWW8-09	2	186	0.01
MWW8-14	1	44.5	0.03
MWW8-15	27	1659.5	0.02
MWW8-16	10	686	0.01
MWW8-24	289	1914.5	0.15
RWW8-01	5	182	0.03
RWW8-02	12.2	511	0.02
RWW8-08	56.2	816	0.07

Overall Summary

Total Volume Recovered (gal)	**587.7**
Overall Average LNAPL Recovery Rate (gal/hr)[1]	**0.2**

TABLE 4.1

MPE SYSTEM 1 LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
2/26/2005	5.1	0	50	0	0	0.0	0.0	0	233
2/27/2005	13.6	0	539	1	1	0.0	100.0	3	1,382
3/1/2005	56.3	25	2,915	2	27	91.2	8.8	15	1,335
3/3/2005	96.8	50	4,779	5	55	90.7	9.3	16	1,105
3/4/2005	117.6	75	5,470	6	81	92.7	7.3	30	798
3/10/2005	131.3	100	6,005	9	109	91.7	8.3	49	937
3/11/2005	146.7	125	6,258	11	136	92.3	7.7	41	394
3/16/2005	268.4	500	7,215	13	513	97.5	2.5	74	189
3/17/2005	290.7	600	7,470	14	614	97.8	2.2	109	275
3/18/2005	321.0	625	7,635	14	639	97.7	2.3	20	130
3/21/2005	392.9	825	8,207	15	840	98.2	1.8	67	191
3/22/2005	413.9	888	8,367	16	904	98.2	1.8	72	183
3/23/2005	440.2	950	8,522	17	967	98.3	1.7	57	142
3/24/2005	463.9	988	8,830	17	1,004	98.3	1.7	38	312
3/25/2005	482.1	1,050	8,988	17	1,067	98.4	1.6	83	208
3/28/2005	558.8	1,188	9,700	20	1,207	98.4	1.6	44	223
3/29/2005	580.5	1,250	9,941	20	1,270	98.4	1.6	70	267
3/30/2005	605.5	1,375	10,098	21	1,396	98.5	1.5	121	151
4/1/2005	648.8	1,438	10,635	23	1,461	98.4	1.6	36	298
4/4/2005	722.4	1,438	11,492	26	1,463	98.3	1.7	1	280
4/6/2005	769.0	1,475	11,884	26	1,501	98.3	1.7	19	202
4/7/2005	793.4	1,500	12,047	27	1,527	98.3	1.7	25	160
4/12/2005	904.1	1,625	12,847	33	1,658	98.0	2.0	28	174
4/13/2005	931.5	1,688	12,847	34	1,721	98.0	2.0	56	0
4/14/2005	957.7	1,750	13,738	35	1,785	98.0	2.0	58	816
4/18/2005	1,053.4	1,813	16,191	37	1,850	98.0	2.0	16	615
4/20/2005	1,105.0	1,875	17,235	38	1,913	98.0	2.0	29	486
4/21/2005	1,128.3	1,906	17,333	38	1,944	98.1	1.9	32	101
4/22/2005	1,149.6	1,938	17,410	38	1,976	98.1	1.9	36	86
4/26/2005	1,216.4	2,049	17,731	40	2,089	98.1	1.9	40	115
4/27/2005	1,240.2	2,061	17,768	41	2,102	98.1	1.9	13	37
4/28/2005	1,254.6	2,080	17,798	41	2,121	98.1	1.9	32	50
5/2/2005	1,353.5	2,080	18,100	45	2,125	97.9	2.1	1	73
5/3/2005	1,374.1	2,205	18,186	45	2,250	98.0	2.0	146	100
5/4/2005	1,398.6	2,205	18,263	45	2,250	98.0	2.0	0.3	75
5/5/2005	1,422.6	2,205	18,376	46	2,251	98.0	2.0	0.4	114

TABLE 4.1

MPE SYSTEM 1 LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
5/6/2005	1,446.5	2,205	18,447	46	2,251	98.0	2.1	1	70
5/9/2005	1,519.0	2,205	18,906	47	2,251	97.9	2.1	0.1	152
5/10/2005	1,541.4	2,205	19,056	47	2,252	97.9	2.1	1	161
5/11/2005	1,561.6	2,268	19,213	48	2,315	98.0	2.1	75	186
5/12/2005	1,585.6	2,330	19,438	48	2,378	98.0	2.0	63	225
5/13/2005	1,615.0	2,330	19,800	49	2,379	98.0	2.0	1	295
5/16/2005	1,681.3	2,330	20,804	49	2,379	97.9	2.1	0.1	364
5/17/2005	1,704.9	2,393	21,112	49	2,441	98.0	2.0	64	313
5/18/2005	1,729.3	2,393	21,456	50	2,442	98.0	2.0	1	339
5/19/2005	1,734.0	2,393	21,526	50	2,442	98.0	2.0	0.4	356
5/20/2005	1,749.9	2,393	21,753	51	2,443	97.9	2.1	1	343
5/23/2005	1,823.5	2,455	22,572	51	2,506	98.0	2.0	21	267
5/24/2005	1,851.5	2,455	22,572	52	2,507	97.9	2.1	1	0
5/25/2005	1,872.4	2,480	22,792	52	2,532	97.9	2.1	30	253
5/26/2005	1,895.1	2,483	23,327	53	2,536	97.9	2.1	4	566
5/27/2005	1,907.8	2,518	23,399	54	2,571	97.9	2.1	66	136
6/7/2005	1,909.0	2,549	23,399	54	2,602	97.9	2.1	629	0
6/8/2005	1,912.9	2,555	23,486	54	2,609	97.9	2.1	40	536
6/9/2005	1,933.3	2,580	23,647	55	2,635	97.9	2.1	30	189
6/10/2005	1,957.7	2,580	23,968	56	2,636	97.9	2.1	1	315
6/13/2005	2,027.8	2,611	24,855	57	2,668	97.9	2.1	11	304
6/14/2005	2,054.9	2,643	25,246	58	2,701	97.8	2.2	29	346
6/15/2005	2,079.9	2,674	25,626	59	2,732	97.9	2.1	30	364
6/16/2005	2,099.8	2,686	25,951	59	2,745	97.8	2.2	16	392
6/17/2005	2,124.6	2,705	26,343	60	2,765	97.8	2.2	19	380
6/20/2005	2,199.8	2,730	27,758	65	2,795	97.7	2.3	10	452
6/21/2005	2,214.9	2,755	27,984	66	2,821	97.7	2.3	41	359
6/22/2005	2,237.5	2,755	28,388	66	2,821	97.7	2.3	1	429
6/23/2005	2,264.6	2,768	29,037	68	2,835	97.6	2.4	12	574
6/24/2005	2,282.9	2,770	29,411	69	2,839	97.6	2.4	4	490
6/27/2005	2,354.5	2,773	30,710	72	2,845	97.5	2.5	2	435
6/28/2005	2,381.5	2,785	30,799	73	2,858	97.4	2.6	12	79
6/29/2005	2,399.1	2,805	31,199	74	2,879	97.4	2.6	29	545
7/4/2005	2,516.5	2,818	34,093	83	2,901	97.1	2.9	4	592
7/5/2005	2,545.4	2,843	34,671	85	2,928	97.1	2.9	23	480

TABLE 4.1

MPE SYSTEM 1 LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
7/6/2005	2,568.9	2,855	35,267	86	2,941	97.1	2.9	14	608
7/7/2005	2,593.3	2,868	35,847	88	2,955	97.0	3.0	14	571
7/8/2005	2,611.2	2,893	36,191	89	2,982	97.0	3.0	36	461
7/11/2005	2,643.4	2,930	36,869	93	3,023	96.9	3.1	30	506
7/13/2005	2,660.1	2,943	36,962	94	3,037	96.9	3.1	20	133
7/14/2005	2,678.3	2,955	37,136	95	3,050	96.9	3.1	18	230
7/15/2005	2,700.7	2,968	37,542	97	3,065	96.8	3.2	15	435
7/18/2005	2,770.2	2,974	39,123	104	3,078	96.6	3.4	5	546
7/19/2005	2,814.7	2,983	40,124	108	3,091	96.5	3.5	7	540
7/20/2005	2,821.3	2,985	40,633	109	3,094	96.5	3.5	12	1,853
7/21/2005	2,842.9	2,988	40,876	111	3,098	96.4	3.6	5	270
7/25/2005	2,847.9	3,036	40,937	111	3,147	96.5	3.5	235	290
7/26/2005	2,848.6	3,039	40,937	112	3,150	96.5	3.5	89	0
7/27/2005	2,855.9	3,041	40,966	112	3,153	96.4	3.6	11	96
7/29/2005	2,860.3	3,044	41,131	113	3,156	96.4	3.6	16	375
8/1/2005	2,935.6	3,044	43,522	120	3,163	96.2	3.8	2	713
8/2/2005	2,936.3	3,044	43,522	120	3,164	96.2	3.8	3	680
8/3/2005	2,938.6	3,046	42,613	120	3,166	96.2	3.8	28	444
8/4/2005	2,960.3	3,049	43,976	122	3,171	96.1	3.9	5	653
8/5/2005	2,981.2	3,050	44,092	124	3,174	96.1	3.9	4	558
8/9/2005	2,988.8	3,051	44,451	125	3,176	96.1	3.9	6	599
8/10/2005	3,012.2	3,052	45,026	127	3,179	96.0	4.0	4	600
8/11/2005	3,028.7	3,054	44,759	129	3,182	96.0	4.0	5	520
8/15/2005	3,121.0	3,056	45,742	134	3,190	95.8	4.2	2	424
8/16/2005	3,148.9	3,059	46,186	136	3,195	95.7	4.3	4	300
8/17/2005	3,172.6	3,061	46,582	138	3,199	95.7	4.3	4	311
8/18/2005	3,195.5	3,089	46,853	140	3,229	95.7	4.3	31	396
8/19/2005	3,219.6	3,139	47,035	142	3,280	95.7	4.3	51	283
8/22/2005	3,289.4	3,139	48,055	147	3,285	95.5	4.5	2	309
8/23/2005	3,312.2	3,139	48,690	149	3,287	95.5	4.5	2	315
8/24/2005	3,335.9	3,139	48,859	151	3,289	95.4	4.6	2	284
8/26/2005	3,370.0	3,140	50,877	154	3,294	95.3	4.7	3	430
8/29/2005	3,424.6	3,176	53,379	161	3,337	95.2	4.8	19	604
8/30/2005	3,454.3	3,182	53,861	163	3,346	95.1	4.9	7	603

TABLE 4.1

MPE SYSTEM 1 LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
8/31/2005	3,478.0	3,189	54,262	166	3,354	95.1	4.9	9	603
9/1/2005	3,501.6	3,207	54,568	168	3,376	95.0	5.0	22	605
9/6/2005	3,620.9	3,214	55,561	180	3,394	94.7	5.3	4	510
9/7/2005	3,646.5	3,220	55,909	183	3,402	94.6	5.4	8	528
9/8/2005	3,666.9	3,226	56,079	184	3,410	94.6	5.4	9	500
9/9/2005	3,691.0	3,232	56,341	187	3,419	94.5	5.5	9	506
9/12/2005	3,763.5	3,239	56,956	194	3,433	94.3	5.7	5	371
9/13/2005	3,787.2	3,245	57,314	197	3,442	94.3	5.7	9	260
9/14/2005	3,810.7	3,251	57,581	199	3,450	94.2	5.8	9	251
9/15/2005	3,832.4	3,257	57,822	202	3,459	94.2	5.8	9	241
9/16/2005	3,846.7	3,264	61,773	203	3,467	94.1	5.9	13	501
9/19/2005	3,925.8	3,276	62,712	211	3,487	93.9	6.1	6	563
9/20/2005	3,949.7	3,289	62,801	214	3,502	93.9	6.1	15	546
9/22/2005	3,993.5	3,314	63,068	218	3,532	93.8	6.2	16	514
9/23/2005	4,017.1	3,339	63,248	221	3,559	93.8	6.2	28	508
9/26/2005	4,072.6	3,345	63,428	227	3,572	93.7	6.3	5	502
9/29/2005	4,086.0	3,352	63,896	228	3,579	93.6	6.4	14	529
10/6/2005	4,087.9	3,352	64,203	228	3,579	93.6	6.4	1	573
10/26/2005	4,111.7	3,352	64,881	228	3,579	93.6	6.4	0	607
10/27/2005	4,141.9	3,352	65,785	228	3,579	93.6	6.4	0	326
10/28/2005	4,160.2	3,352	66,329	228	3,579	93.6	6.4	0	370
10/31/2005	4,231.7	3,352	67,770	228	3,579	93.6	6.4	0	423
11/2/2005	4,283.3	3,357	68,776	228	3,584	93.6	6.4	2	473
11/3/2005	4,307.4	3,359	69,315	228	3,587	93.6	6.4	2	502
11/4/2005	4,324.8	3,362	69,673	228	3,589	93.7	6.3	3	594
11/7/2005	4,420.6	3,364	71,779	238	3,602	93.4	6.6	3	565
11/8/2005	4,443.1	3,367	72,241	241	3,607	93.3	6.7	5	543
11/11/2005	4,490.7	3,369	73,172	243	3,612	93.3	6.7	3	525
11/14/2005	4,563.5	3,372	74,317	243	3,615	93.3	6.7	1	486
11/15/2005	4,591.1	3,385	74,845	243	3,628	93.3	6.7	11	474
11/16/2005	4,614.3	3,388	75,251	243	3,631	93.3	6.7	3	469
11/17/2005	4,637.9	3,391	75,833	243	3,634	93.3	6.7	3	478
11/18/2005	4,660.2	3,394	76,234	243	3,637	93.3	6.7	3	471
11/21/2005	4,734.4	3,397	77,902	243	3,640	93.3	6.7	1	482

TABLE 4.1

MPE SYSTEM 1 LNAPL RECOVERY SUMMARY
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
11/22/2005	4,756.4	3,400	78,375	243	3,643	93.3	6.7	3	471
11/23/2005	4,782.1	3,403	78,881	243	3,646	93.3	6.7	3	470
1/4/2006	4,785.1	3,403	80,242	243	3,646	93.3	6.7	0	576
1/5/2006	4,809.1	3,406	80,481	243	3,649	93.3	6.7	2	602
1/6/2006	4,830.7	3,408	80,656	243	3,651	93.3	6.7	3	582
1/9/2006	4,899.5	3,410	81,066	243	3,653	93.3	6.7	1	489
1/12/2006	4,973.3	3,412	81,350	243	3,655	93.4	6.6	1	395
1/13/2005	4,997.5	3,414	81,358	243	3,657	93.4	6.6	2	365
1/16/2006	5,047.2	3,415	81,730	243	3,658	93.4	6.6	0.5	294
1/17/2006	5,067.2	3,416	81,898	243	3,659	93.4	6.6	1.2	272
1/18/2006	5,092.7	3,417	82,065	243	3,660	93.4	6.6	0.9	246
1/19/2006	5,115.9	3,419	82,248	243	3,662	93.4	6.6	2.1	146
1/20/2006	5,137.6	3,420	82,559	243	3,663	93.4	6.6	1.1	152
1/23/2006	5,141.3	3,421	82,763	243	3,664	93.4	6.6	3.2	163
1/24/2006	5,164.0	3,422	82,951	243	3,665	93.4	6.6	1.6	171
1/26/2006	5,187.9	3,423	83,637	243	3,666	93.4	6.6	0.5	256
1/27/2006	5,206.1	3,423	84,320	243	3,666	93.4	6.6	0.7	341
1/30/2006	5,277.7	3,424	86,348	243	3,667	93.4	6.6	0.2	481
1/31/2006	5,306.9	3,425	88,415	243	3,668	93.4	6.6	1.2	653
2/6/2006	5,309.5	3,426	88,517	243	3,669	93.4	6.6	4.6	714
2/7/2006	5,328.0	3,426	88,979	243	3,669	93.4	6.6	0.6	762
2/8/2006	5,351.9	3,427	89,524	243	3,670	93.4	6.6	0.5	780
2/9/2006	5,372.6	3,427	89,892	243	3,670	93.4	6.6	0.6	740
2/10/2006	5,395.3	3,427	90,345	243	3,670	93.4	6.6	0.0	767

TABLE 5.1

LNAPL RECOVERY PROJECTIONS
INTERIM MEASURES REPORT LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Year	Yearly LNAPL Recovery (gallons)	Cumulative LNAPL Recovery (gallons)	Annual Percentage of Total LNAPL Recovery (%)
0.62	3,670	3,670	78.09
1	3,849	3,849	81.90
2	256	4,105	5.45
3	150	4,255	3.19
4	106	4,361	2.26
5	83	4,444	1.76
6	67	4,511	1.43
7	57	4,568	1.21
8	49	4,618	1.05
9	44	4,661	0.93
10	39	4,700	0.83

TABLE 5.2

MPE SYSTEM 1 OPERATING COST PER GALLON DATA
INTERIM MEASURES REPORT - AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Week	*Week Ending Date*	*Weekly/Monthly Recovery (gallons)*	*O&M Cost/Recovery ($/gallon)*
1	3/5/2005	81	$ 140.71
2	3/12/2005	55	$ 207.22
3	3/19/2005	503	$ 22.66
4	3/26/2005	428	$ 26.63
5	4/2/2005	394	$ 28.93
6	4/9/2005	197	$ 57.85
7	4/16/2005	192	$ 59.36
8	4/23/2005	126	$ 90.45
9	4/30/2005	145	$ 78.60
10	5/7/2005	130	$ 87.67
11	5/14/2005	128	$ 89.04
12	5/21/2005	64	$ 178.08
16	6/18/2005	322	$ 35.40
20	7/16/2005	300	$ 37.99
24	8/13/2005	125	$ 91.18
28	9/10/2005	229	$ 49.77
32	10/8/2005	160	$ 71.23
36	11/8/2005	28	$ 407.05
40	1/13/2006	50	$ 227.95
44	2/10/2006	13	$ 876.72

System 1
Average Monthly O&M Cost $ 45,589.24
Average Weekly O&M Cost: $ 11,397.31

System 2
Average Monthly O&M Cost $ 53,952.91
Average Weekly O&M Cost: $ 13,488.23

System 3
Average Monthly O&M Cost $ 46,913.30
Average Weekly O&M Cost: $ 11,728.33

TABLE 6.1

SUMMARY OF WASTE CHARACTERIZATION AND HANDLING
INTERIM MEASURES REPORT LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

Waste Material	Volume	Container	Waste Description	Analytical Parameters	Analytical Results	Disposal Facility
Recovered LNAPL	200 gallons	tote	LNAPL recovered from System 1	PCBs	hazardous, < 2ppm PCBs	EQ - Detroit, MI
	150 gallons	closed-top drum	LNAPL recovered from Systems 2 and 3	PCBs	hazardous, TSCA > 2ppm PCBs	ONYX - Port Arthur, TX
Well Extraction Network	3 roll-offs	roll-off	PVC, Tigerflex, insulation from System 1 extraction well network	VOCs, SVOCs, Metals, PCBs, PCB wipes	non-hazardous, <10"g/100cm^2 PCBs	Landfilled - Oakland Heights Development - Auburn Hills, MI
	5 roll-offs	roll-off	PVC, Tigerflex, insulation from Systems 2 and 3 extraction well network	VOCs, SVOCs, Metals, PCBs, PCB wipes	non-hazardous, <10"g/100cm^2 PCBs	Landfilled - Oakland Heights Development, Auburn Hills, MI
System Cleaning Waste	1300 gallons	totes	Water, product, sediment from System 1 cleaning	VOCs, SVOCs, Metals, PCBs	hazardous, < 2ppm PCBs	EQ - Detroit, MI
	8190 gallons	totes, drums	Water, product, sediment from Systems 2 and 3 cleaning	VOCs, SVOCs, Metals, PCBs	non-hazardous, TSCA > 0.5ppb PCBs in water	Waste Management - Model City, NY
Activated Carbon	100 gallons	open-top drum	Carbon removed from carbon vessel in System 1	VOCs, SVOCs, Metals, PCBs	non-hazardous, < 0.5ppb PCBs in water	EQ - Detroit, MI
	400 gallons	open-top drum	Carbon removed from carbon vessel in Systems 2 and 3	PCBs	non-hazardous, TSCA > 0.5ppb PCB's in water	Waste Management - Model City, NY
Water Contained within Carbon Vessel	600 gallons	totes	Water contained within the carbon vessels of Systems 2 and 3	VOCs, SVOCs, Metals, PCBs	non-hazardous, TSCA > 0.5ppb	Waste Management - Model City, NY

Appendices

ENCORE
Environmental Corporate Remediation ©

Appendix A

LNAPL Fingerprinting Results

ENCORE
Environmental Corporate Remediation ©

ZymaX FORENSICS

December 21, 2001

Mr. Coleen Carter
BBL, Inc.
E. Eisenhower Parkway, Suite 260
Ann Arbor, MI. 48108

RE: PNC
Project No.: 64411

Dear Mr. Carter,
Enclosed are analytical results for four product samples submitted to ZymaX on December 13, 2001. Per your request, the following analyses were performed on the samples submitted.

1. Simulated Distillation by ASTM method D2887
2. Column cleanup (except MWW8-03-NP-102601)
3. GC/MS full scan analysis

Our preliminary conclusion based on the analytical data, indicates that

A, MWW8-03-NP-102601 is predominated by a weathered diesel #2 with a small amount of highly degraded No.6 fuel oil.

B, MWW10-01-NP-102601 is dominated by a moderately degraded diesel #2 with less amount of highly degraded No.6 fuel oil.

C, MW36-99-NP-111201 is dominated by a highly degraded No.6 fuel oil with less amount of moderately degraded kerosene-type fuel.

D, MW24-99-NP-111201 is dominated by a highly degraded No.6 fuel oil with less amount of highly degraded diesel #2.

A detailed interpretive report discussing the chemical data, fuel identification, and how the data can be used to characterize the fuel types and estimate their exposure time can be provided.

The project was performed at ZymaX forensics as Laboratory No.25787.

Please call us at **805.544.4696** if you have any questions regarding the analytical results, or if you require a cost estimate for the report.

Respectfully,
ZymaX forensics

Shantan Lu, Ph.D.
Director of Petroleum Geochemistry

www.ZymaXforensics.com

16921 Parthenia Street Ste. 201 • North Hills CA 91343 • fax 818.893.8940 • vox 818.893.4103
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email: forensics@ZymaXusa.com

ZymaX

71 Zaca Lane San Luis Obispo CA 93401 tel 805.544.4696 fax 805.544.8226

CHAIN of CUSTODY

report to: Colleen Carter	phone: 734-668-1133	fax: 734-668 1538
company: BBL	project: @ PNC	
address: 455 E. Eisenhower P'way, ANN ARBOR, MI 48108	project #: 64411	
	sampler:	

Turnaround Time: ASAP ☐ 48 hr ☐ 12 hr ☐ 72 hr ☐ 24 hr ☐ std ☒

ZymaX use only	SAMPLE DESCRIPTION	Date Sampled	Time	Matrix	Preserve	Simulated Distillation	GC/MS Full Scan	Column cleanup	# of containers	Remarks
25787-1	MWW8-03-NP-102601	10/26/01	1300	NAPL	—	✓	X	⊗		Xpn C. Carter
-2	MWW10-01-NP-~~111601~~ 102601	10/26/01	1310	↓	↓	✓	X	X		12/13 AJ
-3	MW36-99-NP-111201	11/12/01	0800	↓	↓	✓	X	X		⊗ No column cleanup
-4	MW24-99-NP-111201	11/12/01	0930	↓	↓	✓	X	X		

Comments

Relinquished by:
Signature: [signature]
Print: John McKenna
Company: BBL
Date: _____ Time: _____

Received by:
Signature: _____
Print: _____
Company: _____
Date: _____ Time: _____

Sample integrity upon receipt:
Samples received intact ✓
Samples received cold
Custody seals
Correct container types ✓

Bill 3rd Party:
PO# _____
Quote yes no

Relinquished by:
Signature: _____
Print: _____
Company: _____
Date: _____ Time: _____

Received by ZymaX envirotechnology inc:
Signature: A Branham
Print: Amy Branham
Company: ZymaX
Date: 11-16-01 Time: 1100

email: zymax@ZymaXusa.com

ZymaX FORENSICS

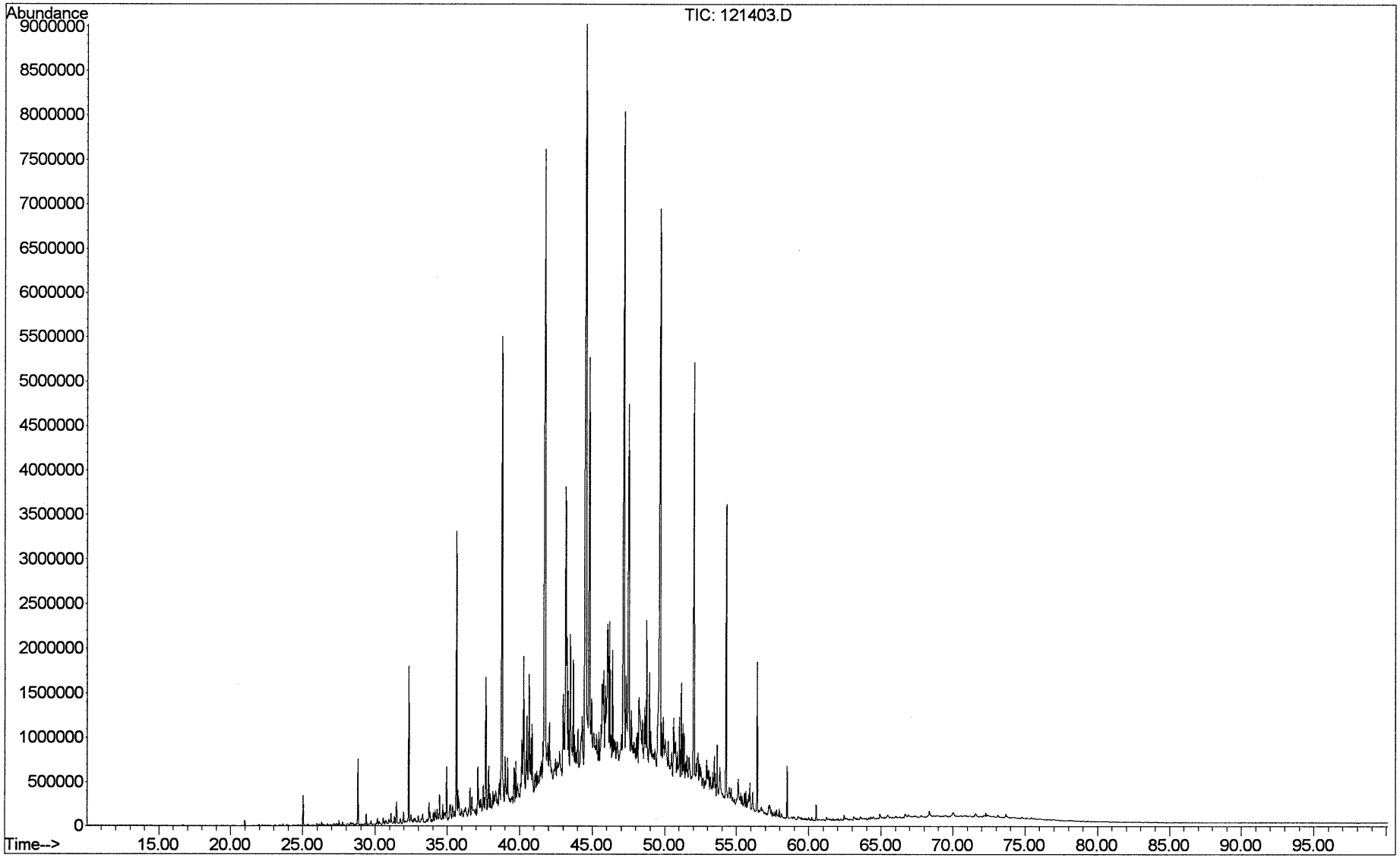
December 14, 2001

Hydrocarbon fractions for product samples submitted by BBL, Inc.

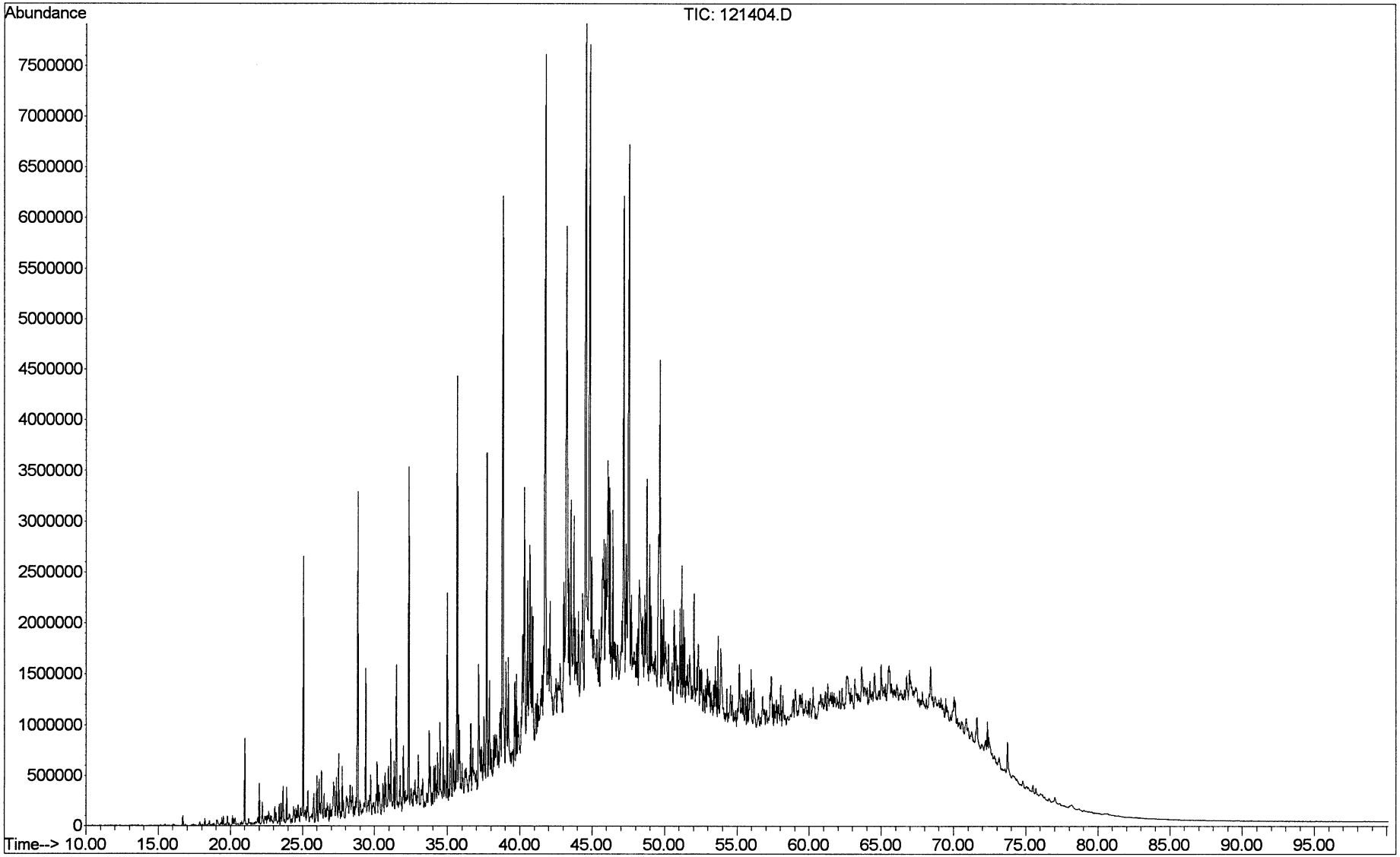
Sample ID	Zymax ID	Saturated + Aromatic (%)	Polar + Asphaltenes (%)
MWW10-01-NP-102601	25787-2	76.1	23.9
MW36-99-NP-111201	25787-3	62.2	37.8
MW24-99-NP-111201	25787-4	63.7	36.3

Supervisor

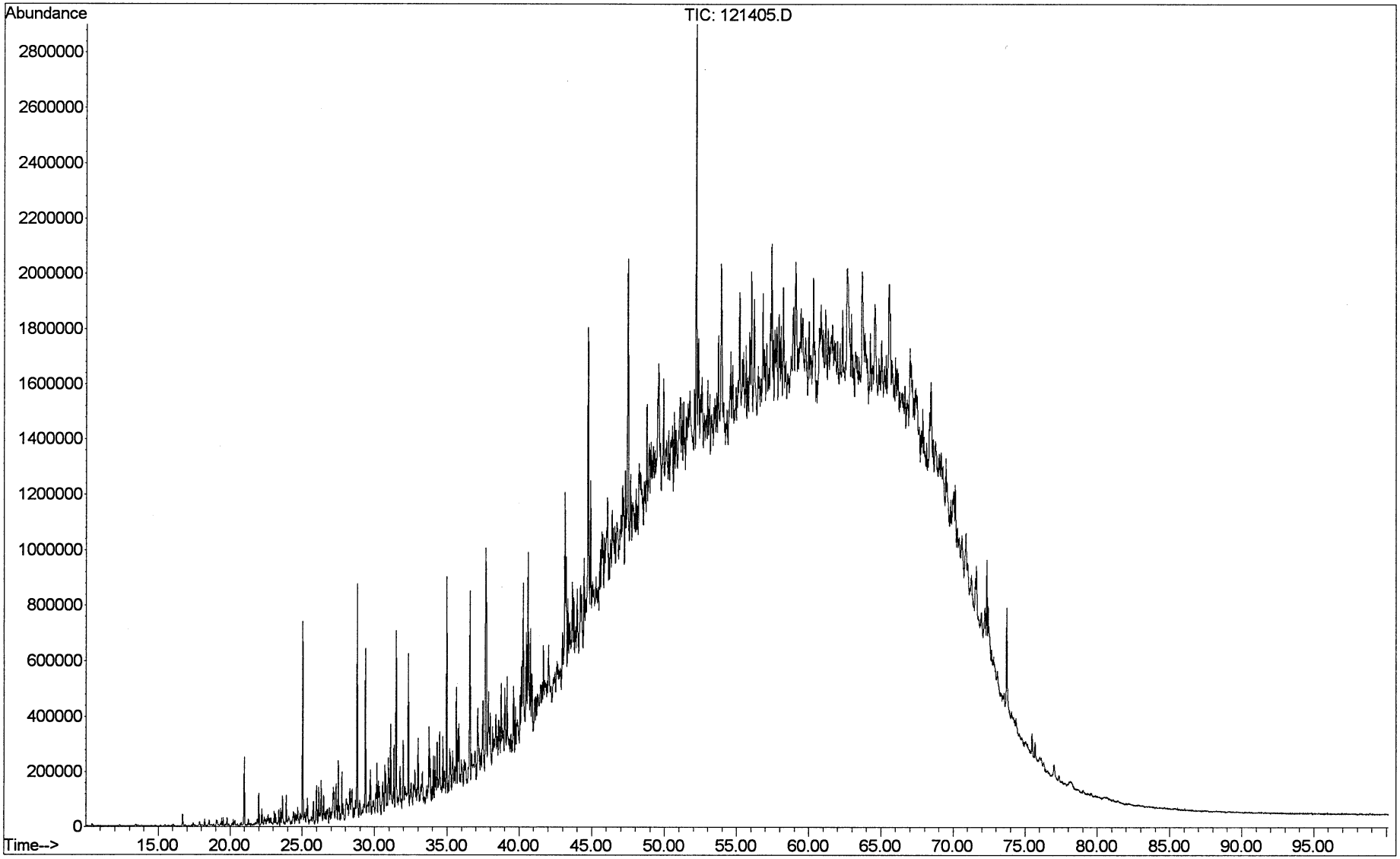
Sample Name: MWW8-03-NP-102601 (25787-1) Product x75
Misc Info : PNC



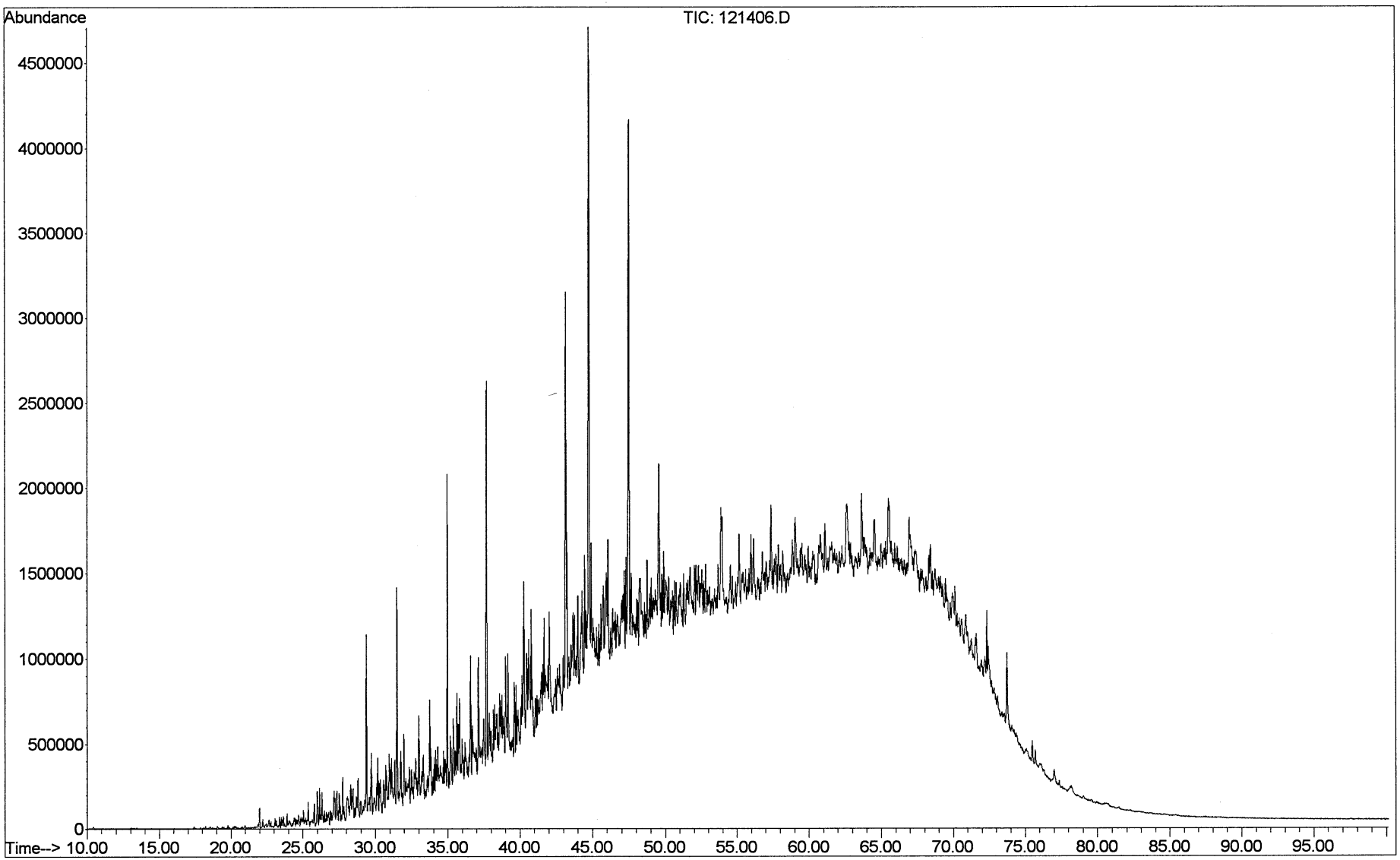
Sample Name: MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
Misc Info : PNC



Sample Name: MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
Misc Info : PNC



Sample Name: MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
Misc Info : PNC

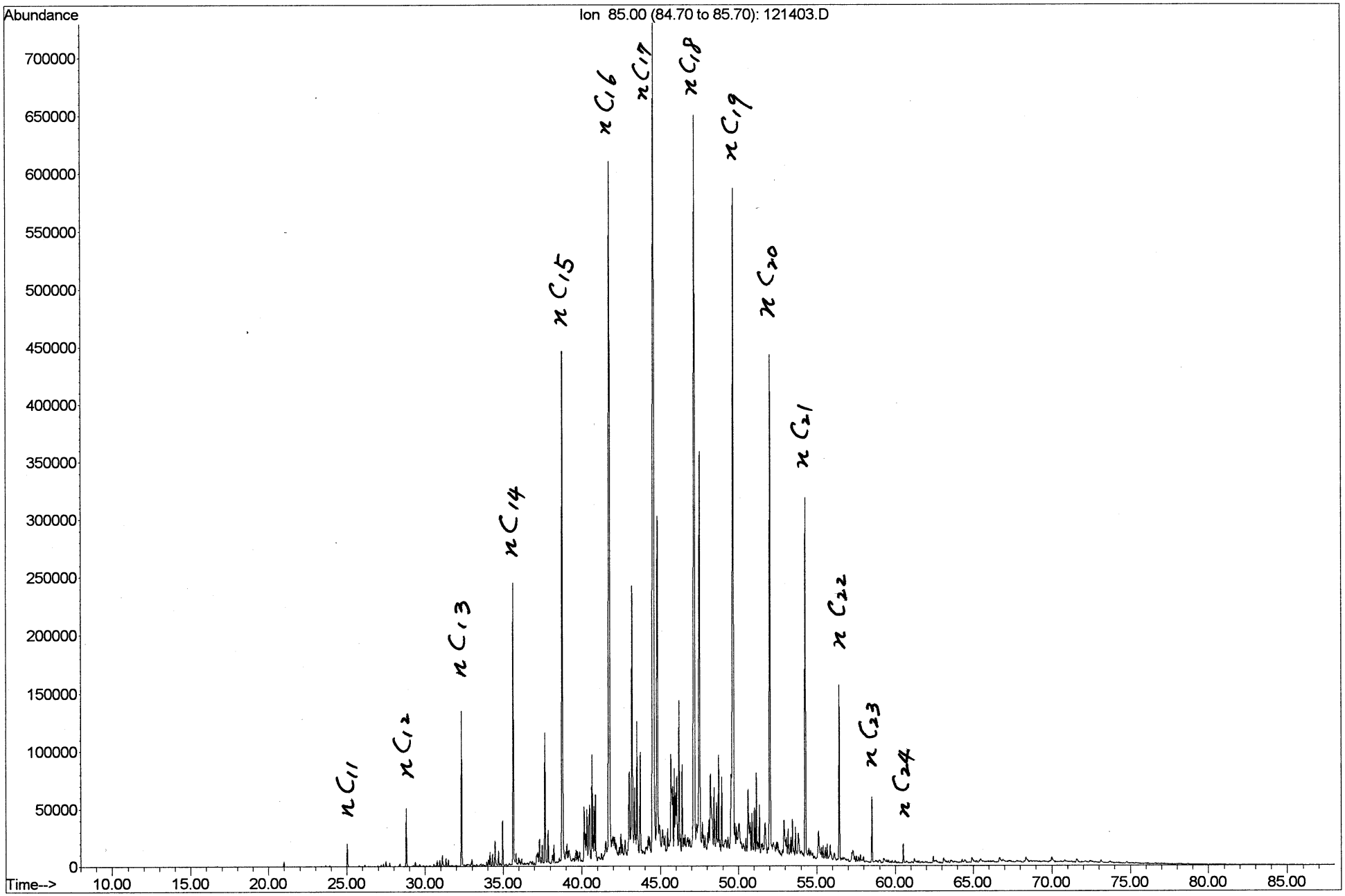


Table

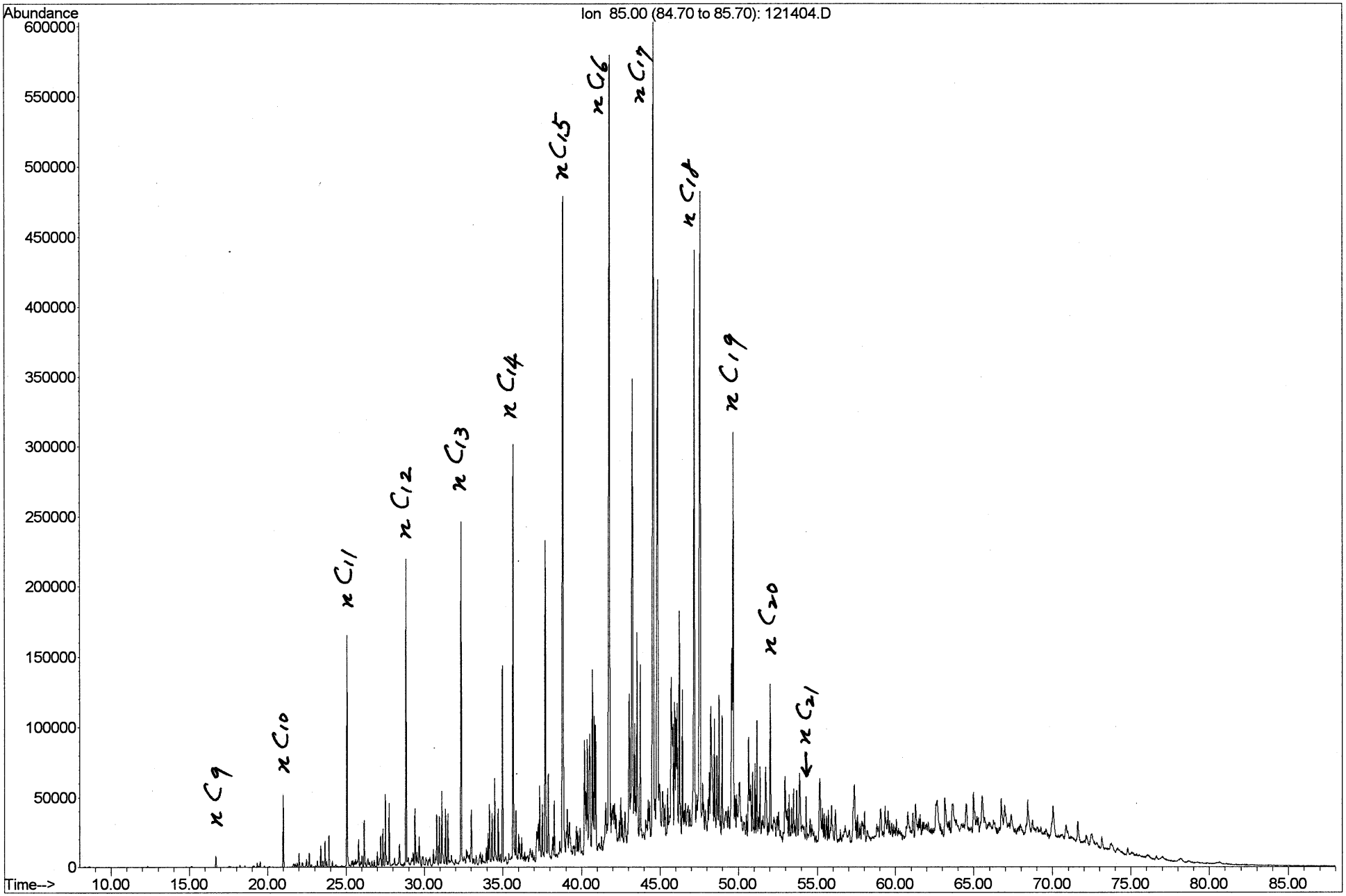
Key to Chromatogram Symbol Identification for m/z 85 and m/z 113 Paraffins and Isoparaffins

Symbol	Detail
i-10	Iso-alkane with 10 carbon atoms
i-15	Farnesane (isoprenoid with 15 carbon atoms)
i-16	Isoprenoid with 16 carbon atoms
Pr	Pristane (isoprenoid with 19 carbon atoms)
Ph	Phytane (isoprenoid with 20 carbon atoms)
nC_8	n-C_8 normal alkane
nC_{15}	n-C_{15} normal alkane
i-8	2,5-(2,4)-Dimethylhexane
i-8'	2,3,4-Trimethylpentane
i-8"	2,3-Dimethylhexane
CH-*n*	Alkylcyclohexane (where *n* indicates number of carbon atoms in the side chain)

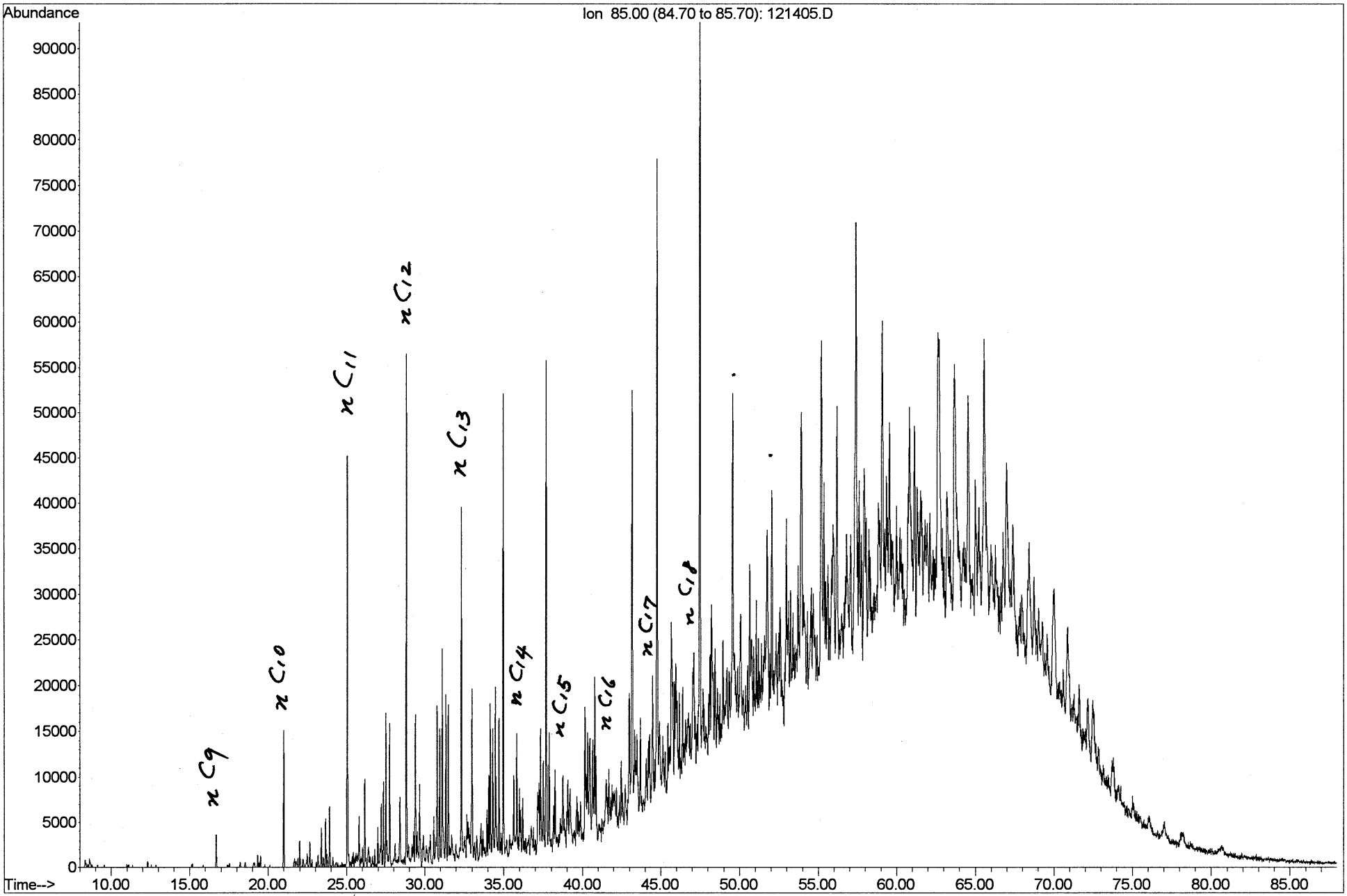
MWW8-03-NP-102601 (25787-1) Product x75
PNC



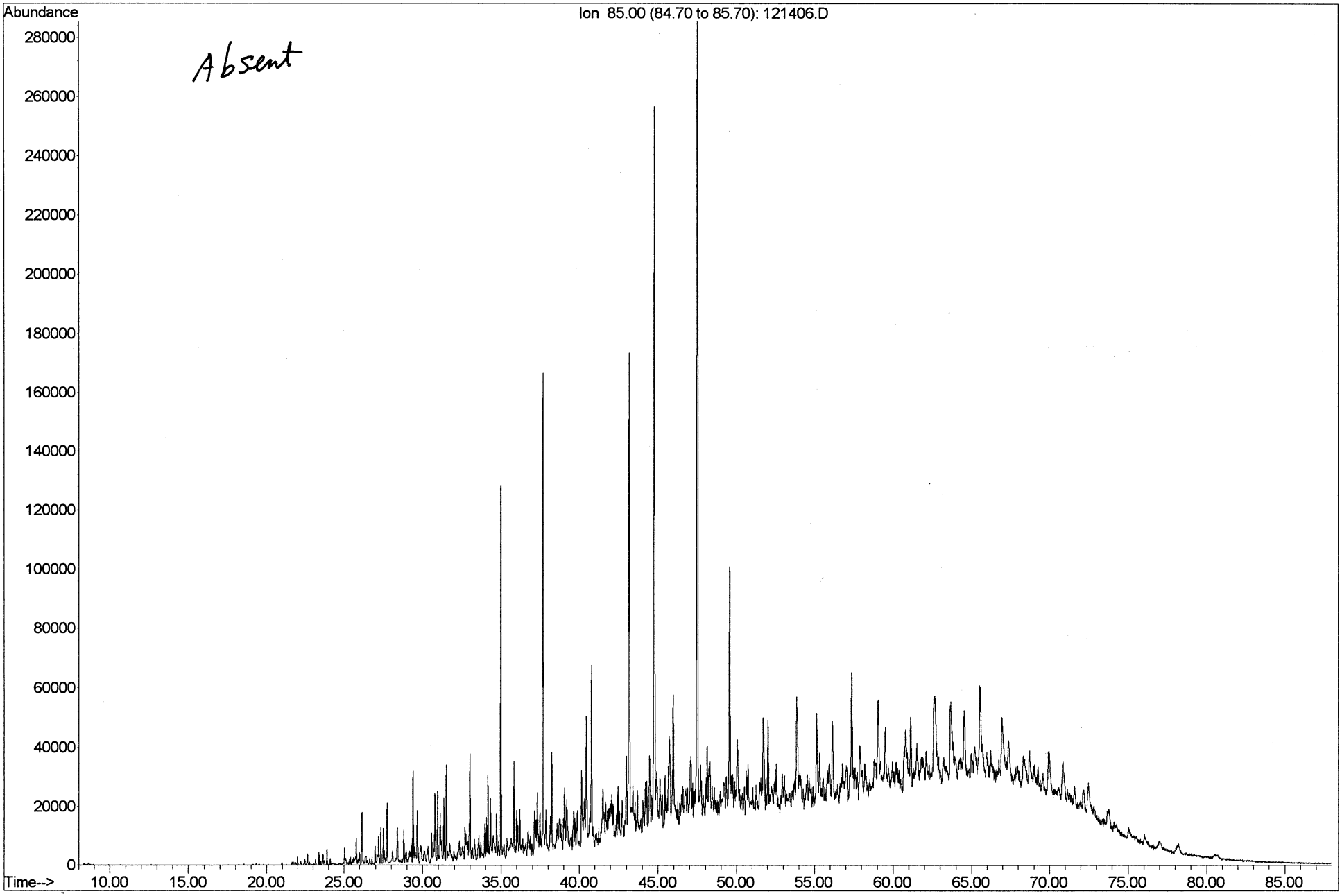
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC



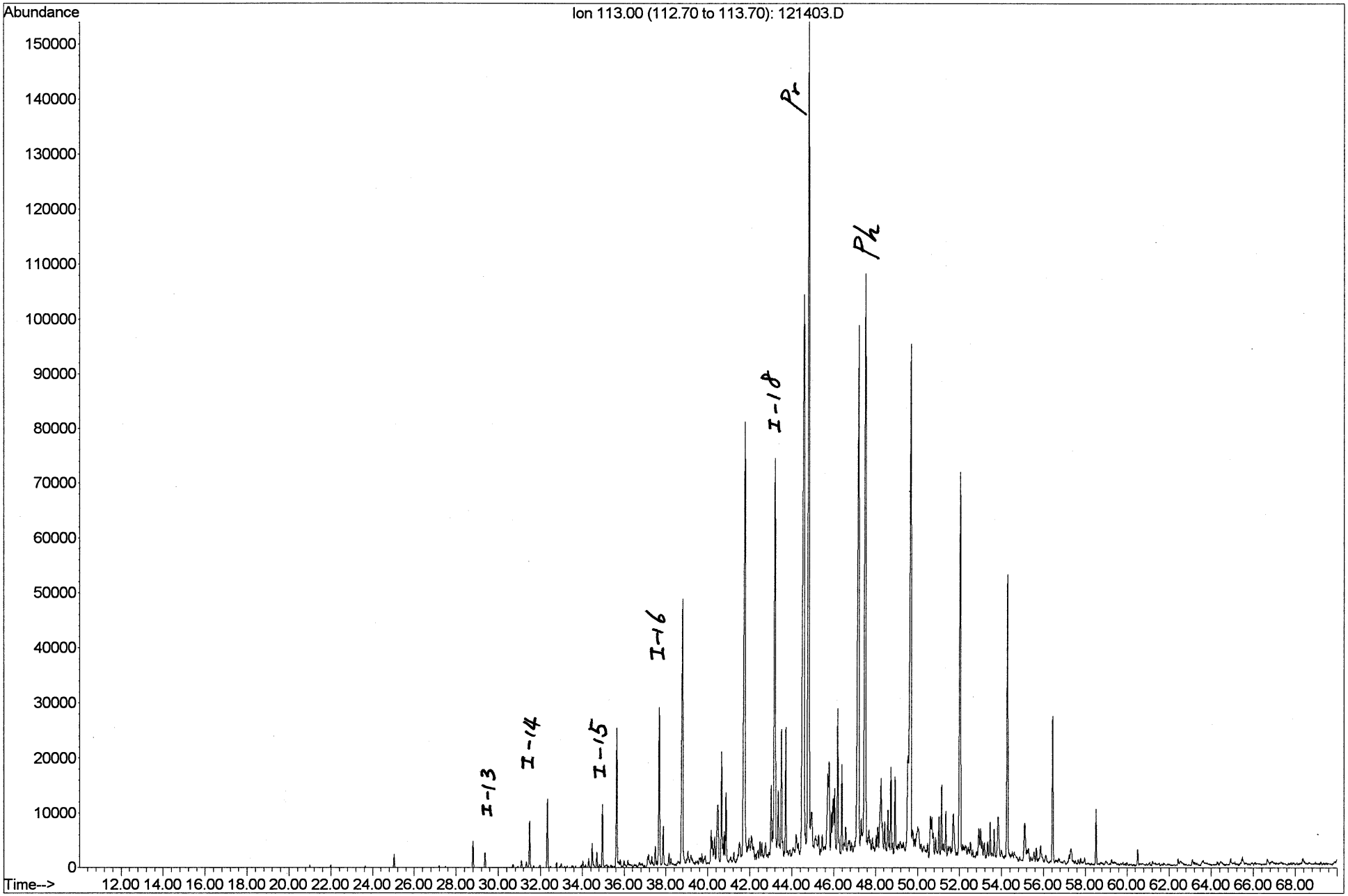
MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



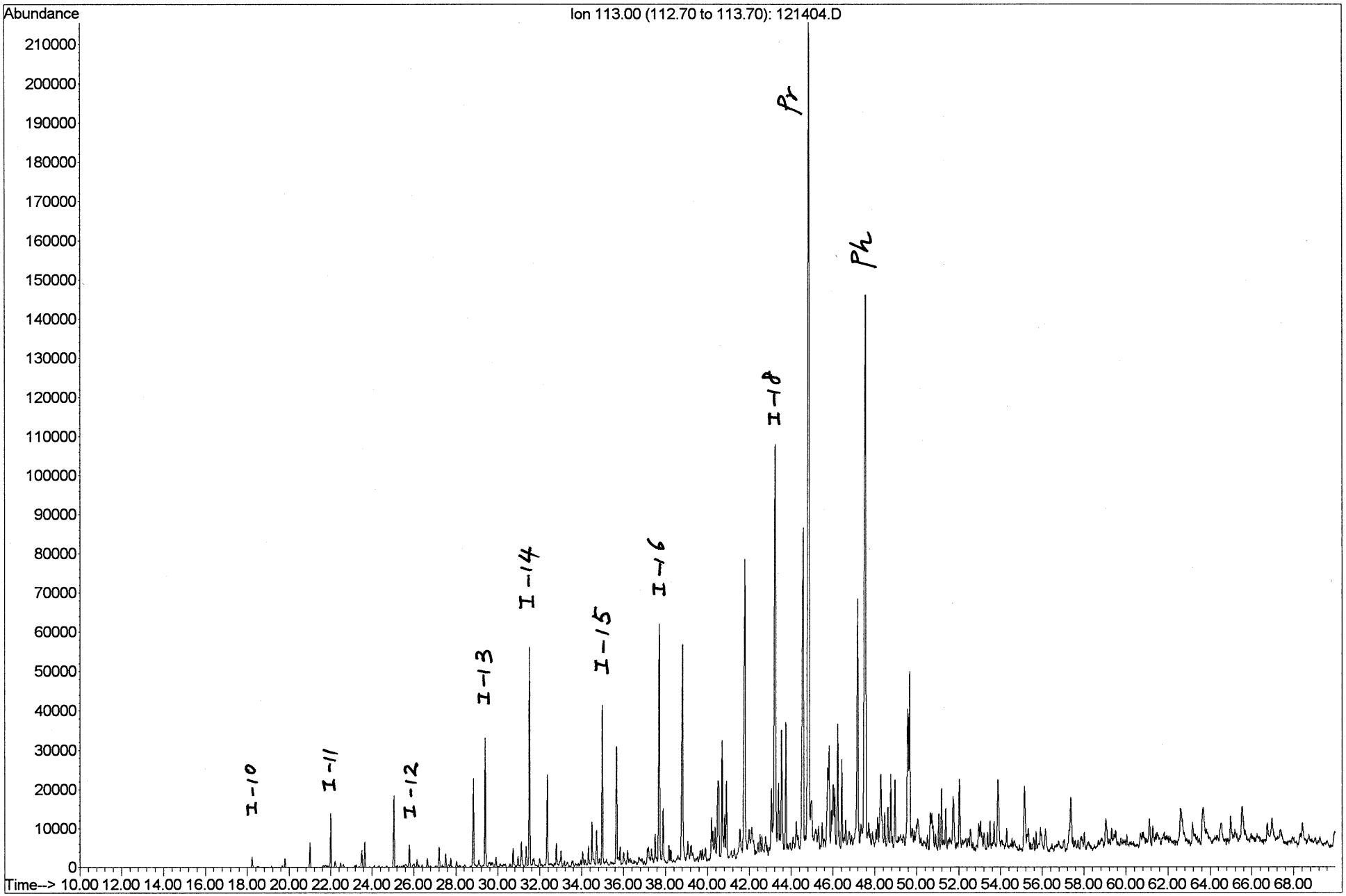
MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC



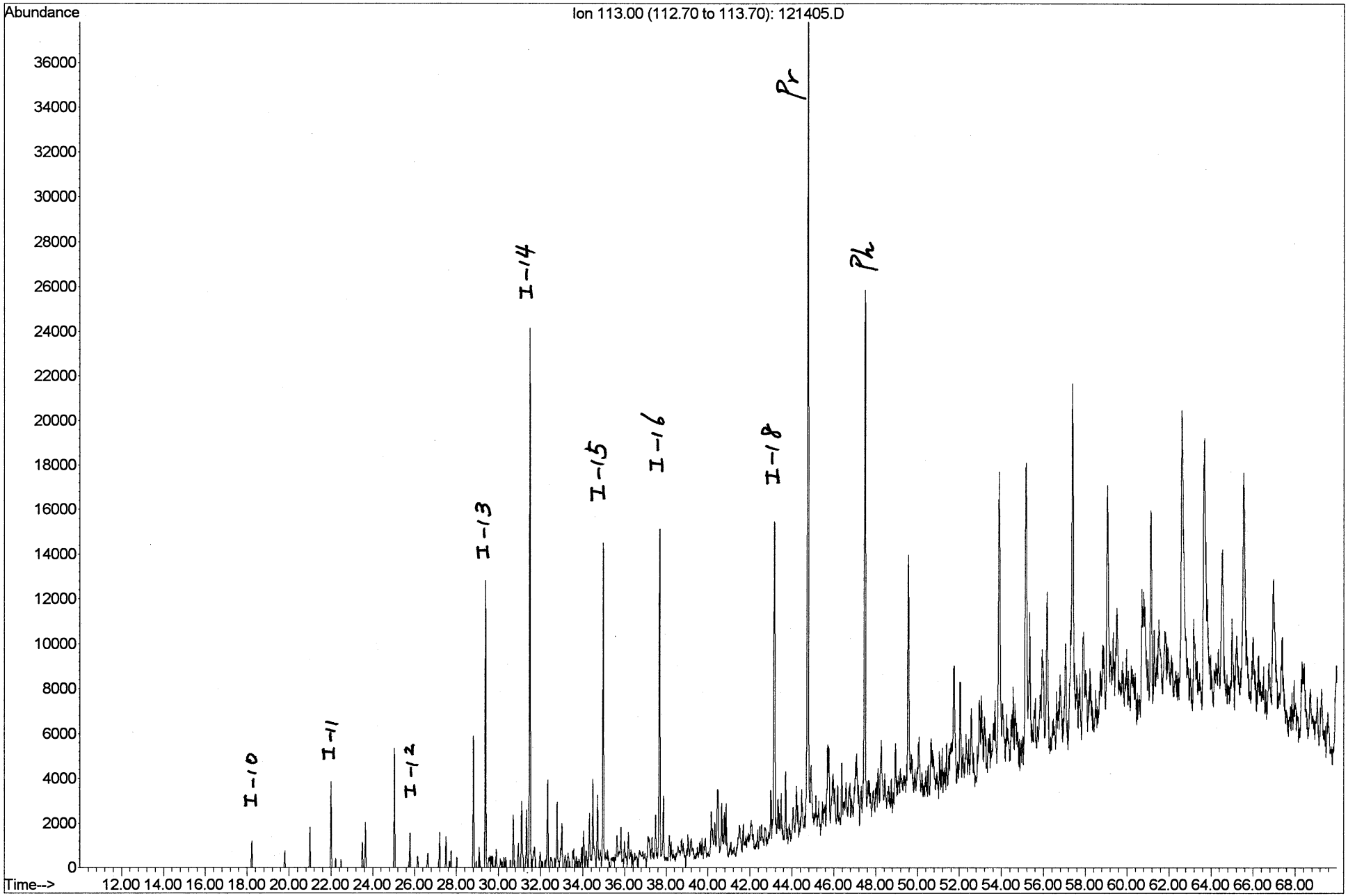
MWW8-03-NP-102601 (25787-1) Product x75
PNC



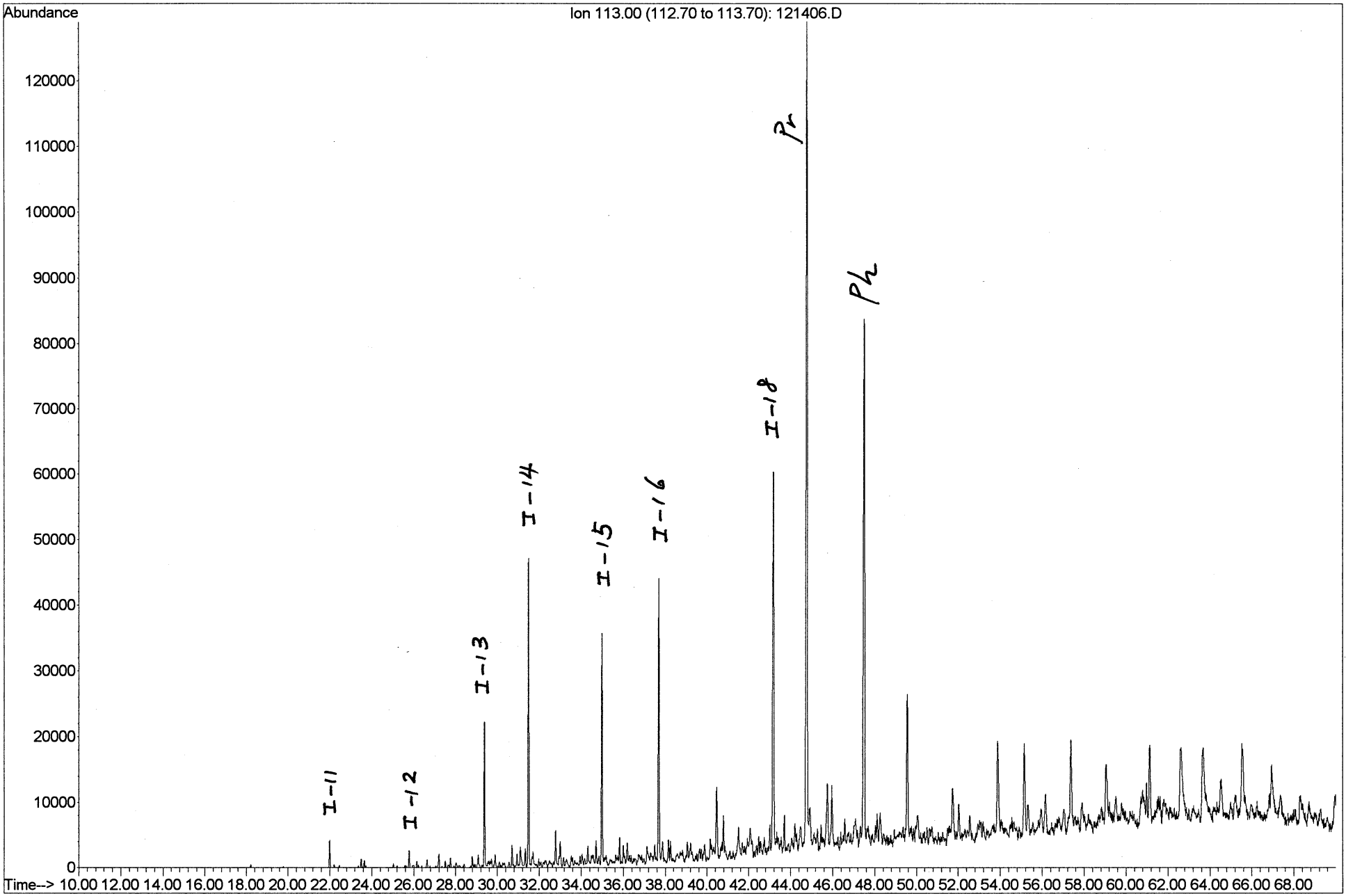
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC



MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC



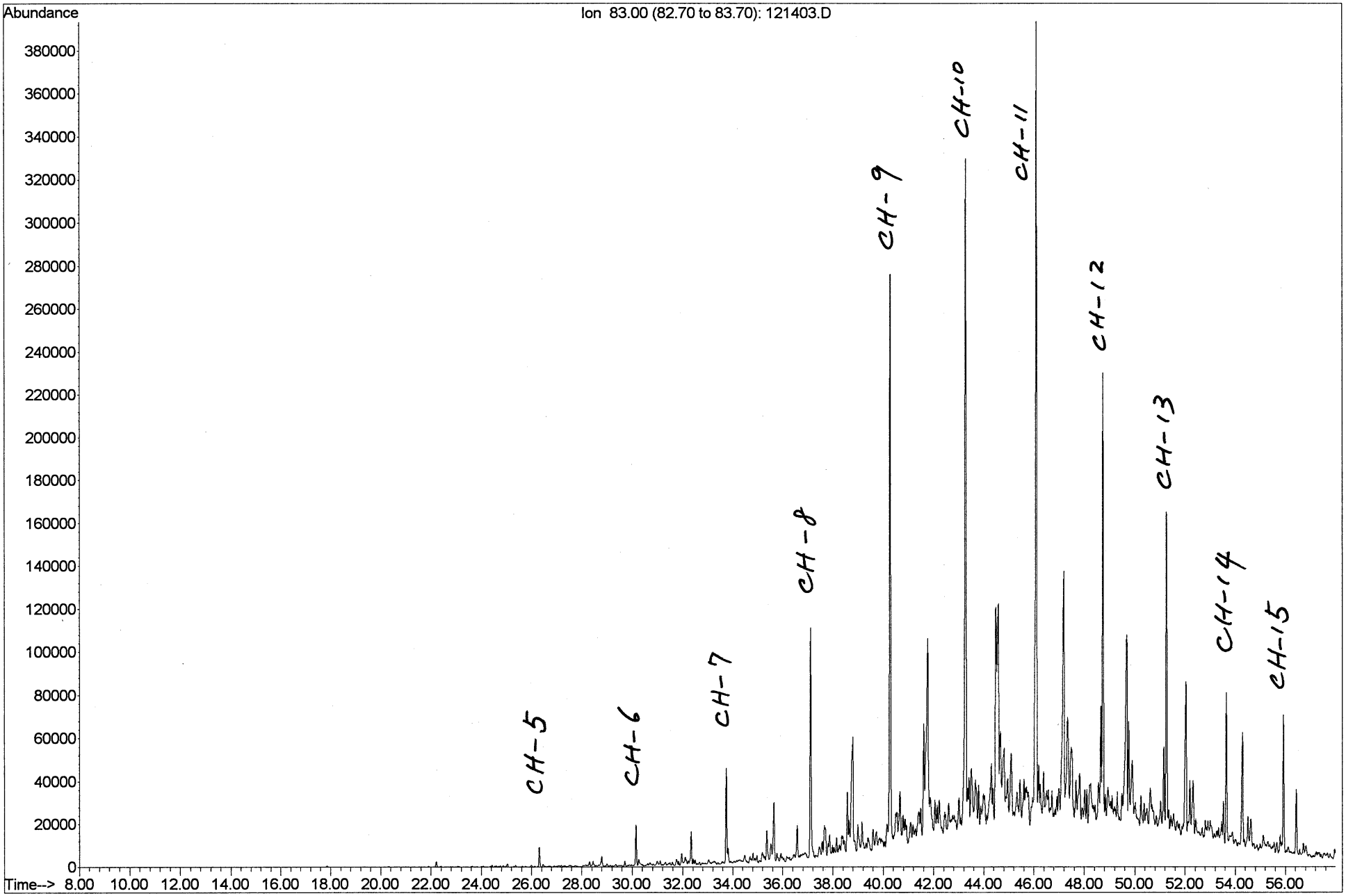
ZymaX FORENSICS

Table

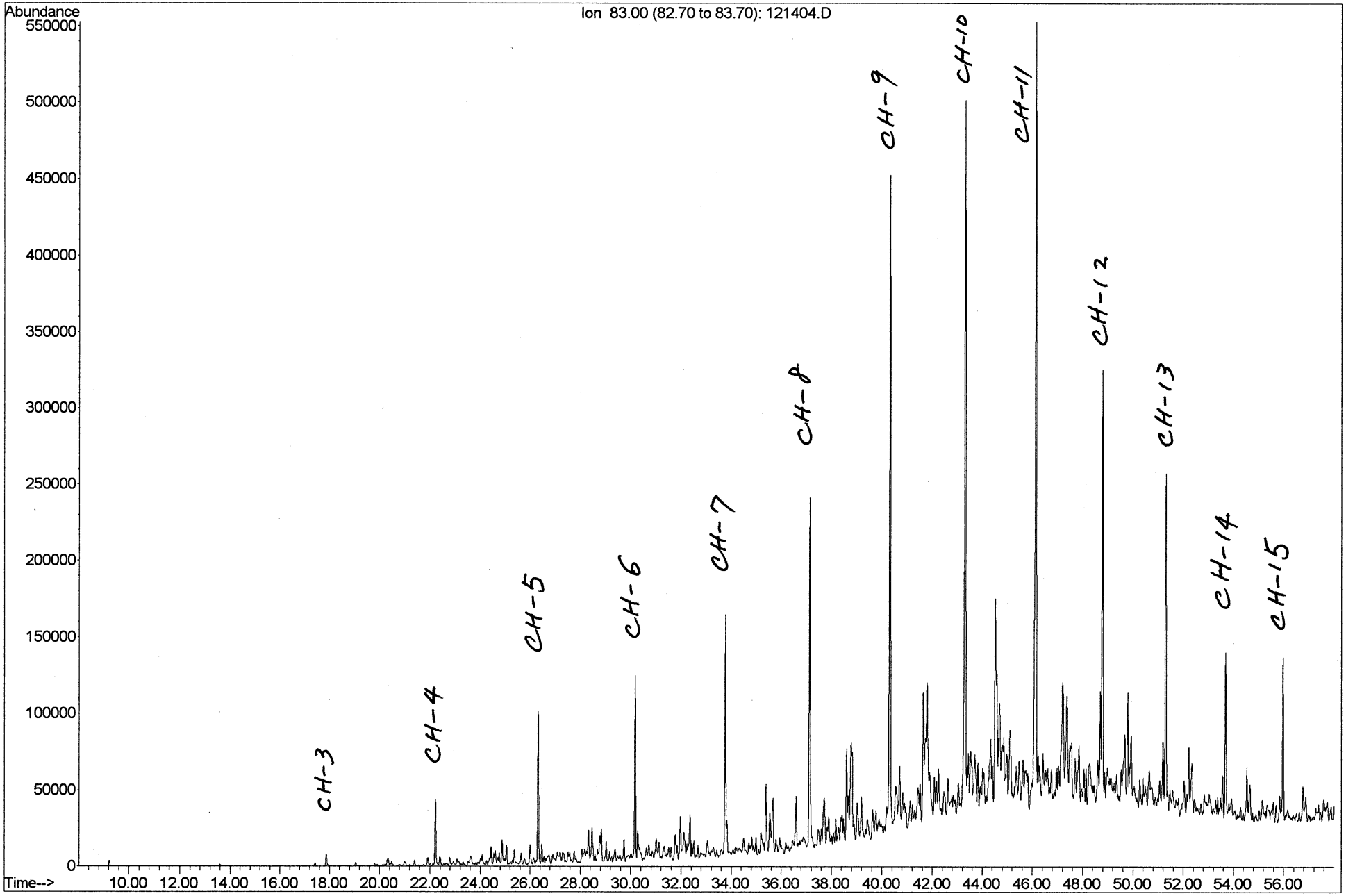
Key for Alkylcyclohexanes at m/z 83

Symbol	Detail
CH-1:	Methylcyclohexane
CH-2:	Ethylcyclohexane
CH-3:	Propylcylohexane
CH-4:	Butylcyclohexane
CH-5:	Pentylcyclohexane
CH-6:	Hexylcyclohexane
CH-7:	Heptylcyclohexane
CH-8:	Octylcyclohexane
CH-9:	Nonylcyclohexane
CH-10:	Decylcyclohexane
CH-11:	Undecylcyclohexane
CH-12:	Dodecylcyclohexane
CH-13:	Tridecylcyclohexane
CH-14:	Tetradecylcyclohexane

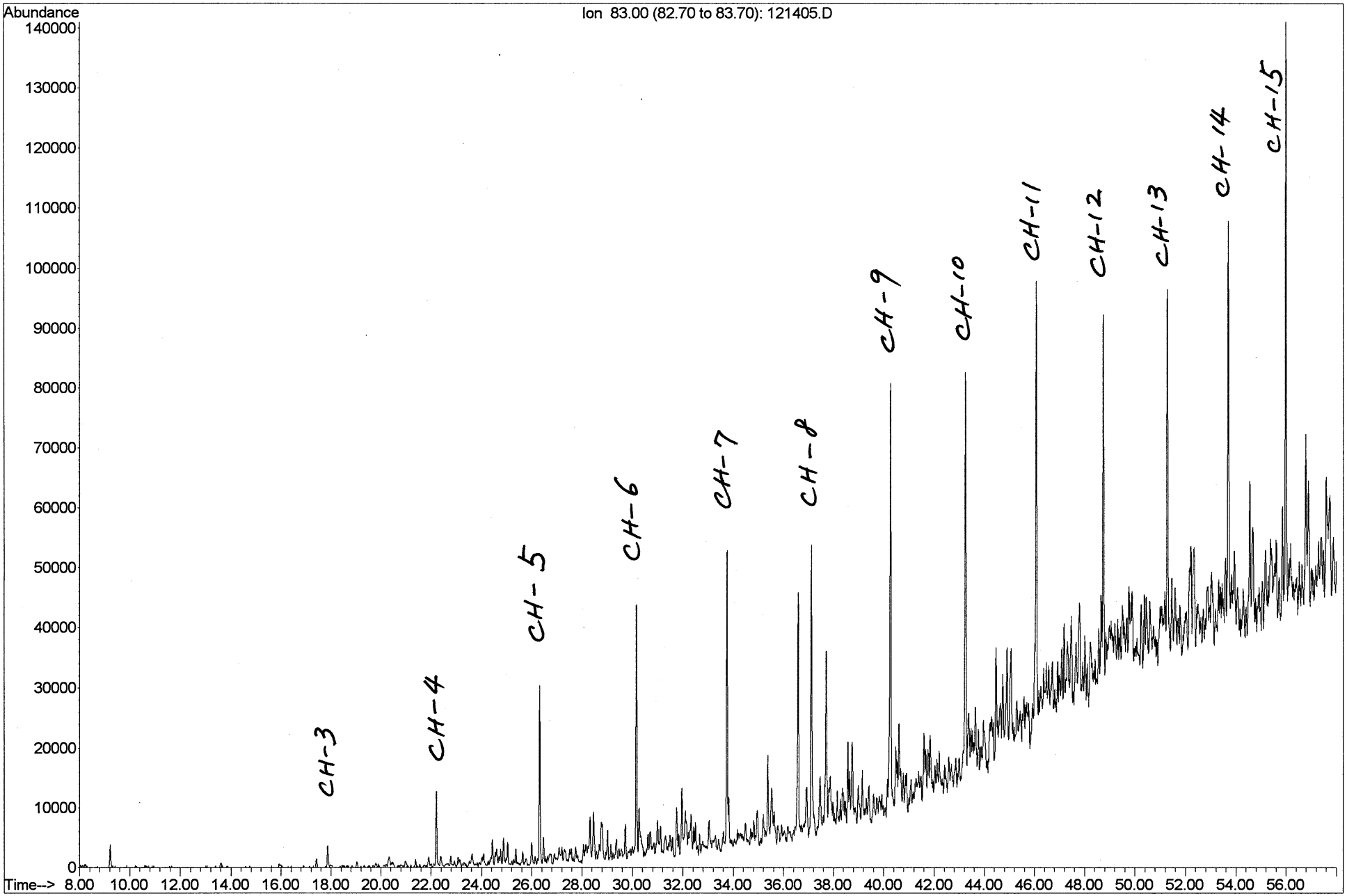
MWW8-03-NP-102601 (25787-1) Product x75
PNC



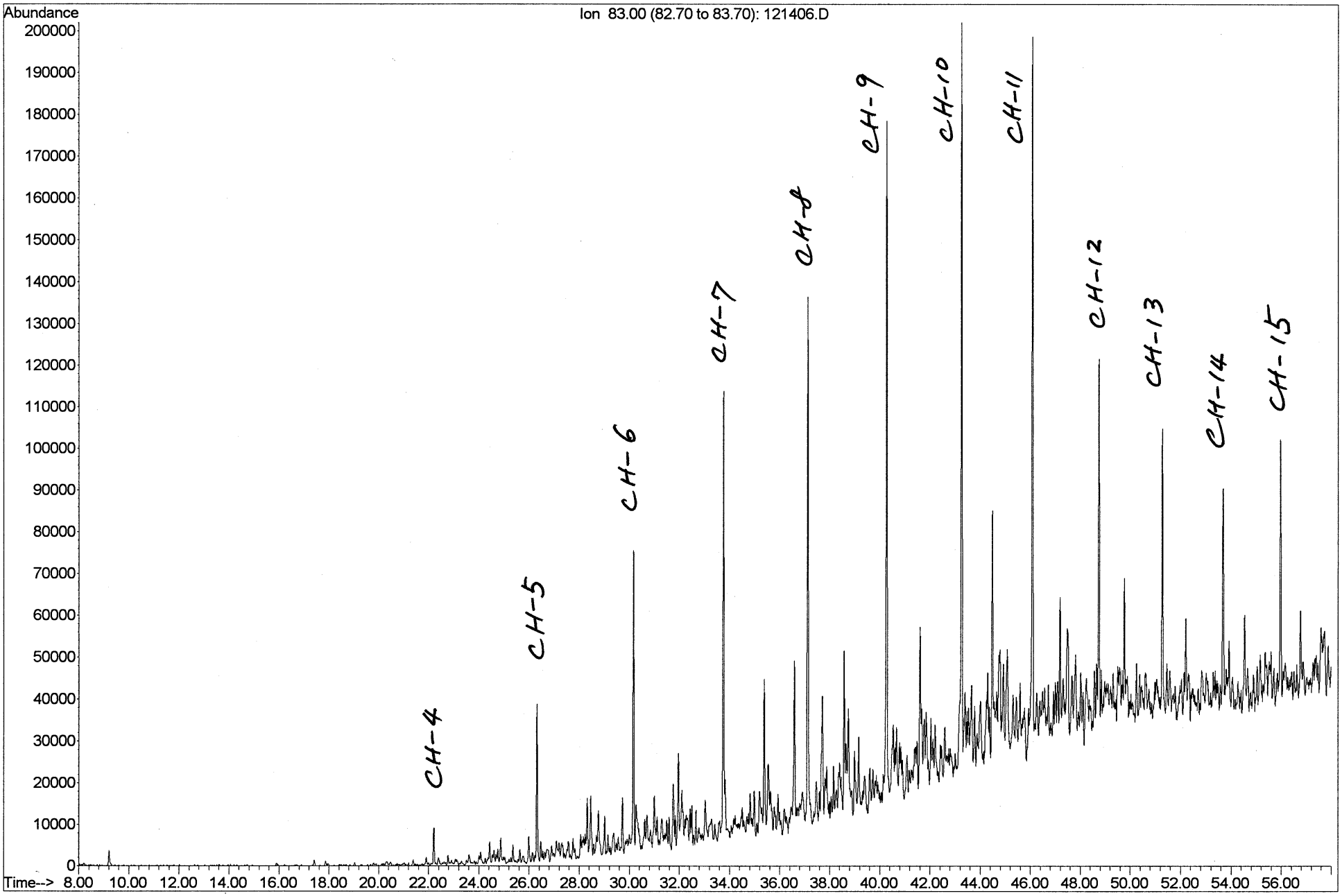
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC



MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC

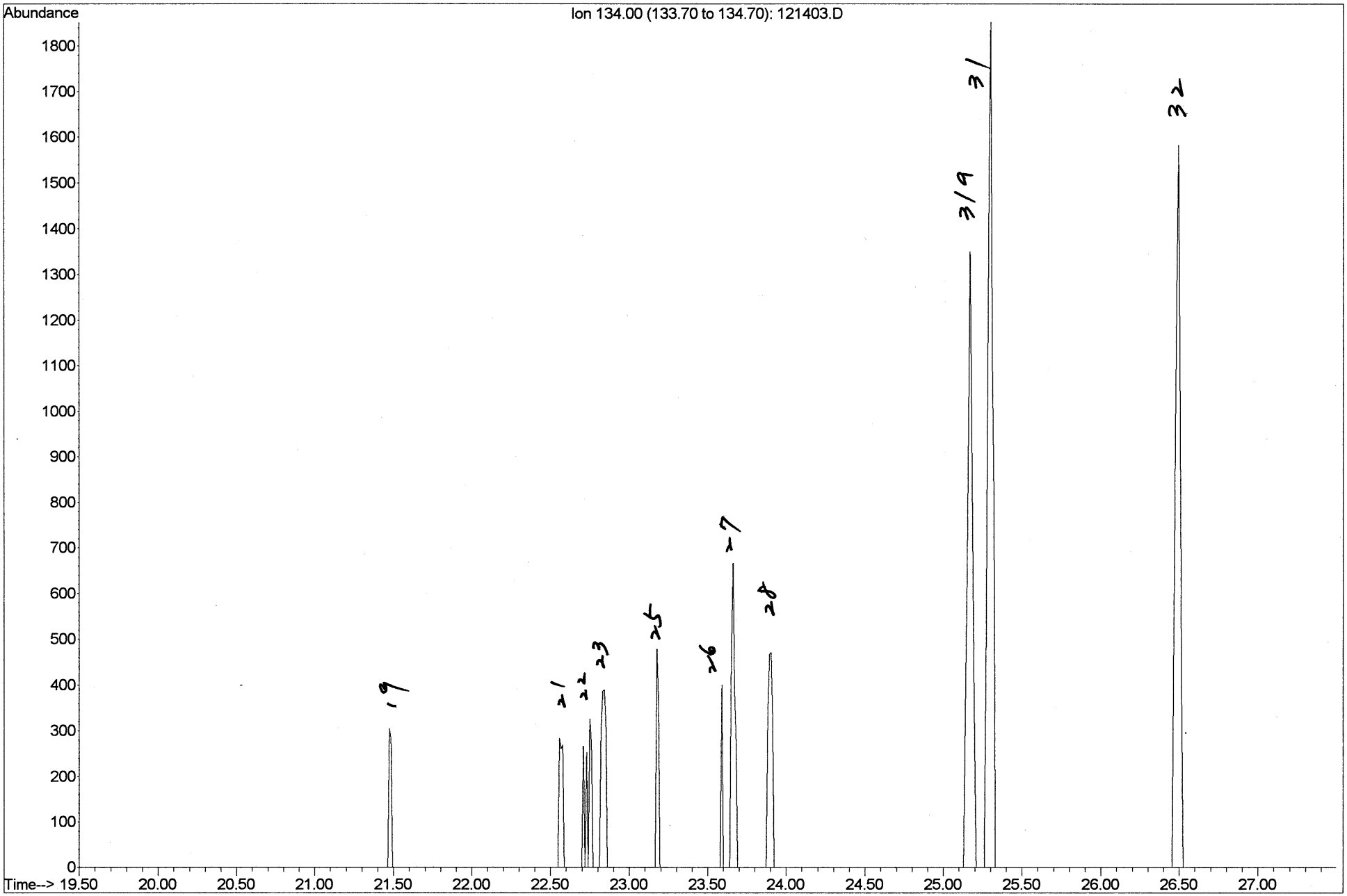


ZymaX FORENSICS

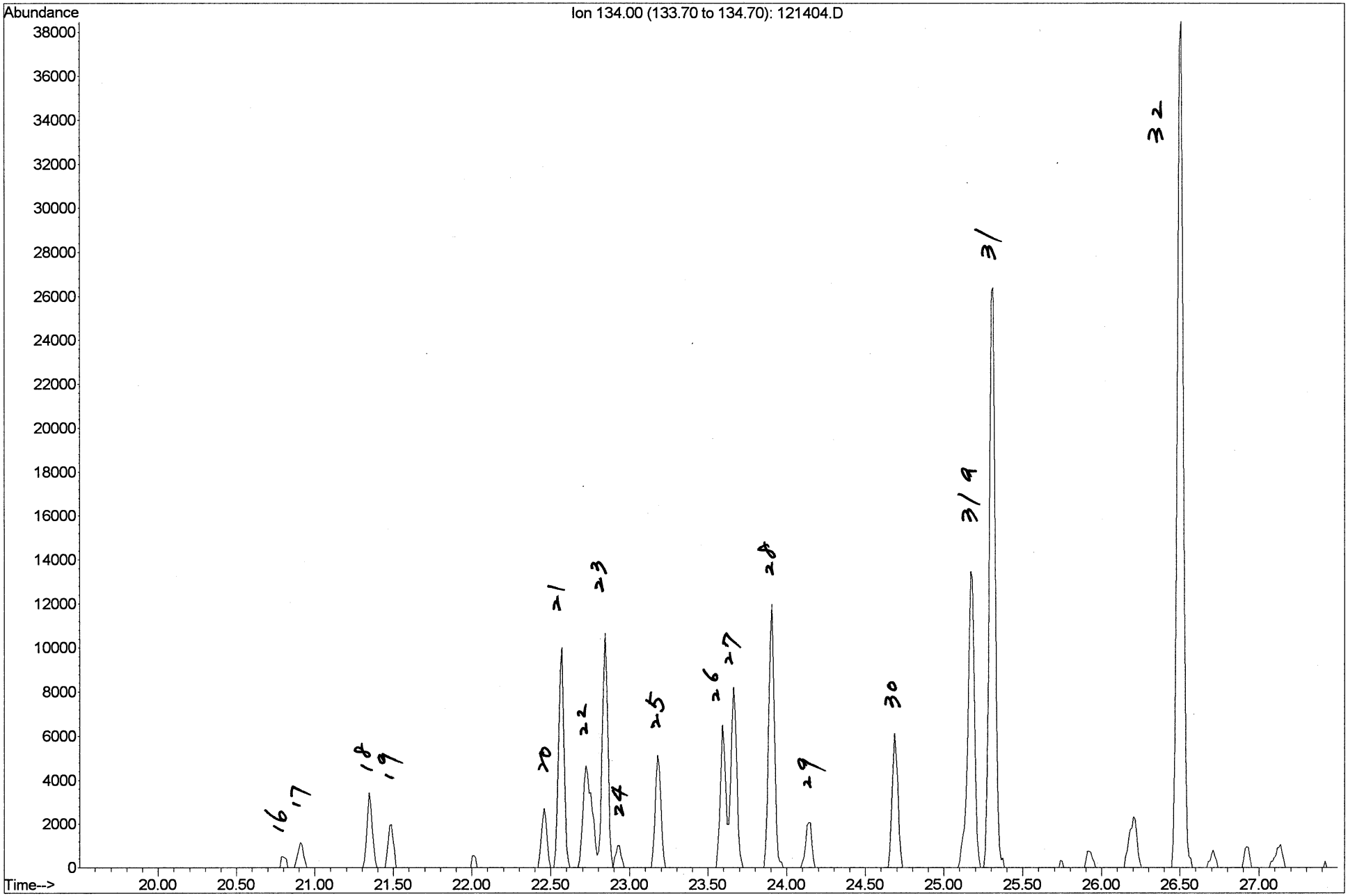
Key for C_4-Alkylbenzenes (m/z 134 mass chromatograms)

#	Compound
16	Sec-Butylbenzene
17	1-Methyl-3-Isopropylbenzene
18	1-Methyl-4-Isopropylbenzene
19	1-Methyl-2-Isopropylbenzene
20	1,3-Diethylbenzene
21	1-Methyl-3-Propylbenzene
22	Butylbenzene
23	1,3-Dimethyl-5-Ethylbenzene
24	1,2-Diethylbenzene
25	1-Methyl-2-Propylbenzene
26	1,4-Dimethyl-2-Ethylbenzene
27	1,3-Dimethyl-4-Ethylbenzene
28	1,2-Dimethyl-4-Ethylbenzene
29	1,3-Dimethyl-2-Ethylbenzene
30	1,2-Dimethyl-3-Ethylbenzene
31a	1,2,4,5-Tetramethylbenzene
31	1,2,3,5-Tetramethylbenzene
32	1,2,3,4-Tetramethylbenzene

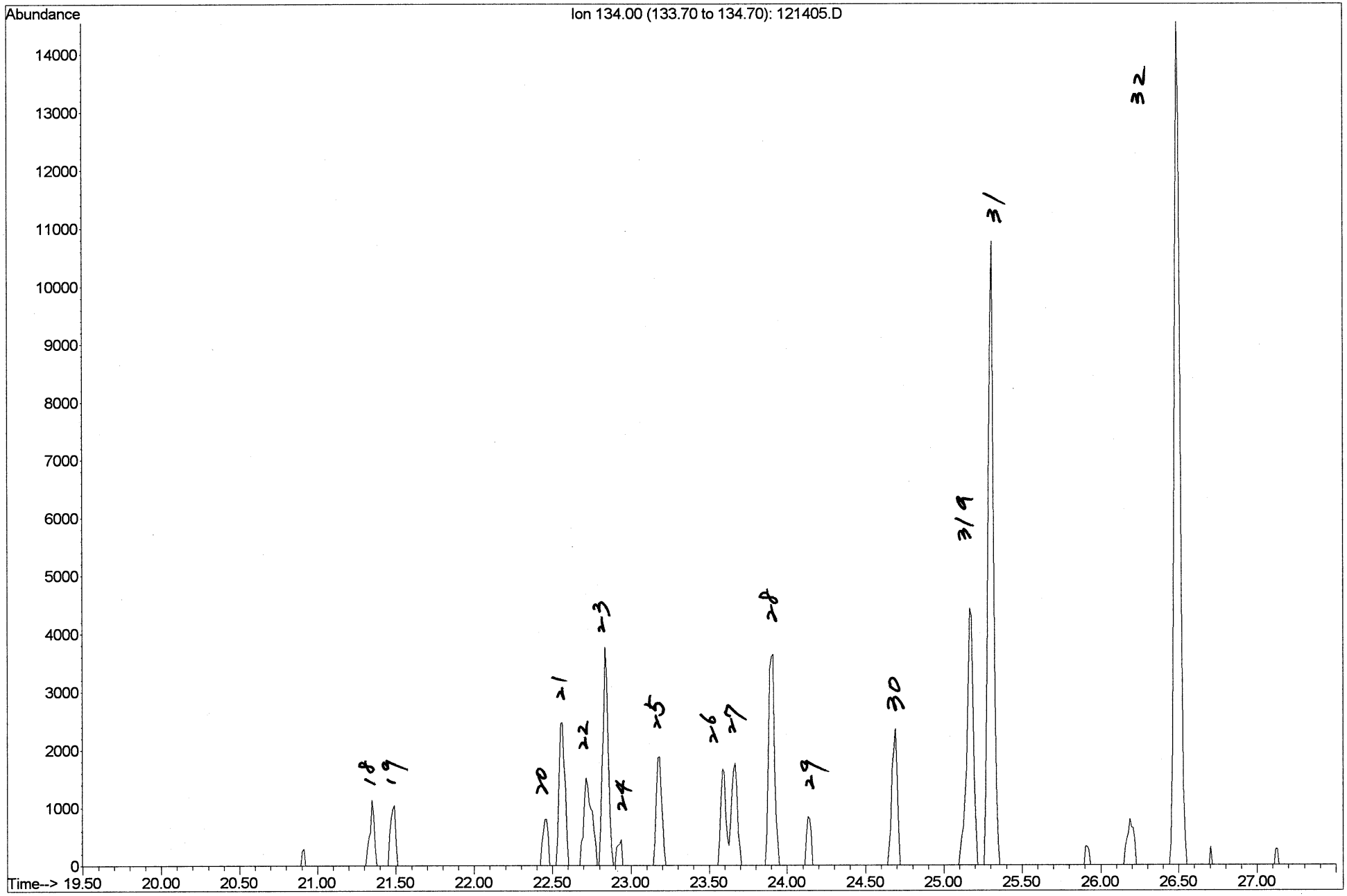
MWW8-03-NP-102601 (25787-1) Product x75
PNC



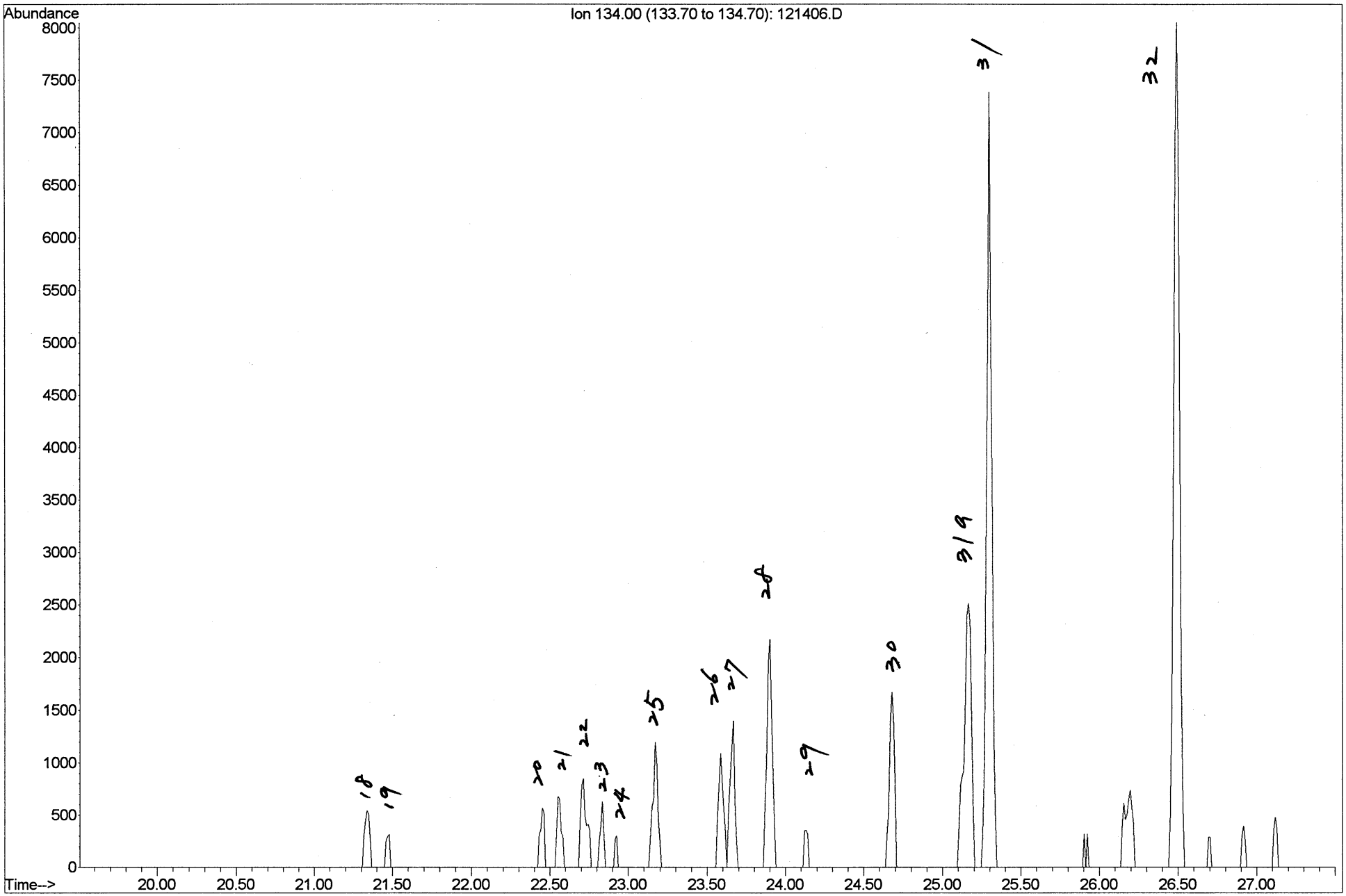
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC



MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC

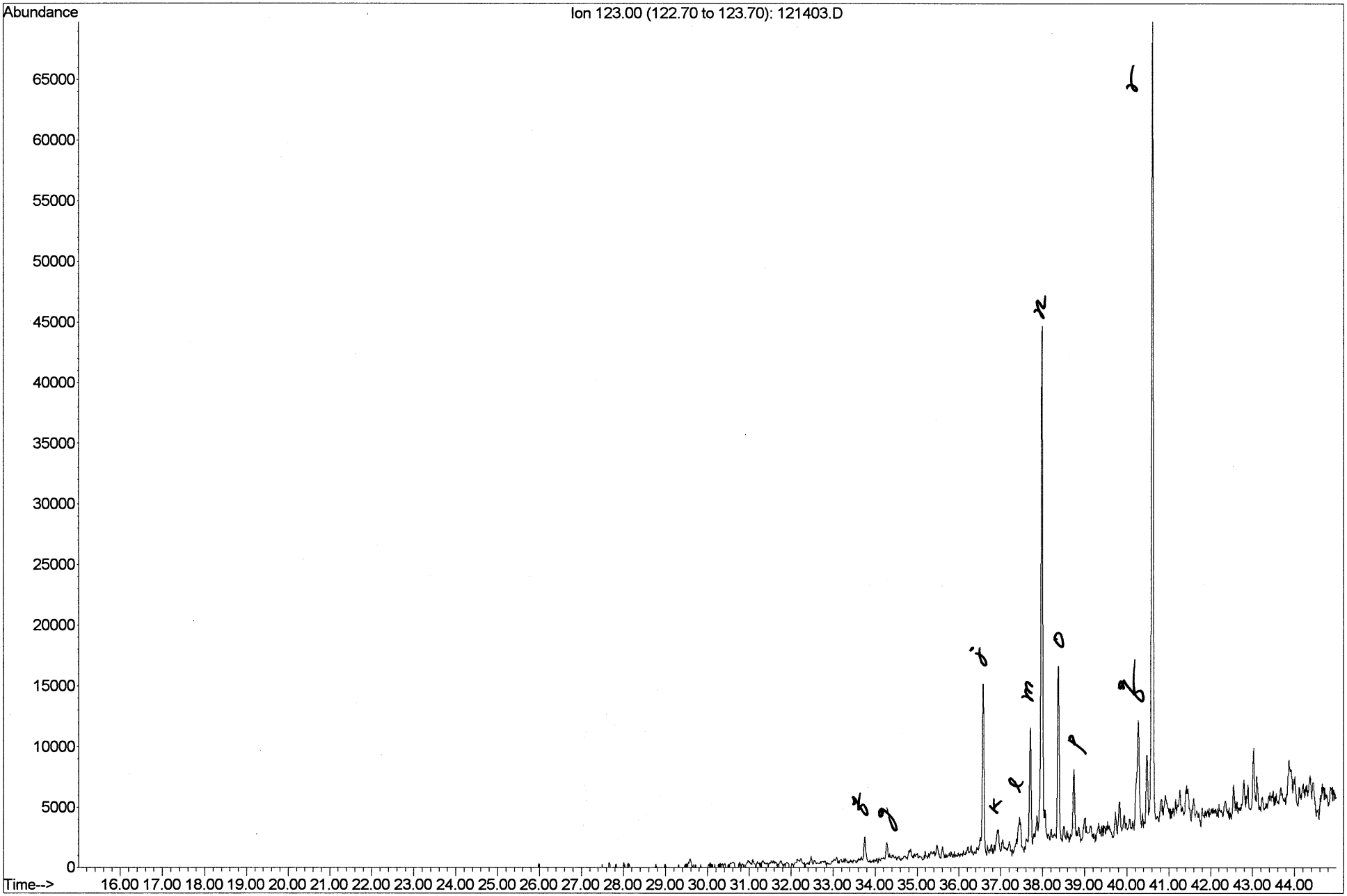


Table

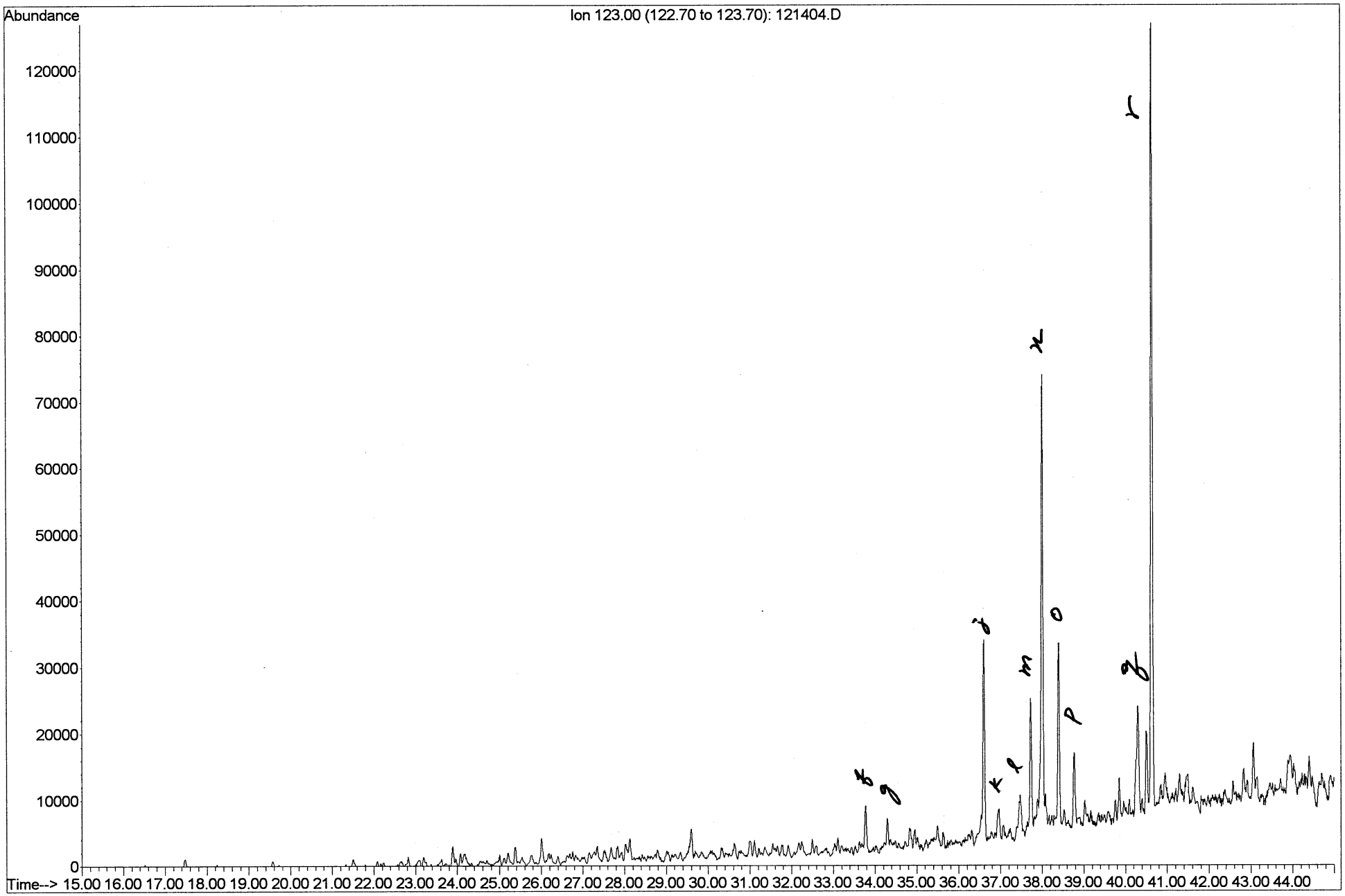
Key for identification of the Bicyclanes (m/z 123 mass chromatograms)

Peak No.	Identity	Formula	M.W.
a	2,2,3-Trimethylbicyloheptane	$C_{10}H_{18}$	138
b	C_{10} bicycloalkane	$C_{10}H_{18}$	138
c	3,3,7-Trimethylbicycloheptane	$C_{10}H_{18}$	138
d	C_{11} decalin	$C_{11}H_{20}$	152
f	Nordrimane	$C_{14}H_{26}$	194
g	Nordrimane	$C_{14}H_{26}$	194
h	Rearranged drimane	$C_{15}H_{28}$	208
j	Rearranged drimane	$C_{15}H_{28}$	208
k	Isomer of eudesmane	$C_{15}H_{28}$	208
l	4β(H) Eudesmane	$C_{15}H_{28}$	208
m	C_{15} bicyclic sesquiterpane	$C_{15}H_{28}$	208
n	8β(H) Drimane	$C_{15}H_{28}$	208
o	C_{15} bicyclic sesquiterpane	$C_{15}H_{28}$	208
p	C_{16} bicyclic sesquiterpane	$C_{16}H_{30}$	222
q	C_{16} bicyclic sesquiterpane	$C_{16}H_{30}$	222
r	8β(H) Homodrimane	$C_{16}H_{30}$	222

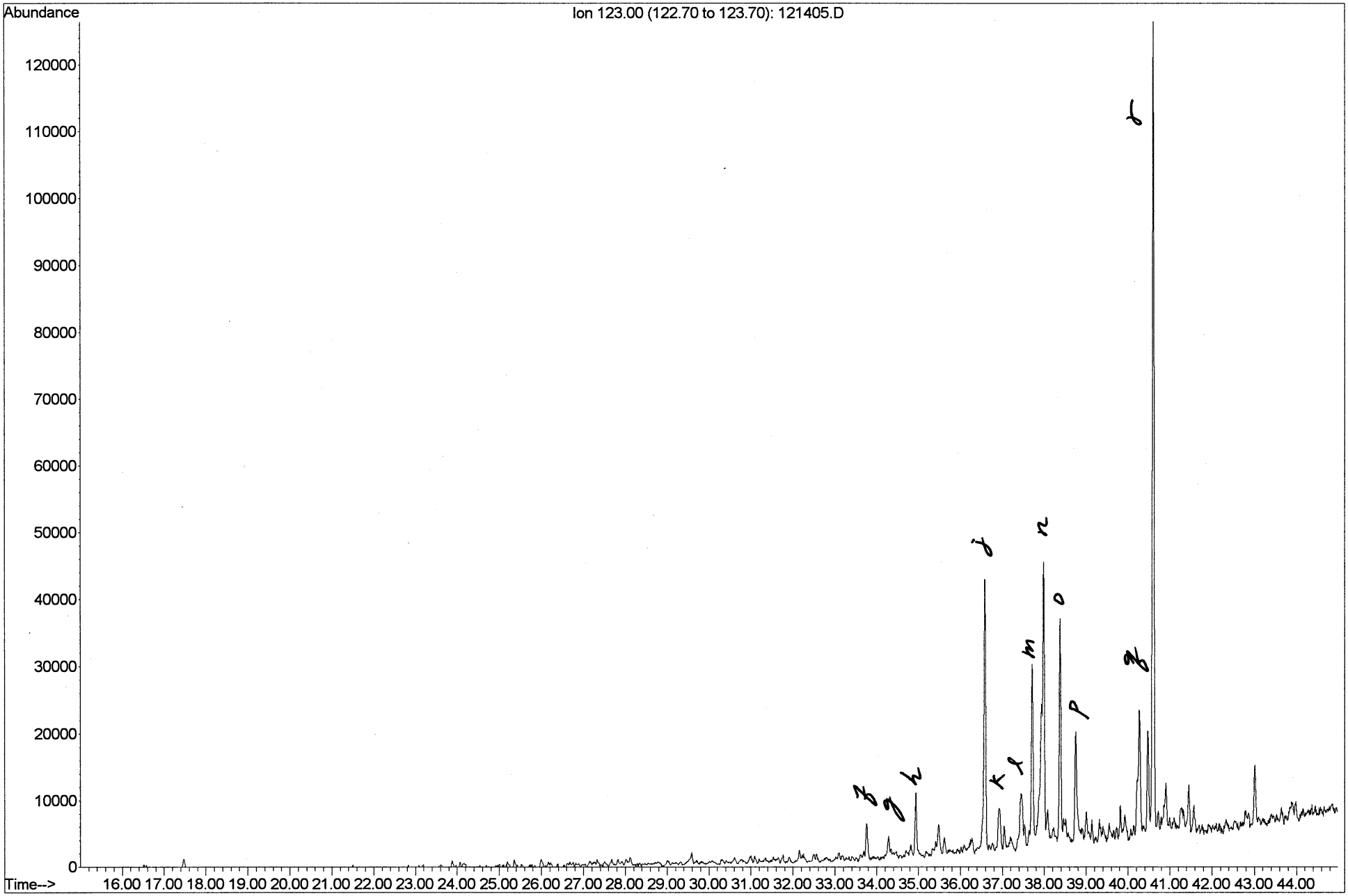
MWW8-03-NP-102601 (25787-1) Product x75
PNC



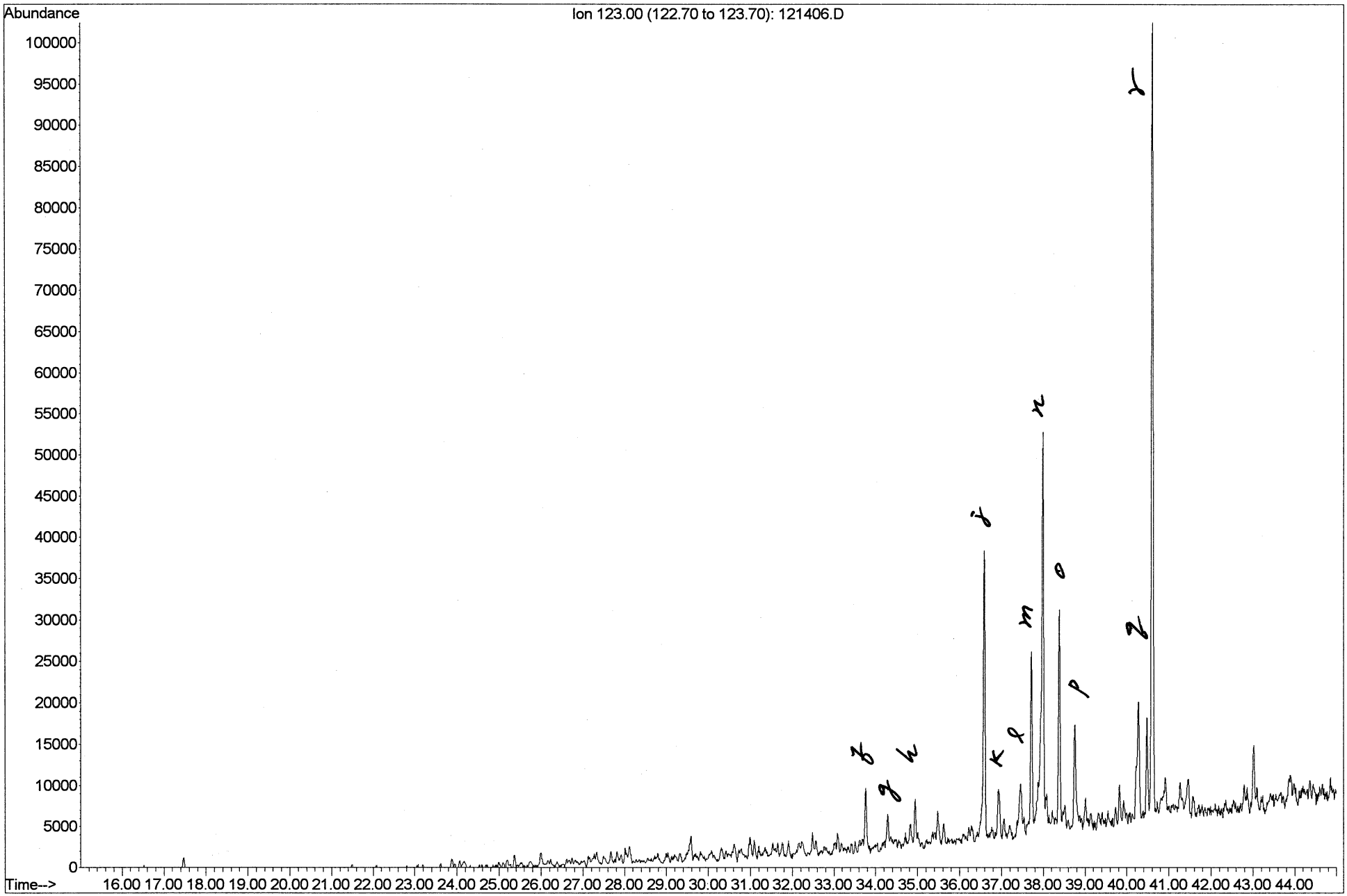
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC

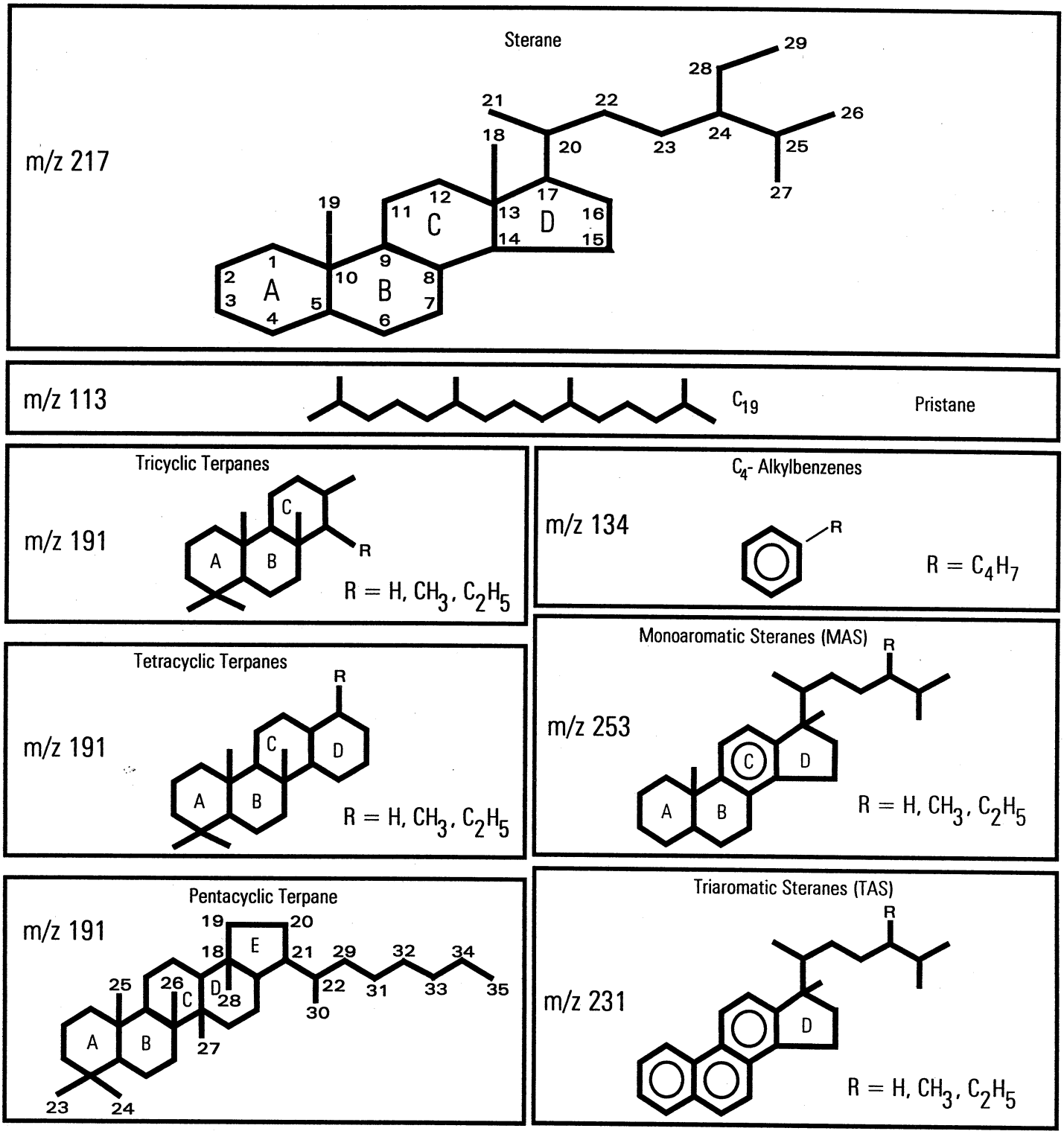


MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC





The compound structures of pristane, C_4-alkylbenzenes, sterane; terpanes; monoaromatic and triaromatic steranes

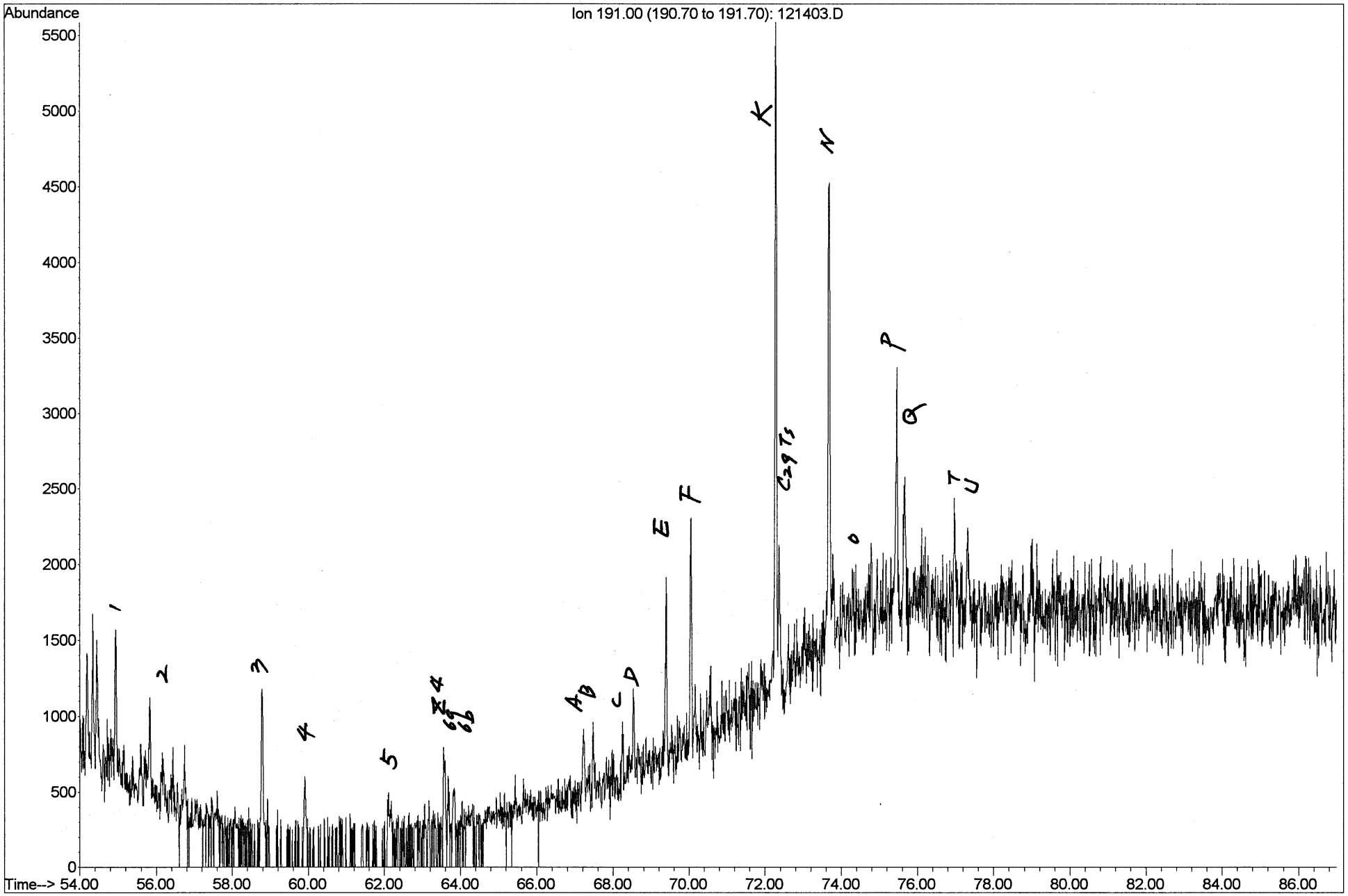
Table

ZymaX FORENSICS

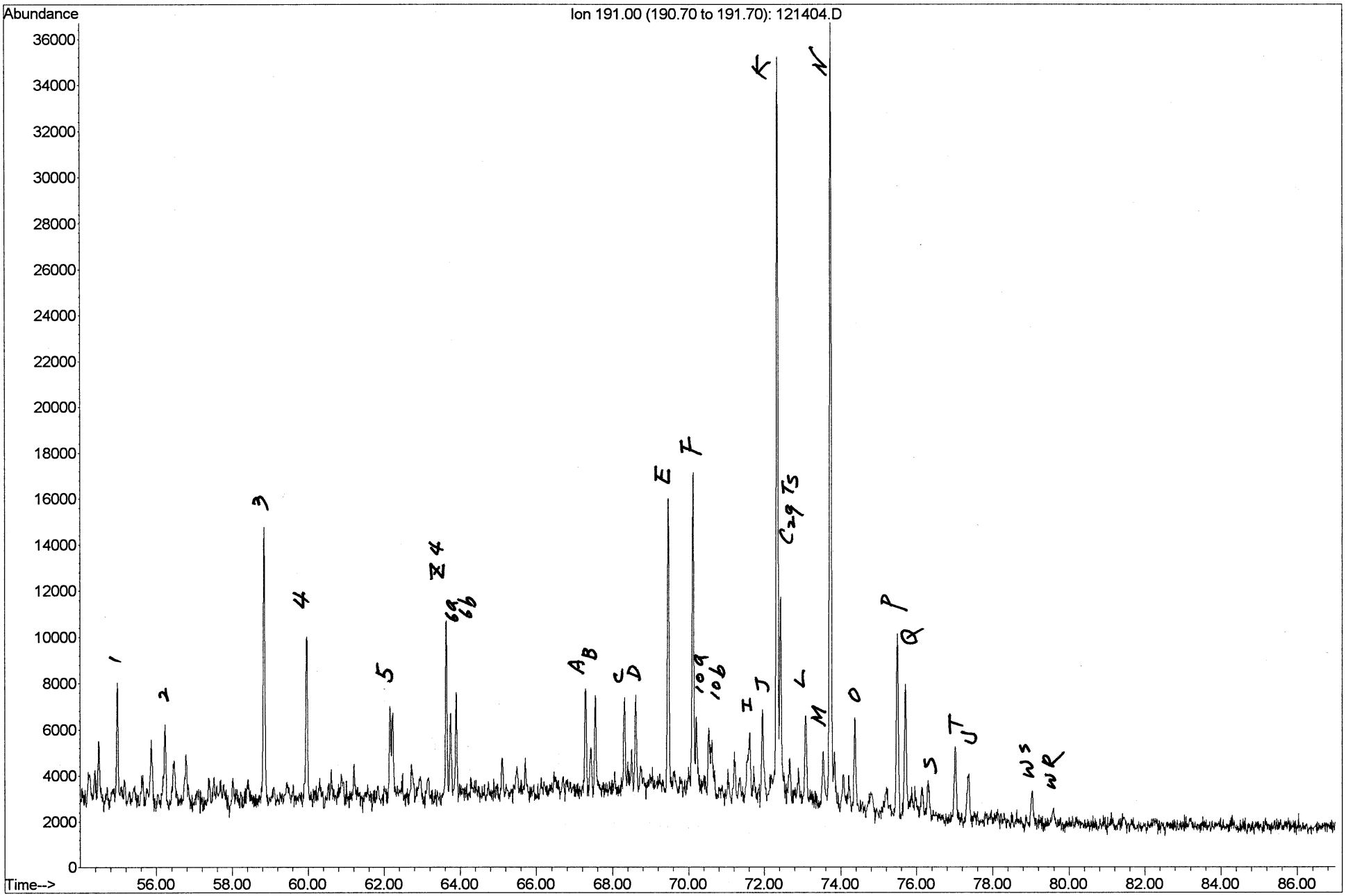
Key for Tricyclic, Tetracyclic, and Pentacyclic Terpanes Identification (m/z 191 mass chromatograms)

Code	Identity	Carbon #
0	C_{20}-Tricyclic Terpane	20
1	C_{21}-Tricyclic Terpane	21
2	C_{22}-Tricyclic Terpane	22
3	C_{23}-Tricyclic Terpane	23
4	C_{24}-Tricyclic Terpane	24
5	C_{25}-Tricyclic Terpane	25
Z4	C_{24}-Tetracyclic Terpane	24
6a	C_{26}-Tricyclic Terpane	26
6b	C_{26}-Tricyclic Terpane	26
7	C_{27}-Tricyclic Terpane	27
A	C_{28}-Tricyclic Terpane #1	28
B	C_{28}-Tricyclic Terpane #2	28
C	C_{29}-Tricyclic Terpane #1	29
D	C_{29}-Tricyclic Terpane #2	29
E	18α-22,29,30-Trisnorneohopane (Ts)	27
F	17α-22,29,30-Trisnorhopane (Tm)	27
G	17ß-22,29-30-Trisnorhopane	27
H	17α-23,28-Bisnorlupane	28
10a	C_{30}-Tricyclic Terpane #1	30
10b	C_{30}-Tricyclic Terpane #2	30
I	17α-28,30-Bisnorhopane	28
11a	C_{31}-Tricyclic Terpane #1	31
J	17α-25-Norhopane	29
11b	C_{31}-Tricyclic Terpane #2	31
K	17α,21ß-30-Norhopane	29
C_{29}Ts	18α-30-Norneohopane	29
C_{30}*	17α-Diahopane	30
L	17ß-21α-30-Normoretane	29
Ma	18α-Oleanane	30
Mb	18ß-Oleanane	30
N	17α,21ß-Hopane	30
O	17ß,21α-Moretane	30
13a	C_{33}-Tricyclic Terpane #1	33
13b	C_{33}-Tricyclic Terpane #2	33
P	22S-17α,21ß-30-Homohopane	31
Q	22R-17α,21ß-30-Homohopane	31
R	Gammacerane	30
14a	C_{34}-Tricyclic Terpane #1	34
S	17ß,21α-Homomoretane	31
14b	C_{34}-Tricyclic Terpane #2	34
T	22S-17α,21ß-30-Bishomohopane	32
U	22R-17α,21ß-30-Bishomohopane	32
15a	C_{35}-Tricyclic Terpane #1	35
15b	C_{35}-Tricyclic Terpane #2	35
V	17ß,21α-C_{32}-Bishomomoretane	32
WS	22S-17α,21ß-30,31,32-Trishomohopane	33
WR	22R-17α,21ß-30,31,32-Trishomohopane	33
16a	C_{36}-Tricyclic Terpane #1	36
16b	C_{36}-Tricyclic Terpane #2	36
XS	22S-17α,21ß-30,31,32,33-Tetrahomohopane	34
XR	22R-17α,21ß-30,31,32,33-Tetrahomohopane	34
YS	22S-17α,21ß-30,31,32,33,34-Pentahomohopane	35
YR	22R-17α,21ß-30,31,32,33,34-Pentahomohopane	35

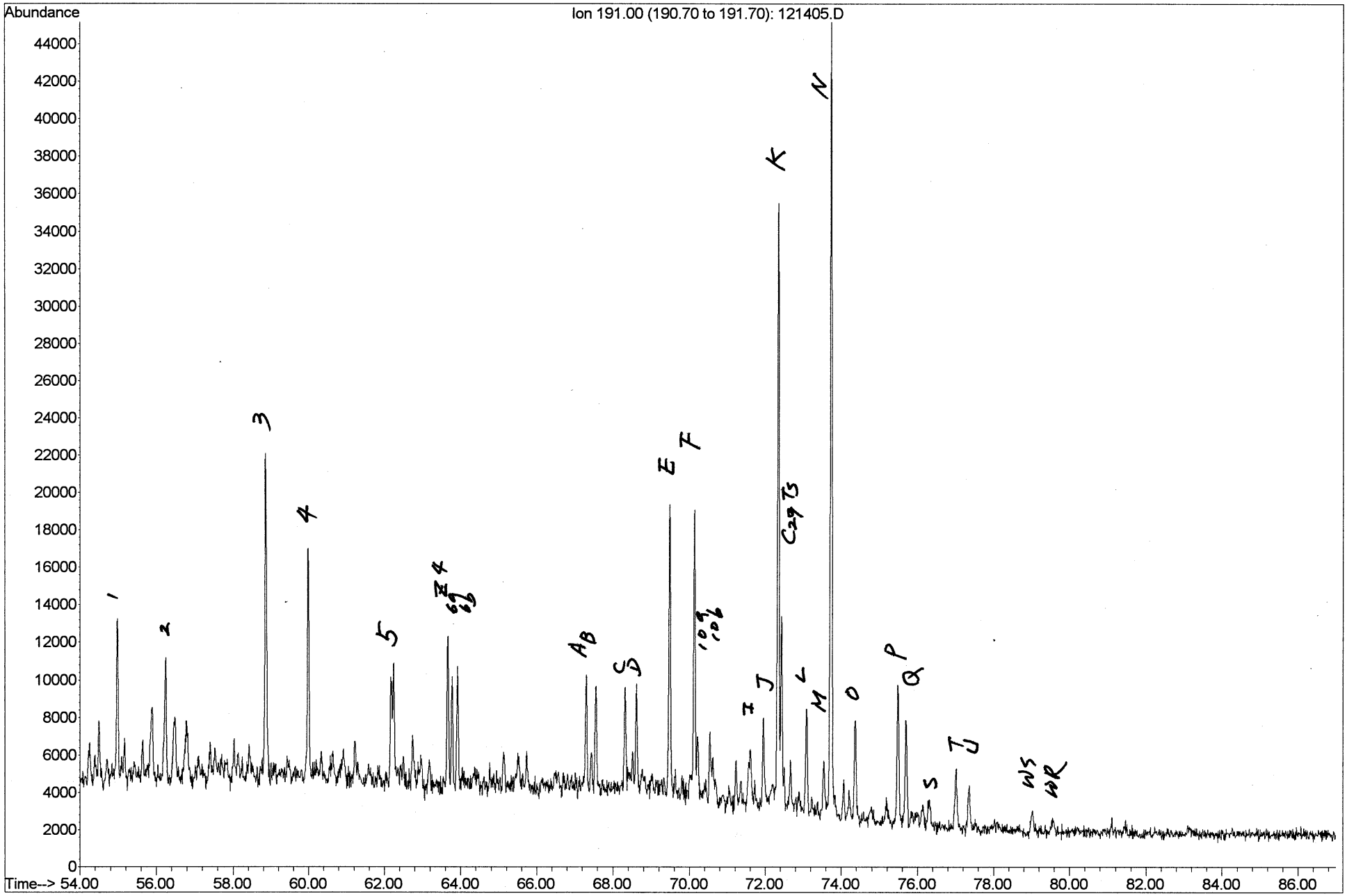
MWW8-03-NP-102601 (25787-1) Product x75
PNC



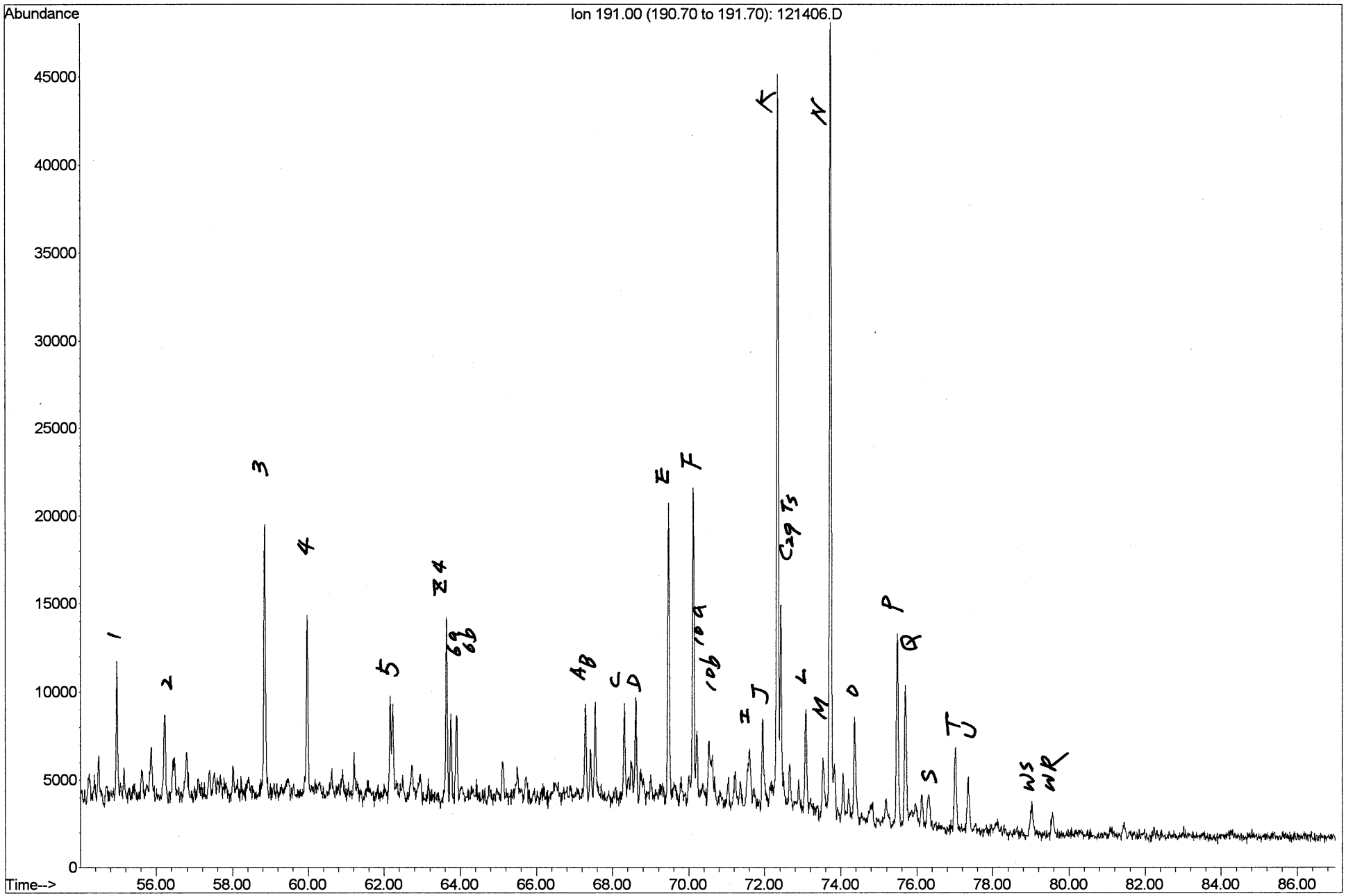
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC



MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC



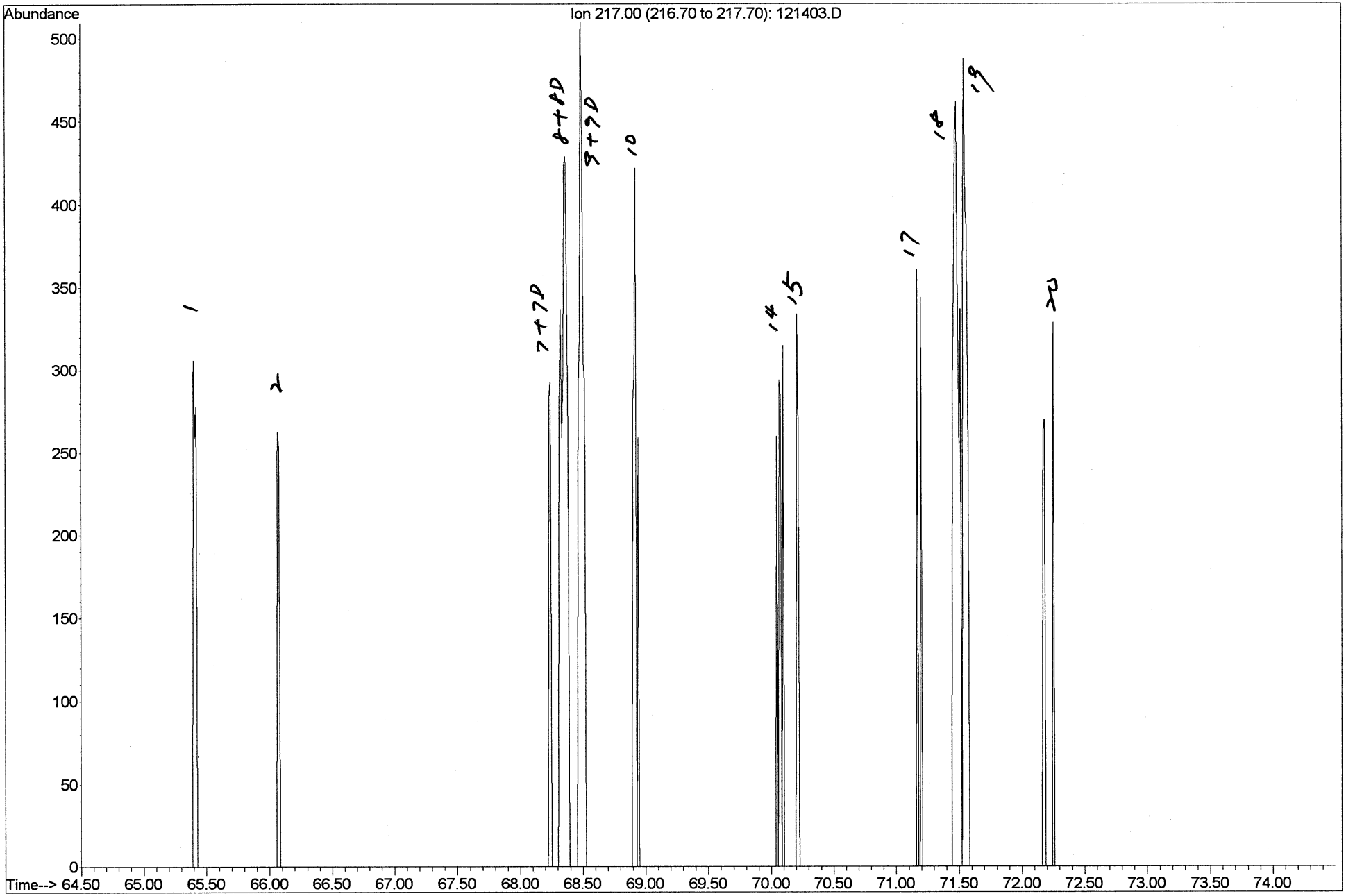
Table

ZymaX FORENSICS

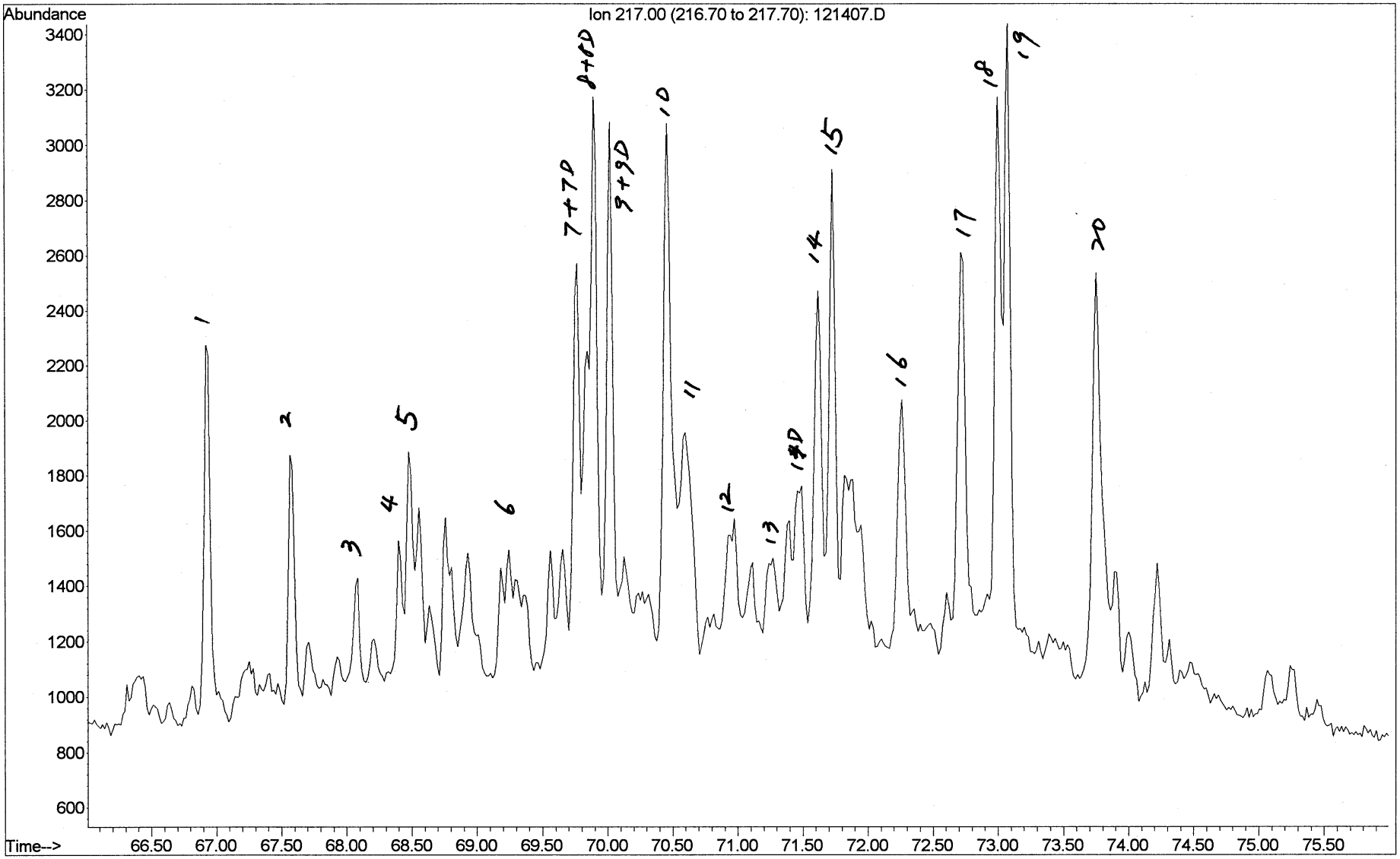
Key for Steranes Identification (m/z 217 Mass Chromatogram)

Code	Identity	Carbon #
1	13ß,17α-diacholestane (20S)	27
2	13ß,17α-diacholestane (20R)	27
3	13α,17ß-diacholestane (20S)	27
4	13α,17ß-diacholestane (20R)	27
5	24-methyl-13ß,17α-diacholestane (20S)	28
6	24-methyl-13ß,17α-diacholestane (20R)	28
7D	24-methyl-13α,17ß-diacholestane (20S)	28
7	14α,17α-cholestane (20S)	27
8D	24-ethyl-13ß,17α-diacholestane (20S)	29
8	14ß,17ß-cholestane (20R)	27
9	14ß,17ß-cholestane (20S)	27
9D	24-methyl-13α,17ß-diacholestane (20R)	28
10	14α,17α-cholestane (20R)	27
11	24-ethyl-13ß,17α-diacholestane (20R)	29
12	24-ethyl-13α,17ß-diacholestane (20S)	29
13	24-methyl-14α,17α-cholestane (20S)	28
14D	24-ethyl-13α,17ß-diacholestane (20R)	29
14	24-methyl-14ß,17ß-cholestane (20R)	28
15	24-methyl-14ß,17ß-cholestane (20S)	28
16	24-methyl-14α,17α-cholestane (20R)	28
17	24-ethyl-14α-cholestane (20S)	29
18	24-ethyl-14ß,17ß-cholestane (20R)	29
19	24-ethyl-14ß,17ß-cholestane (20S)	29
20	24-ethyl-14α,17α-cholestane (20R)	29
21A	24-n-Propylcholestane (20S)	30
21B	4-methyl-24-ethylcholestane (20S)	30
22A	4α-methyl-24-ethyl-14β,17β-cholestane(20S)	30
22B	24-n-propyl-14β,17β-cholestane (20S)	30
23A	4α-methyl-24-ethyl-14β,17β-cholestane(20R)	30
23B	24-n-propyl-14β,17β-cholestane (20R)	30
24A	4α-methyl-24-ethylcholestane(20R)	30
24B	24-n-propylcholestane (20R)	30

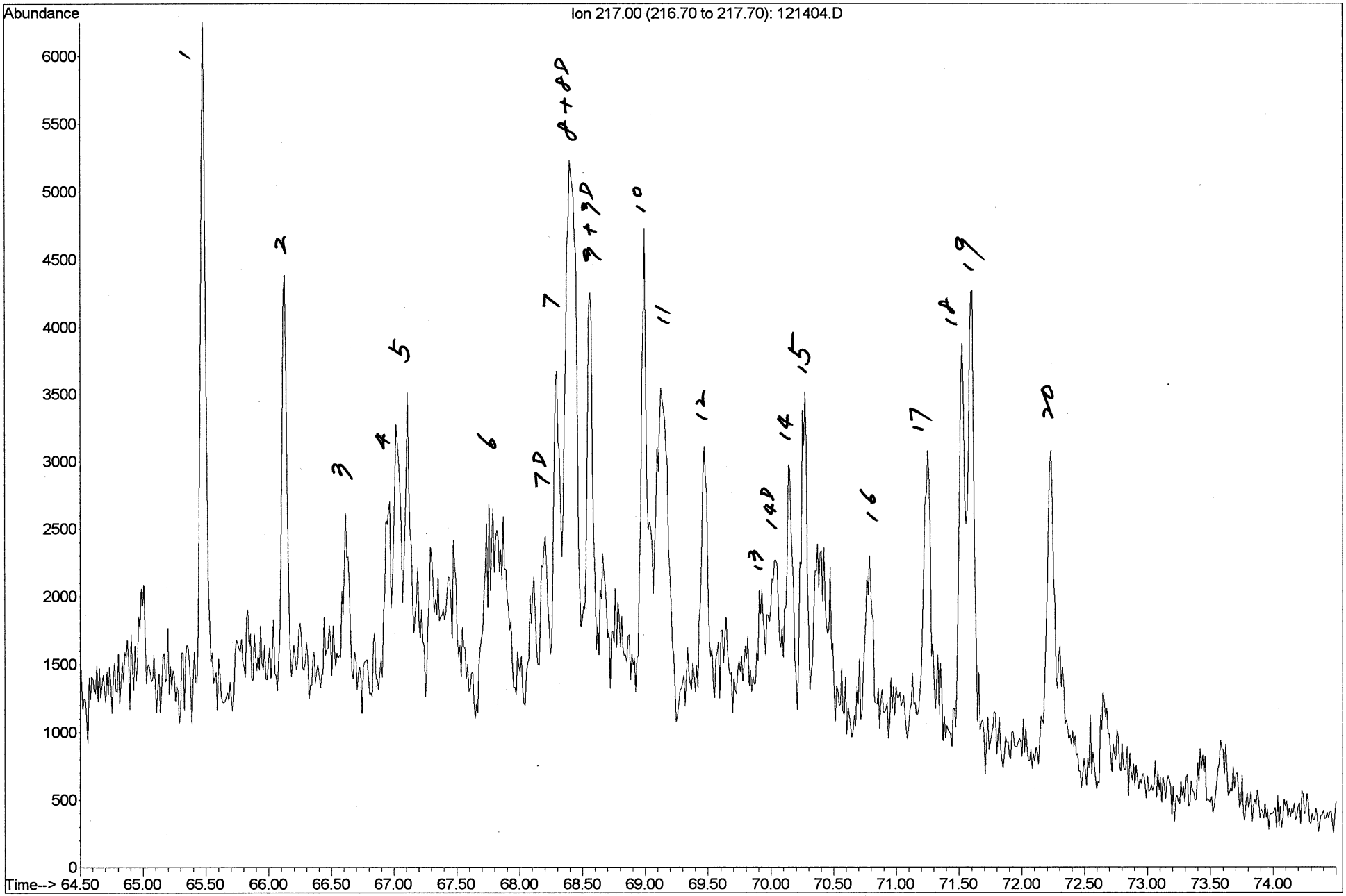
MWW8-03-NP-102601 (25787-1) Product x75
PNC



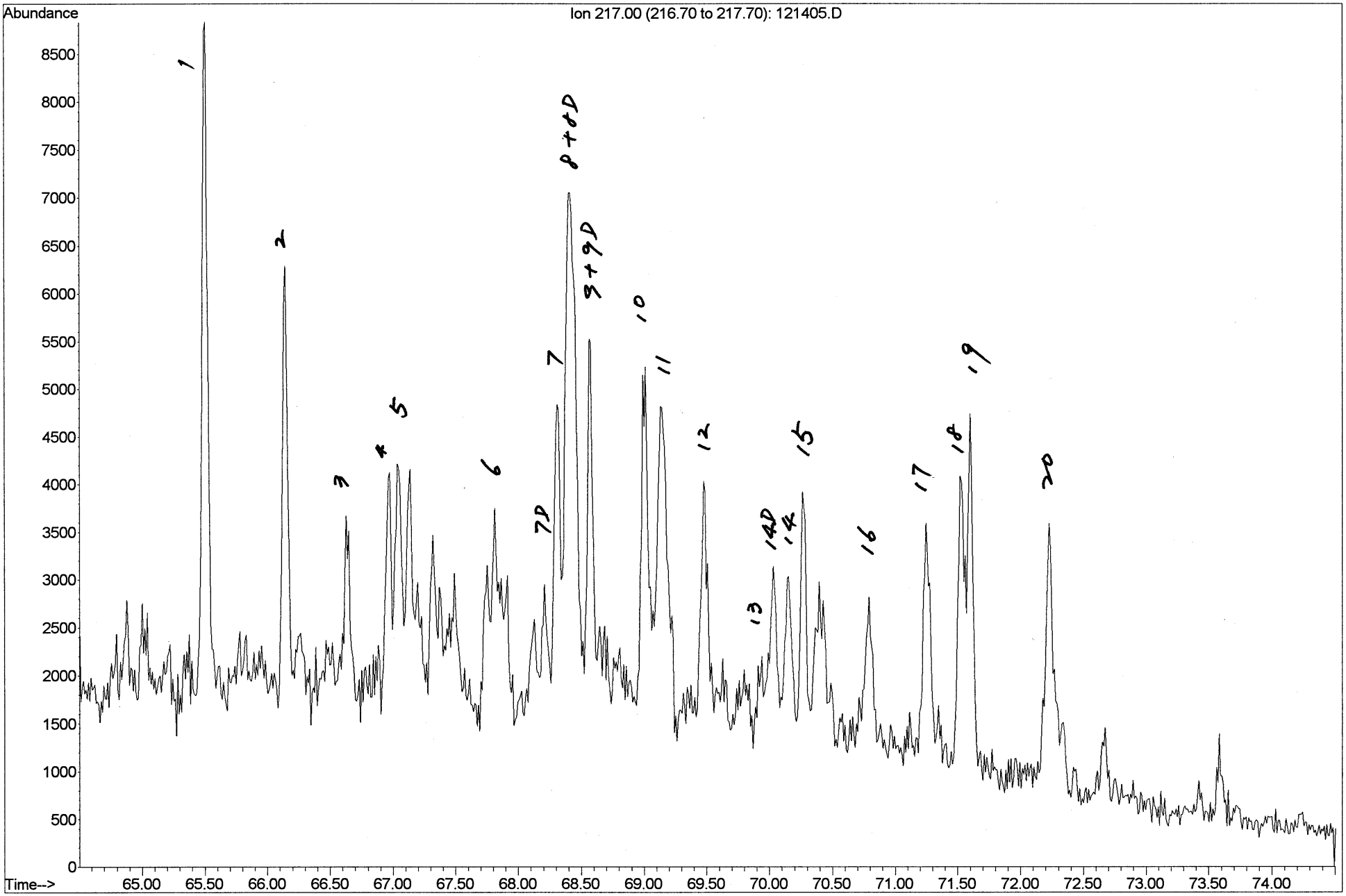
Sample Name: MWW8-03-NP-102601 (25787-1) Product x75
Misc Info : PNC



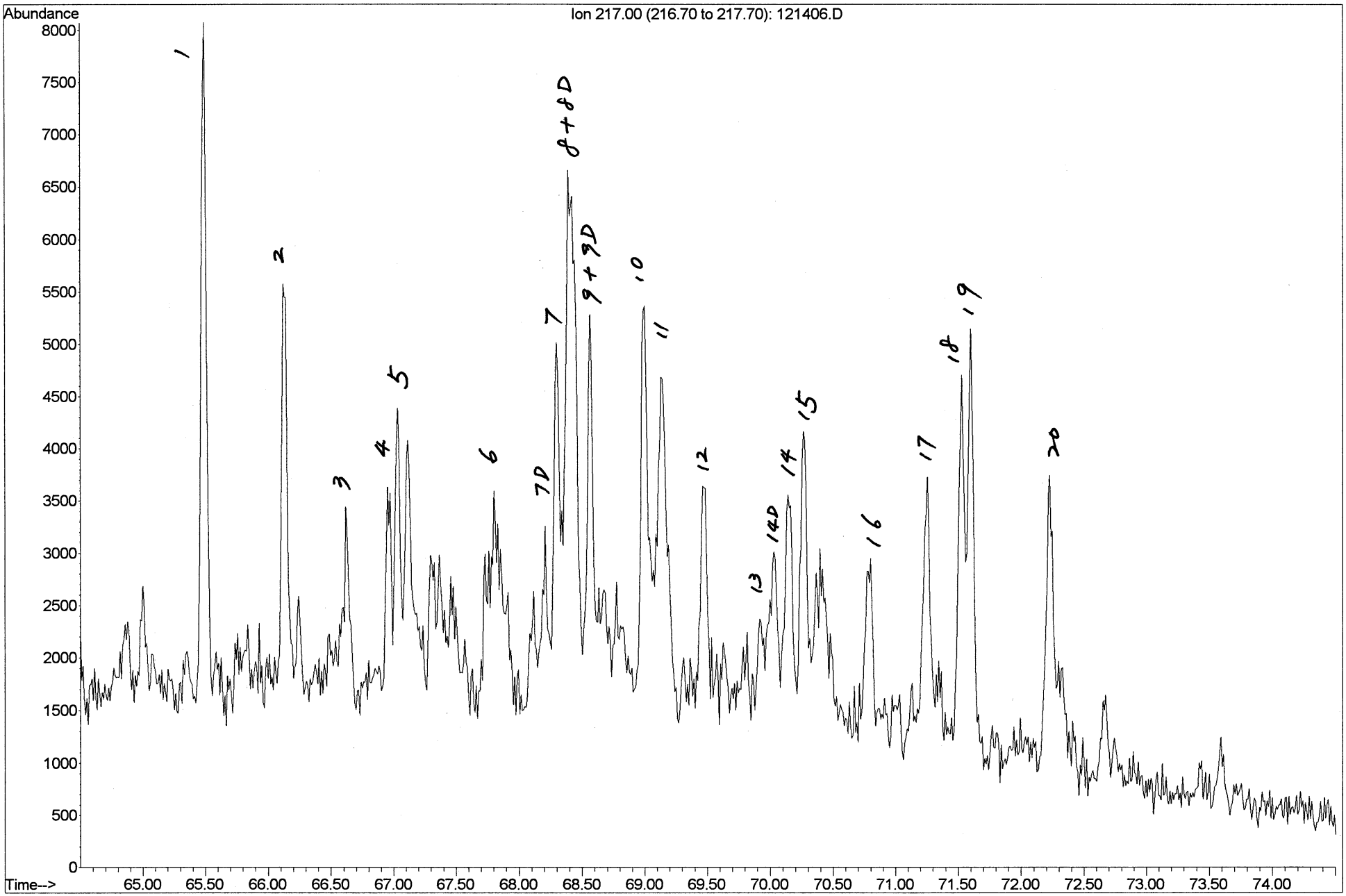
MWW10-01-NP-102601 (25787-2) Product(Ali+Aro)
PNC



MW36-99-NP-111201 (25787-3) Product(Ali+Aro)
PNC



MW24-99-NP-111201 (25787-4) Product(Ali+Aro)
PNC



Table

Key for Aromatic Compounds Identification in Bar Diagram

AB:	C_3-C_6 Alkylbenzenes
NAPH:	C_0-C_4 Naphthalenes
FL:	C_0-C_4 Fluorenes
BP:	C_0-C_2 BP Biphenyl/Dibenzofuran
PHEN:	C_0-C_4 Phenanthrenes
PY:	C_0-C_4 Pyrenes/Fluoranthenes
CHR:	C_0-C_4 Chrysenes
BT:	C_1-C_5 Benzothiophenes
DBT:	C_0-C_4 Dibenzothiophenes
NBT:	C_0-C_4 Naphthobenzothiophenes
MAS:	Monoaromatic Steranes
TAS:	Triaromatic Steranes

Table

ZymaX FORENSICS

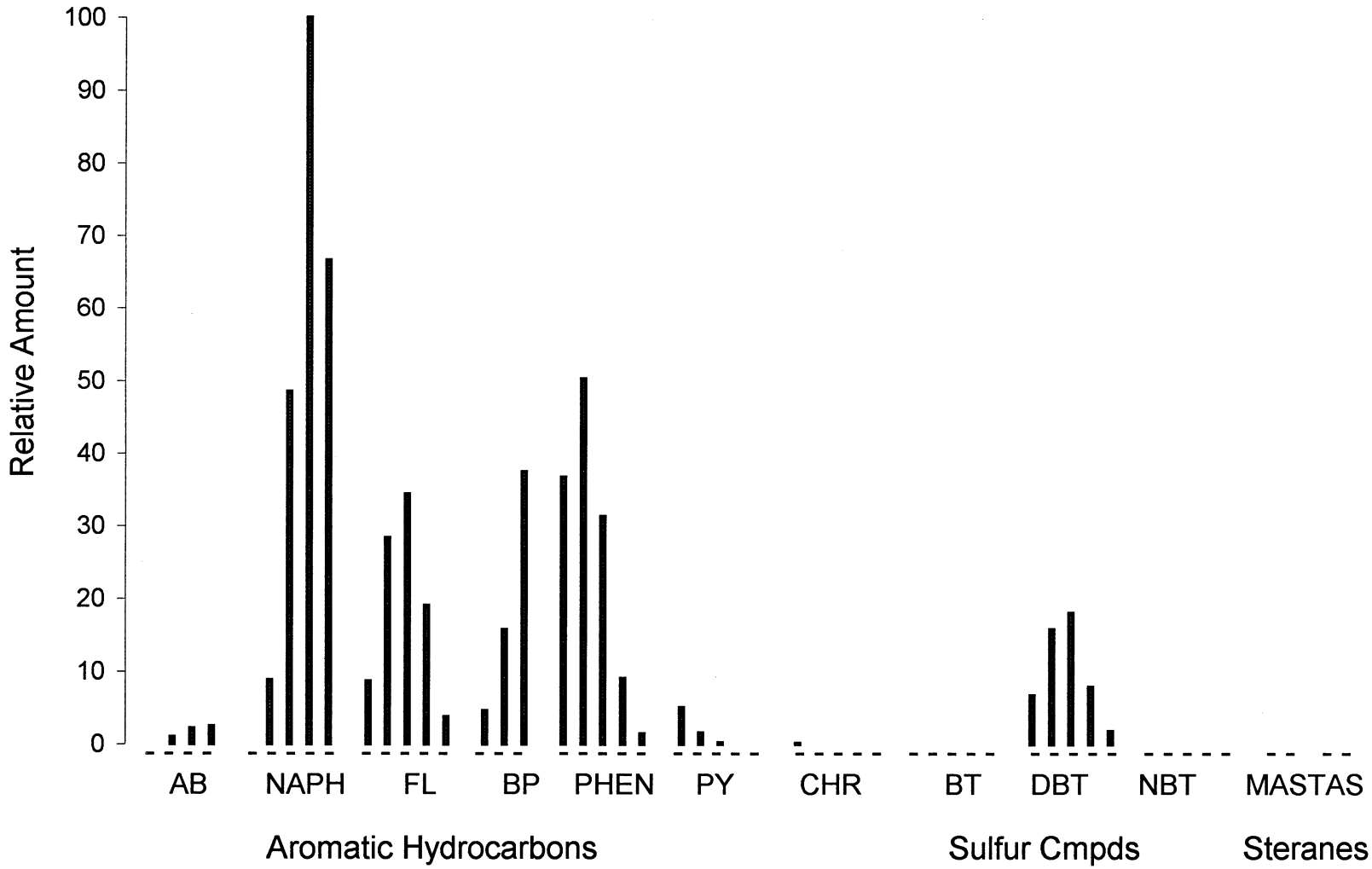
Key for Identifying Aromatic Hydrocarbons at Various m/z Units

No.	m/z	Compound
1	120	C_3-alkylbenzenes
2	134	C_4-alkylbenzenes
3	148	C_5-alkylbenzenes
4	162	C_6-alkylbenzenes
5	128	C_0-naphthalene
6	142	C_1-naphthalenes
7	156	C_2-naphthalenes
8	170	C_3-naphthalenes
9	184	C_4-naphthalenes
10	166	C_0-fluorene
11	180	C_1-fluorenes
12	194	C_2-fluorenes
13	208	C_3-fluorenes
14	222	C_4-fluorenes
15	154	C_0-biphenyl
16	168	C_1-biphenyls + dibenzofuran
17	182	C_2-biphenyls + C_1-dibenzofuran
18	178	C_0-phenanthrene
19	192	C_1-phenanthrenes
20	206	C_2-phenanthrenes
21	220	C_3-phenanthrenes
22	234	C_4-phenanthrenes
23	202	C_0-pyrene/fluoranthene
24	216	C_1-pyrenes/fluoranthenes
25	230	C_2-pyrenes/fluoranthenes
26	244	C_3-pyrenes/fluoranthenes
27	258	C_4-pyrenes/fluoranthenes
28	228	C_0-chrysene
29	242	C_1-chrysenes
30	256	C_2-chrysenes
31	270	C_3-chrysenes
32	284	C_4-chrysenes
33	148	C_1-benzothiophenes
34	162	C_2-benzothiophenes
35	176	C_3-benzothiophenes
36	190	C_4-benzothiophenes
37	204	C_5-benzothiophenes
28	184	C_0-dibenzothiophene
39	198	C_1-dibenzothiophenes
40	212	C_2-dibenzothiophenes
41	226	C_3-dibenzothiophenes
42	240	C_4-dibenzothiophenes
43	234	C_0-naphthobenzothiophene
44	248	C_1-naphthobenzothiophenes
45	262	C_2-naphthobenzothiophenes
46	276	C_3-naphthobenzothiophenes
47	290	C_4-naphthobenzothiophenes
48	253	Monoaromatic steranes
49	267	Monoaromatic steranes
50	239	Monoaromatic steranes
51	231	Triaromatic steranes
52	245	Triaromatic steranes

ZymaX FORENSICS

Aromatic Hydrocarbon Distribution

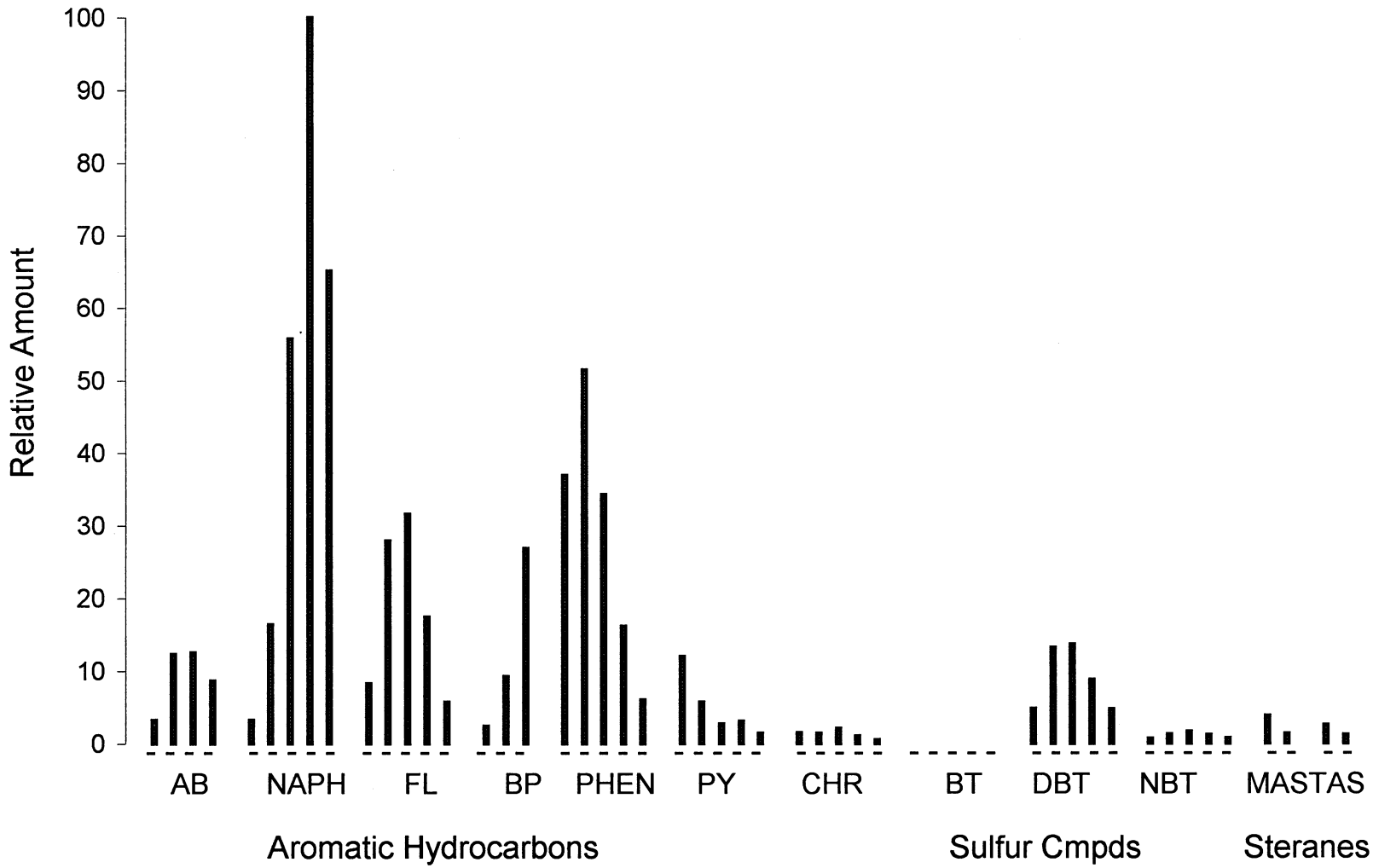
MWW8-03-NP-102601



ZymaX FORENSICS

Aromatic Hydrocarbon Distribution

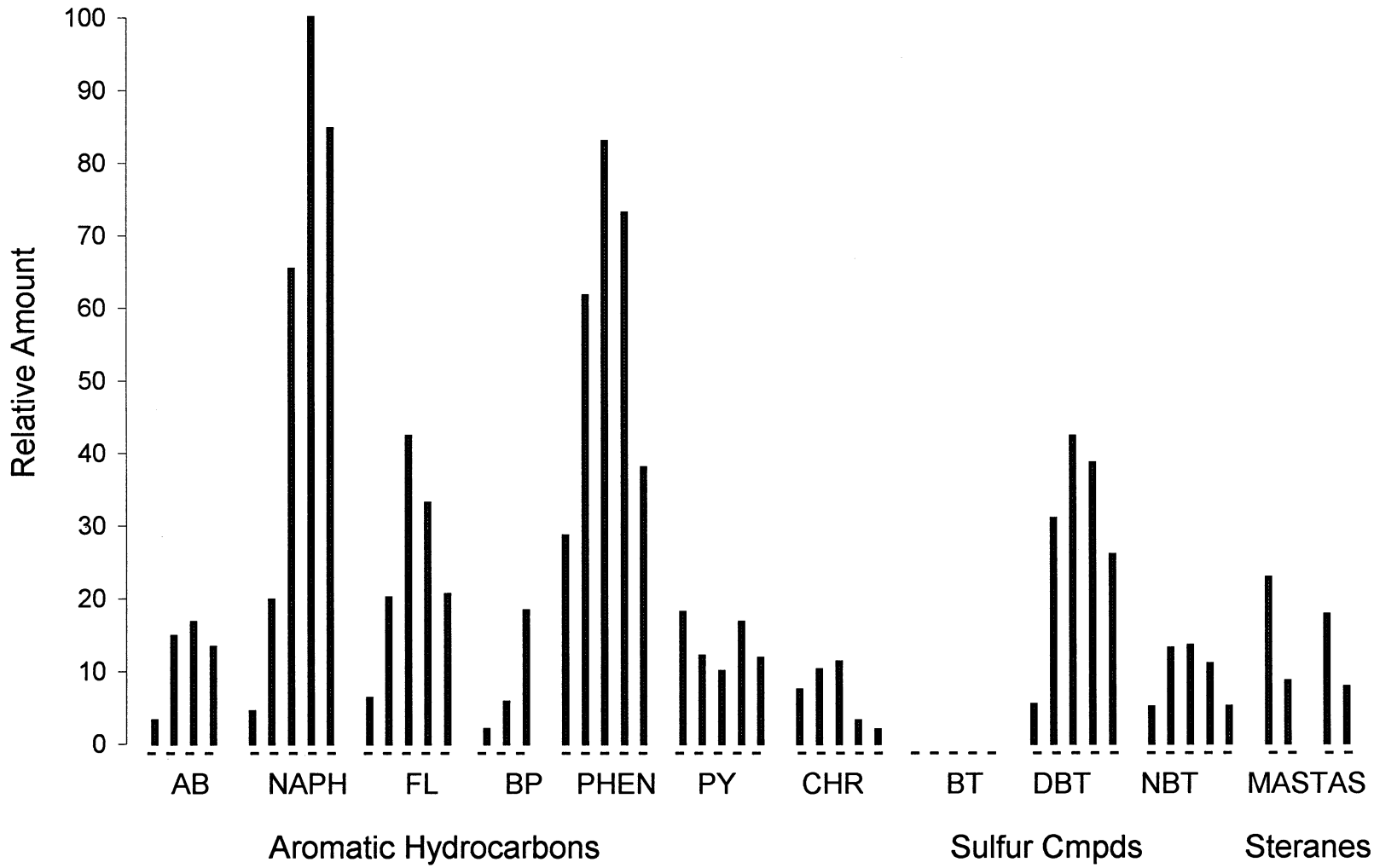
MWW10-01-NP-102601



ZymaX FORENSICS

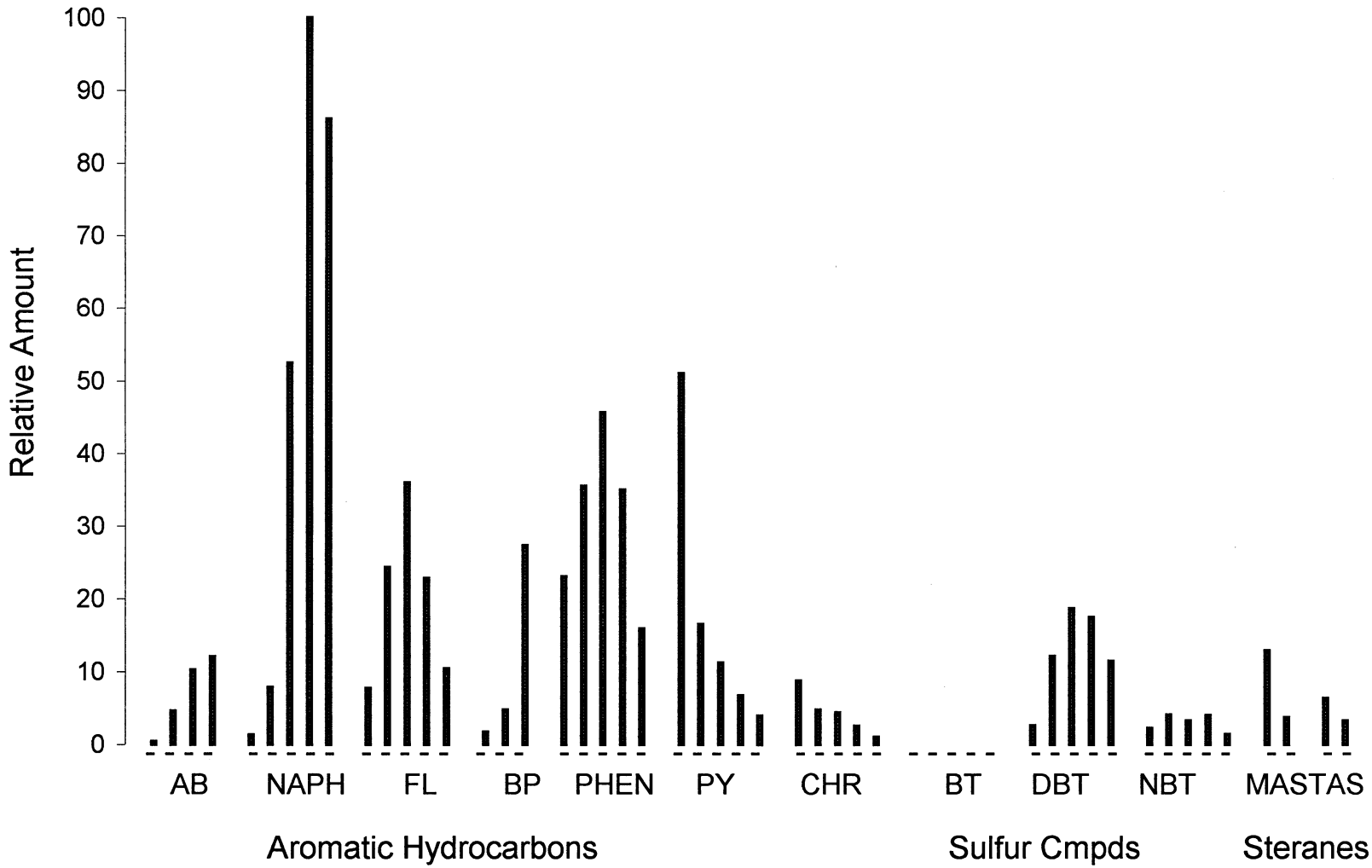
Aromatic Hydrocarbon Distribution

MW36-99-NP-111201



Aromatic Hydrocarbon Distribution

MW24-99-NP-111201



ZymaX

71 Zaca Lane San Luis Obispo CA 93401 tel 805.544.4696 fax 805.544.8226

CHAIN of CUSTODY

report to Colleen Carter	phone 734-668-1133	fax 734-668 1538
company BBL	project @ PNC	
address 455 E. Eisenhower P'way Ann Arbor, MI 48108	project # 64411	
	sampler	

ANALYSIS REQUESTED

Simulated Distillation

Turnaround Time

ASAP ☐ 48 hr ☐ 12 hr ☐ 72 hr ☐ 24 hr ☐ std ☒

ZymaX use only	SAMPLE DESCRIPTION	Date Sampled	Time	Matrix	Preserve	✓	# of containers	Remarks
25787-1	MWW8-03-NP-102601	10/26/01	1300	NAPL	—	✓		
-2	MWW10-01-NP-~~111601~~ 102601	10/26/01	1310			✓		
-3	MW36-99-NP-111201	11/12/01	0900			✓		
-4	MW24-99-NP-111201	11/12/01	0930	↓	—	✓		

Comments

Relinquished by:
Signature
Print John McKenna
Company BBL
Date ____ Time ____

Received by:
Signature
Print
Company
Date ____ Time ____

Sample integrity upon receipt:
Samples received intact ✓
Samples received cold
Custody seals
Correct container types ✓

Bill 3rd Party:

PO# ____
Quote yes no

Relinquished by:
Signature
Print
Company
Date ____ Time ____

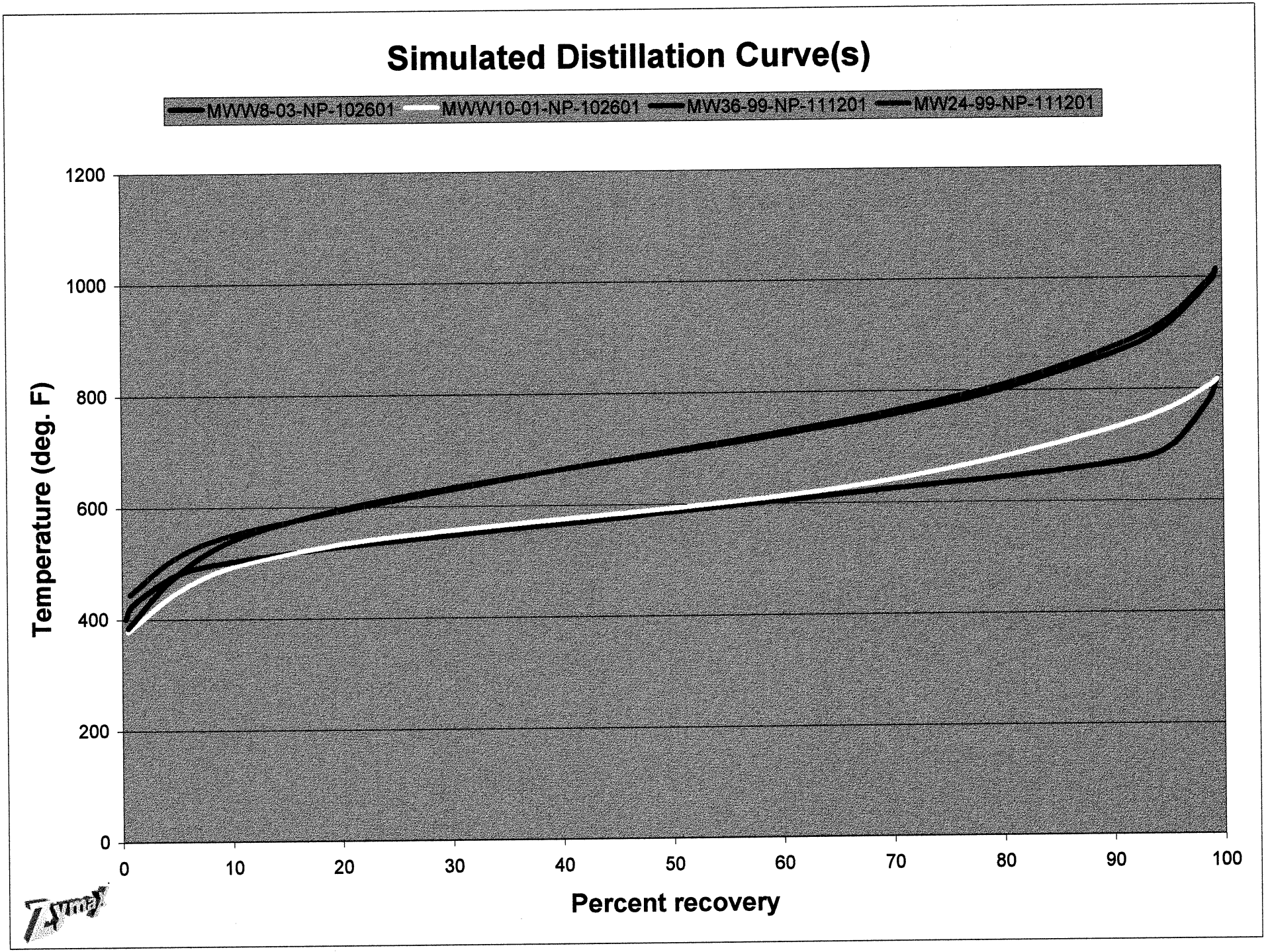
Received by ZymaX envirotechnology inc:
Signature A Branham
Print Amy Branham
Company ZymaX
Date 11-16-01 Time 1100

email: zymax@ZymaXusa.com

Page 1 of 1

NOV 12 2001 10:20 HP LASERJET 3200 P.2

Simulated Distillation Curve(s)



ZymaX

71 Zaca Lane San Luis Obispo CA 93401 tel 805.544.4696 fax 805.544.8226

CHAIN of CUSTODY

report to Colleen Cantor | phone 734-668-1133 | fax 734-668 1538

company BBL | project @ PNC

address 455 E. Eisenhower P'way, Ann Arbor, MI 48108 | project # 64411

sampler [signature]

ANALYSIS REQUESTED: Simulated Distillation

Turnaround Time: ASAP ☐ 48 hr ☐ 12 hr ☐ 72 hr ☐ 24 hr ☐ std ☒

ZymaX #	SAMPLE DESCRIPTION	Date Sampled	Time	Matrix	Preserve	Simulated Distillation	# of containers	Remarks
23782-1	MWW8-03-NP-102601	10/26/01	1300	NAPL	—	✓		
-2	MWW10-01-NP-102601 ~~111201~~	10/26/01	1310	↓	—	✓		
-3	MW36-99-NP-111201	11/12/01	0900	↓	—	✓		
-4	MW24-99-NP-111201	11/12/01	0930	↓	—	✓		

Comments

Relinquished by:
Signature [signature]
Print John McKenna
Company BBL
Date _____ Time _____

Received by:
Signature _____
Print _____
Company _____
Date _____ Time _____

Sample integrity upon receipt:
Samples received intact ☑
Samples received cold ☐
Custody seals ☐
Correct container types ☑

Bill 3rd Party:

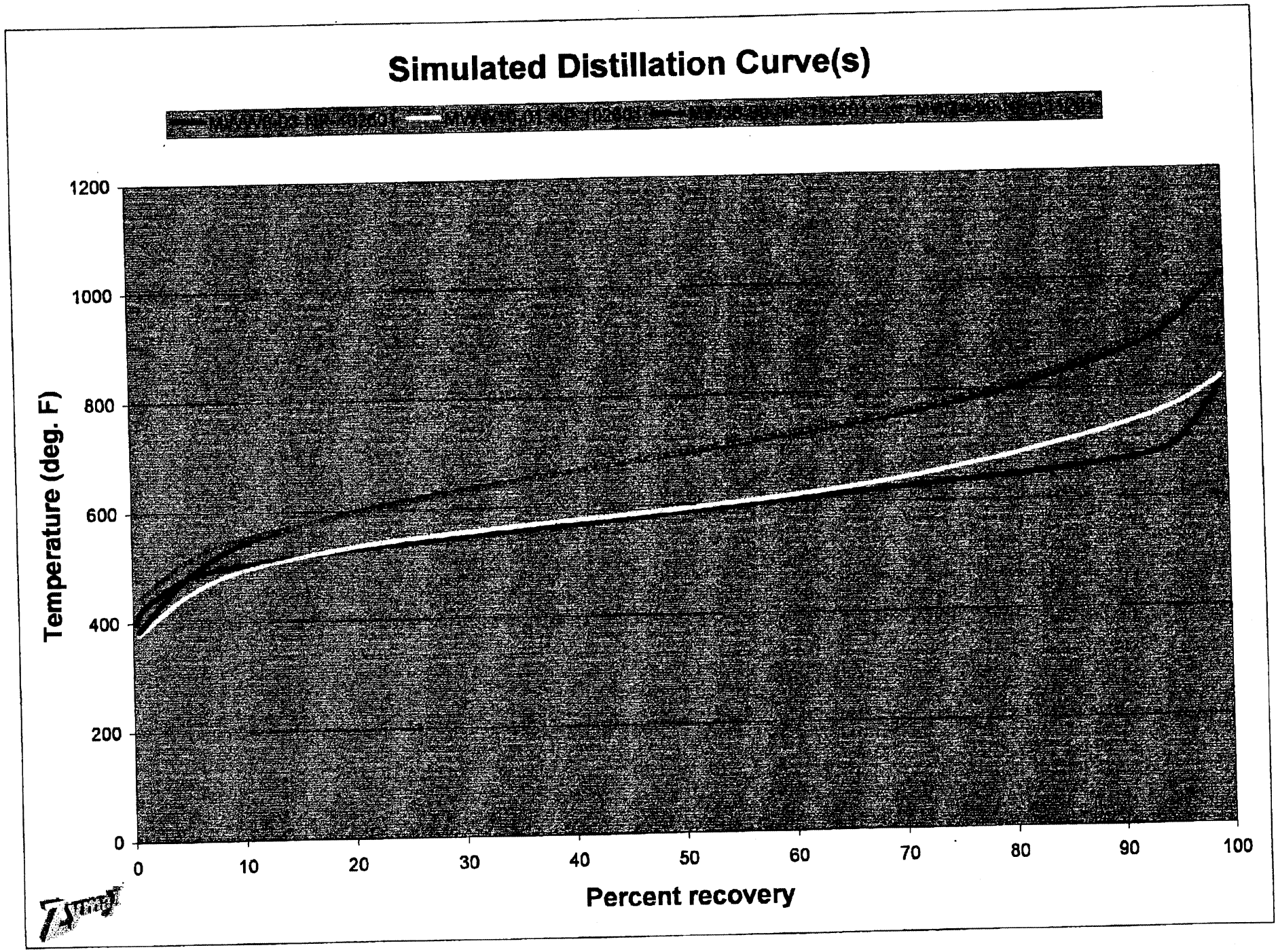
PO# _____
Quote yes no

Relinquished by:
Signature _____
Print _____
Company _____
Date _____ Time _____

Received by ZymaX environtechnology inc:
Signature [signature]
Print Amy Branham
Company ZymaX
Date 11-16-01 Time 1100

email: zymax@ZymaXusa.com

DEC 11 2001 12:02PM HP LASERJET 3200


Simulated Distillation Curve(s)
Temperature (deg. F)
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Percent recovery

ZymaX FORENSICS and envirotechnology

FAX

Fax Number:	734.668.1538
Company:	BBL
Attention:	Colleen Carter
Date:	10/18/2001
From:	Alan Jeffrey
Number of Pages: *(excluding cover sheet)*	4

Additional Comments: Proposal attached

ZymaX
71 Zaca Lane
San Luis Obispo CA 93401
phone: 805.544.4696
fax: 805.544.8226
email: zymax@ZymaXusa.com

ZymaX FORENSICS

PROPOSAL

10/18/2001

BBL
Attn: Colleen Carter
455 E. Eisenhower Pwy, Ste 260
Ann Arbor, MI 48108
vox: 734.668.1133
fax: 734.668.1538

Project: LNAPL

Based on the information provided, the data from the following analytical scheme may help to characterize spilled products and determine the approximate exposure time. If an interpretive report is required, the information in the attached questionnaire will allow us to make a more meaningful interpretation.

cost/sample ***Product Samples*** **2 x 40ml VOA (unpreserved)/sample**

Fuel Screen

$125 **Simulated Distillation**
Helps determine amounts of different fuel types present in the product sample. Artificial mixtures are analyzed under consistent conditions to confirm the estimated composition.

Volatile Fuel Characterization **(If identified in fuel screen]**

$160 **$C_3$-$C_{10}$ gasoline-range hydrocarbons by High Res GC/MS**
Provides a hydrocarbon fingerprint which can be used to correlate gasoline samples. Degredation ratios provide information on the age of the product.

$150 **edb and Organic Lead Speciation by GC/ECD**
Ratios of lead compounds can be used to identify and estimate the age of a leaded gasoline.

$80 **BTEX Analysis of Volatile Organics**
GC/MS analysis by EPA Method 8260 of benzene, toluene, ethylbenzene, and xylenes. Ratios of these compounds can be used to identify gasoline and estimate the length of time a gasoline has been in the environment.

$150 **Oxygenated Blending Agents**
MTBE, DIPE, ETBE, TAME, TBA
Identifies oxygenated additives in gasoline. Data provides information on age of unleaded gasoline.

Higher Fuel Characterization

$400 **GC/MS Full Scan**
Identifies kerosine and higher hydrocarbon fuel types by utilizing the distribution of alkanes, alkylbenzenes, PAHs, and polycyclic biomarkers

$75 **Column Cleanup**
May be required to clean up contaminated samples for GC/MS analysis

We require the following acceptance form to be signed before we can proceed.

These prices reflect a discount for 5 or more samples

Interpretative Reports and Consulting are charged at $250/hr.

Terms and Conditions:

- Individual projects are payable in advance or with approved credit terms
- Approved credit accounts will be charged 1.5 % on unpaid invoices past due date
- Long term projects are billed monthly (progressive billing)
- Cooler return is charged at $15 per shipment
- Change orders to chain-of-custody will include $25 fee per event
- Courier and delivery service will be billed to the client
- Rush delivery of sampling supplies charged at cost + $25 handling fee
- Samples logged in and subsequently canceled, are subject to a storage charge of $1.00 per day
- Sample Disposal Fee is charged at $5.00 per sample
- Normal turnaround time is approximately two weeks/4 weeks for isotopes
- Prices are subject to change without notice, except as provided in current quotations or contracts
- This quote is valid for 90 days.

Please ship samples to:
ZymaX FORENSICS
71 Zaca Lane
San Luis Obispo, CA 93401

ACCEPTANCE OF THIS QUOTATION INCLUDES ACCEPTANCE OF AND GOVERNANCE BY THESE TERMS AND CONDITIONS AS STATED ABOVE.

_____
Signature

_____
Title

_____
Date

16921 Parthenia Street Ste. 201 • North Hills CA 91343 • fax 818.893.8940 • vox 818.893.4103
laboratory: 71 Zaca Lane • San Luis Obispo CA 93401 • fax 805.544.8226 • vox 805.544.4696
email: forensics@ZymaXusa.com

INTERPRETIVE REPORT QUESTIONNAIRE

ZymaX FORENSICS

Client: _____ **Project:** _____

Name of Person Completing Questionnaire: _____

INTERPRETIVE REPORT REQUIRED? ☐ **Yes** ☐ **No**

Specific site information is required to interpret the analytical data of the samples submitted to ZymaX FORENSICS. Please provide the following information:

1. **OBJECTIVES OF THE INTERPRETIVE ANALYSIS:**
   - ☐ Characterize product
   - ☐ Age date product: ☐ gasoline ☐ diesel ☐ other (specify) _____
   - ☐ Compare products from different locations
   - ☐ Other objectives (specify) _____

2. Please provide a site map, if available, with locations of any monitoring wells, as well as the location of storage tanks or pipes which may have been sources of the product release.

3. Describe other relevant details of the environmental setting of the sample: _____

4. Describe the site lithology (mineral type, particle size, etc.) or provide soil boring logs: _____

5. Has the site been remediated or is it being remediated?
   ☐ Yes ☐ No

6. Are historic test results available?
   ☐ Yes ☐ No If yes, please provide.

www.ZymaXforensics.com

16921 Parthenia Street Ste. 201 • North Hills CA 91343 • fax 818.893.8940 • vox 818.893.4103
laboratory: 71 Zaca Lane • San Luis Obispo CA 93401 • fax 805.544.8226 • vox 805.544.4696
email: forensics@ZymaXusa.com

7. **PRODUCT SAMPLE:** Please answer the following questions.

- How thick is the plume (layer)? _____
- How much area does the plume cover? _____
- Was the well purged prior to collection of the sample?
  ☐ Yes ☐ No
- When was it last purged prior to sample collection? _____
- What do you suspect to be the composition of the plume? _____
  _____
  _____
  _____
- If the plume is over 1 foot thick, where was the sample collected:
  ☐ top boundary
  ☐ middle boundary
  ☐ lower boundary

8. **WATER OR SOIL SAMPLE:** Please answer the following questions.

- What is the porosity of the soil where the sample was taken?
  _____
- What is the lithology of the soil hosting the contaminants?
  _____
  _____
  _____
- What was the temperature of the soil or water at site? _____
- At what depth was the sample taken? _____
- What is the depth to groundwater? _____
- How much does the water level fluctuate annually? _____
  _____
- Is the groundwater:
  ☐ Oxidizing ☐ Reducing (stagnant)
- Is there any floating product or sheen on the surface of the water?
  ☐ Yes ☐ No
- What is the annual rainfall in the area? _____
- What is the groundwater gradient? _____
- What direction is the groundwater flow (and flow rate, if known)?
  _____
- Are there non-porous confining layers acting as aquitards?
  ☐ Yes ☐ No

ZymaX FORENSICS and enviroTechnology

FAX

Fax Number: (248) 377-9413

Company: BBL

Attention: Colleen Carter

Date: 12/11/01

From: Jamie Town

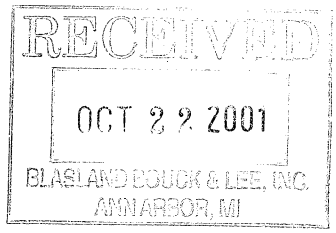
Number of Pages: 2
(excluding cover sheet)

Additional Comments: Results follow.

ZymaX
71 Zaca Lane
San Luis Obispo CA 93401
phone: 805.544.4696
fax: 805.544.8226
email: zymax@ZymaXusa.com

ZymaX FORENSICS

PROPOSAL



10/18/2001

BBL
Attn: Colleen Carter
455 E. Eisenhower Pwy, Ste 260
Ann Arbor, MI 48108
vox: 734.668.1133
fax: 734.668.1538

Project: LNAPL

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- Individual projects are payable in advance or with approved credit terms
- Approved credit accounts will be charged 1.5 % on unpaid invoices past due date
- Long term projects are billed monthly (progressive billing)
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- Courier and delivery service will be billed to the client
- Rush delivery of sampling supplies charged at cost + $25 handling fee
- Samples logged in and subsequently canceled, are subject to a storage charge of $1.00 per day
- Sample Disposal Fee is charged at $5.00 per sample
- Normal turnaround time is approximately two weeks/4 weeks for isotopes
- Prices are subject to change without notice, except as provided in current quotations or contracts
- This quote is valid for 90 days.

Please ship samples to:
ZymaX FORENSICS
71 Zaca Lane
San Luis Obispo, CA 93401

ACCEPTANCE OF THIS QUOTATION INCLUDES ACCEPTANCE OF AND GOVERNANCE BY THESE TERMS AND CONDITIONS AS STATED ABOVE.

_____
Signature

_____
Title

_____
Date

16921 Parthenia Street Ste. 201 • North Hills CA 91343 • fax 818.893.8940 • vox 818.893.4103
laboratory: 71 Zaca Lane • San Luis Obispo CA 93401 • fax 805.544.8226 • vox 805.544.4696
email: forensics@ZymaXusa.com

Appendix B

MPE System Specifications

ENCORE
Environmental Corporate Remediation ©

Ground Effects
Environmental Services Inc.

2251 Industrial Dr. Regina, SK, Canada, S4P 3C4
TELEPHONE: (306) 352-1400 **FAX**: (306) 352-1412
EMAIL: sfrisky@groundeffects.org

MULTI PHASE VAPOR EXTRACTION WITH WATER TREATMENT MODEL 27100

PERFORMANCE CHARACTERISTICS:

- Nominal capacity: 2367 CFM
- Motor: 100 HP
- Speed: 3000 RPM
- Maximum vacuum: 27" Hg
- Weight (approximate): 1650 Lbs
- Maximum gas inlet temperature: 100^0c / 212^0F

Performance based on atmospheric pressure equal to 29.92" Hg

ADVANTAGES:

- Oil-less process eliminates oil carry-over concerns
- Extremely low maintenance
- Eliminates water-cooling, heat exchangers, etc.
- Continuous operation over the full vacuum range without overheating
- Air-cooled design is standard
- Heavy Duty construction

PUMP ASSEMBLY:

(1) *DVJ 412* series vacuum blowers

Pump Capacity:	1734 CFM @ 20" Hg
Ultimate vacuum:	27" Hg
Power consumption:	100 Hp

GEE DVJ 616, VACUUM PUMP PACKAGE

Each package should be complete with the following:

- ROOTS DVJ 616, rotary lobe, positive displacement vacuum pump
- 100 Hp, XP (Class 1, Group C & D / Class 2, Group E, F, G), 230/460/3/60, 1800 rpm, 326T frame, Design 'B' electric motor having class 'F' insulation & 1.15 service factor
- Drive group designed with a minimum service factor of 1.4 times motor nameplate rating and including a poly chain drive
- Fully enclosed belt guard with removable front cover for easy access to belt
- In-line type, inlet filter (air box type) with pleated paper filter element. Filter media efficiency – 99.9% on 10 micron
- Integral base on which all of the above equipment shall be mounted
- Discharge silencers, chamber/absorptive type

GEE MPVE CONTROL SYSTEM

(x1) Modicon Ethernet Bridge

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EMAIL: sfrisky@groundeffects.org

(x1) Thermocouple Signal Converter

(x1) RS232 – RS485 converter

(x1) 460V 3PH 50HP 75A Variable Speed Drive

(x1) Main Lugs Distribution block

(x1) Cooling Fans

(x1) DC power supply

(x1) Industrial PC with PC anyware, HMI software

(x1) 1,500 VA UPS

(x1) Modicon PLC with the following I/O

- (x5) Analog inputs cards
- (x2) Analog outputs cards
- (x5) Digital outputs cards
- (x4) Digital inputs cards

(x1) 30KVA transformer

(x1) Power meter with CT's

(x1) 1/3HP 480V Motor Starter

(x1) 1HP 480V Motor Starter

(x1) 3HP 480V Motor Starter

(x1) 10HP 480V Motor Starter

(x1) 25HP 480V Motor Starter

(x1) 100A Breaker for VFD

(x2) 15A 480V Breakers

(x1) 25A Breaker

(x1) 200A Control Panel Main Breaker

(x1) SEMC-1622-02 Skid Main Breaker Panel

(x1) 240V/115V 100A Breaker Panel C/W assorted breakers

(x1) Firewall Roughter

(x1) Direct-way Dish

(x1) Electrical Enclosure for control panel

(x1) Sat components

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MPVE AIR/WATER OIL/WATER SEPARATOR VESSEL WITH INTEGRAL AIR STRIPPER

- 840 gallon air/water separator tank with high efficiency low maintenance air stripper and Oil/water separator
- 28 gallon internal LNAPL recovery tank
- (x3) conductivity level switches for produced liquids transfer pump (low level, high level and high high level)
  - Siemens' CLS 200 (Capacitance)
- (x2) conductivity level switches for LNAPL transfer pump (low level, high high level)
  - Siemens' CLS 200 (Capacitance)
- (x1) conductivity level switch for secondary containment
  - Siemens' CLS 200 (Capacitance)
- (x2) - 32" x 42"" clean out ports
- (x2) - liquid level site glass
- ASME 36 carbon steel construction
- Internally Novalac epoxy coated
- External Endura industrial coating

MPVE MUD SEPARATOR VESSEL

- 350 gallon mud separator tank with high efficiency low maintenance design
- (x1) 32" x 42"" clean out port
- (x1) liquid level site glass
- (x1) 3" drain valve
- ASME 36 carbon steel construction
- Internally Novalac epoxy coated
- External Endura industrial coating

MPVE TRANSFER PUMP (MUD PUMP)

- Monoflo progressive cavity pump
  - Model E042

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EMAIL: sfrisky@groundeffects.org

- 50 gpm @ 30 psi TDH
- 3 hp, XP, 420 rpm, 230/460 V, 3ph

MPVE LNAPL TRANSFER PUMP

- Moyno progressive cavity pump
  - Model 35601
  - 10 gpm @ 30 psi TDH

1 hp, XP, 1730 rpm, 230/460

MPVE BUILDING

- Mounting of the above items in a 12' x 42' all steel, sound attenuated, skid building
- Process Area to include
  - Double containment floor w/ HHL shutdown
  - MPVE vacuum pump (DVJ 616)
  - Electric motor (100 Hp)
  - Mud tank
  - ITS (Integral Treatment System) package
  - Produced liquids transfer pump
  - LNAPL transfer pump
  - Bag filter
  - (x2) carbon vessels
  - (x4) automated extraction header system
  - Heater (forced fan)
  - Heater (convection)
  - Exhaust fan
  - All necessary piping and instrumentation
  - All necessary XP wiring
- Controls Area to include
  - Pneumatic fracturing compressor
    - Pneumatic fracturing automated header system

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- Nutrient injection system complete with nutrient injection automated header system
- Pneumatic air lift compressor
  - Pneumatic air lift automated header system
- Control system complete with HMI
- All necessary wiring

NOTES:

1. Building interior:	Process Area: Class 1, Div 2
	Controls Area – Non-hazardous
2. Control panel	Nema 3R
3. Power supply	480 Volt, 200 amp, 3 phase
4. Process piping	Schedule 40, steel
5. Valves & Fittings	Steel, 150 lb
6. Lighting:	Process Area: (x2) XP 150 Watt
	Controls Area: (x1) 100 Watt

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GEE Pneumatic Air Lift System

GEE Pneumatic Air Lift Control System

1– Nema 4 System Controller
32- valve PLC operated control system.
GEE proposes a control panel to include controls for the following;

- Pneumatic air lift compressor circuit
- Automated valve circuit

Each motor circuit to include H/O/A switch, green run light, motor starter w/overload protection,

GEE Pneumatic Fracturing System

Performance Characteristics:

- Nominal capacity: 203 ACFM
- Motor: 50 HP
- Speed: 3600 RPM
- Maximum pressure: 100 psi
- Weight (approximate): 1065 Lbs
- Maximum noise level (@ 3 feet): 80dBa

Advantages:

- Extremely low maintenance
- Auto start and stop
- Continuous operation over the full pressure range
- Air-cooled design is standard
- Heavy Duty construction

Pump Assembly:

screw type compressor

Pump Capacity:	203 ACFM @ 100 psi FAD
Power consumption:	50 Hp

GEE Pneumatic Fracturing Control System

1– Nema 4 System Controller
15- valve PLC operated control system.
GEE proposes a control panel to include controls for the following;

- Fracturing compressor circuit
- Automated valve circuit

Each motor circuit to include H/O/A switch, green run light, motor starter w/overload protection,

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Automated nutrient injection system which includes

14- ¼" 316 Stainless Steel ball valves with pneumatic actuators
1- 150 gallon Polyethylene tank for nutrient solution with all hoses and fittings
1- Series 'M' metering pump with 316 Stainless steel head,
check balls and seat, valve cap. Also comes with TFE faced diaphragm,
Manual flow control, and a ½ hp 1725 rpm 115V motor and motor starter.
-316 Stainless steel tubing for nutrient injection

BUILDING EXHAUST FAN

2000 cfm,1/2 hp, 1750 rpm, 230/460 V, 3 ph fan and thermostat
complete with 18"x 30" gravity closing inlet louver

BUILDING HEATER

Ruffneck forced air XP heater
20 kW
Integral thermostat
230/460 V, 3 ph

INSTRUMENTS

7- Vacuum gauge; 0-30 "Hg, liquid filled 4"
7- Level switch; Siemens milltronics point level conductivity probes
1- Temperature indicator; 0-250 ^{0}F
1- Volt meter
1- Amp meter
2- Hour meters
48- Pressure gauge; 0-125 psi, liquid filled, 4"
1- Temperature indicators; 0-500 F
1- Helium injection port

MPVE INSTRUMENTATION

- Water Flow meter (Magnetic)
  - ABB 10DX4311
    - 2" line size, 1" meter size
    - 3 – 50 gpm flow range
    - Flanged connection for ease of maintenance
    - 304 SS body material
    - 120 V power supply

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- 4-20 mA analog output
- Class I, Div. II

- Air flow meter
  - Rosemount 3051SFA
    - Annubar flowmeter
    - 4-20 mA output
    - Sized for 6" exhaust line
    - LCD dsiplay

- LEL Sensor
  - Draeger Polytron IREXIL
    - Infrared
    - 0 – 10,000 ppm range
    - Local Display
    - 4-20 mA analog output with relay output module
- (x3) Pressure Transmitter
  - ASCO 43A00100P4M100
    - ½" NPT connection
    - 0 – 250 psig

- Vacuum Transmitter
  - Wika 892.13.500
    - Class 1 Div 1 Groups A,B,C,D
    - 30"Hg – 30psig compound range
    - ½" MNPT process connection
    - SST wetted parts
    - 4-20 mA output, loop powered
    -
- Vapour Temperature Transmitter
  - Rosemount 644H SMART
    - Complete with
      - Series 644 Temperature Transmitter
      - CSA XP approved
      - Assembled to sensor
      - Aluminum junction box with 2" pipe stand mounting bracket

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- 60 Hz line voltage filter
- LCD meter
- Direct mount with Rosemount Instruments Model 0183 Thermocouple Sensor

BAG FILTERS (X2)

- GEE 25 & 5 micron bag filter housings

  Carbon steel construction

  Tri-pod adjustable leg assembly

  S/S internal basket for bag filters

  Complete with (x5) 25 micron and (x5) 5 micron bag filters

LIQUID PHASE (GAC) GRANULAR ACTIVATED CARBON (X2)

- 48" dia. x 5' h carbon steel constructed liquid phase carbon vessel
  - Carbon steel construction
  - Schd. 80 PVC internals
  - Maximum pressure: 40 Psig
  - External Endura Industrial coated, Internal epoxy coating

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MULTI PHASE VAPOR EXTRACTION WITH WATER TREATMENT

MODEL 2750

PERFORMANCE CHARACTERISTICS:

- Nominal capacity: 1332 CFM
- Motor: 50 HP
- Speed: 3000 RPM
- Maximum vacuum: 27" Hg
- Weight (approximate): 1650 Lbs
- Maximum gas inlet temperature: 100^0c / 212^0F

Performance based on atmospheric pressure equal to 29.92" Hg

ADVANTAGES:

- Oil-less process eliminates oil carry-over concerns
- Extremely low maintenance
- Eliminates water-cooling, heat exchangers, etc.
- Continuous operation over the full vacuum range without overheating
- Air-cooled design is standard
- Heavy Duty construction

PUMP ASSEMBLY:

(1) *DVJ 412* series vacuum blowers

Pump Capacity:	875 CFM @ 20" Hg
Ultimate vacuum:	27" Hg
Power consumption:	50 Hp

GEE DVJ 412, VACUUM PUMP PACKAGE

Each package should be complete with the following:

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- ROOTS DVJ 412, rotary lobe, positive displacement vacuum pump
- 50 Hp, XP (Class 1, Group C & D / Class 2, Group E, F, G), 230/460/3/60, 1800 rpm, 326T frame, Design 'B' electric motor having class 'F' insulation & 1.15 service factor
- Drive group designed with a minimum service factor of 1.4 times motor nameplate rating and including a poly chain drive
- Fully enclosed belt guard with removable front cover for easy access to belt
- In-line type, inlet filter (air box type) with pleated paper filter element. Filter media efficiency – 99.9% on 10 micron
- Integral base on which all of the above equipment shall be mounted
- Discharge silencers, chamber/absorptive type

GEE MPVE CONTROL SYSTEM

(x1) Modicon Ethernet Bridge

(x1) Thermocouple Signal Converter

(x1) RS232 – RS485 converter

(x1) 460V 3PH 50HP 75A Variable Speed Drive

(x1) Main Lugs Distribution block

(x1) Cooling Fans

(x1) DC power supply

(x1) Industrial PC with PC anyware, HMI software

(x1) 1,500 VA UPS

(x1) Modicon PLC with the following I/O

- (x5) Analog inputs cards
- (x2) Analog outputs cards
- (x5) Digital outputs cards
- (x4) Digital inputs cards

(x1) 30KVA transformer

(x1) Power meter with CT's

(x1) 1/3HP 480V Motor Starter

(x1) 1HP 480V Motor Starter

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(x1) 3HP 480V Motor Starter

(x1) 10HP 480V Motor Starter

(x1) 25HP 480V Motor Starter

(x1) 100A Breaker for VFD

(x2) 15A 480V Breakers

(x1) 25A Breaker

(x1) 200A Control Panel Main Breaker

(x1) SEMC-1622-02 Skid Main Breaker Panel

(x1) 240V/115V 100A Breaker Panel C/W assorted breakers

(x1) Firewall Roughter

(x1) Direct-way Dish

(x1) Electrical Enclosure for control panel

(x1) Sat components

MPVE AIR/WATER OIL/WATER SEPARATOR VESSEL WITH INTEGRAL AIR STRIPPER

- 700 gallon air/water separator tank with high efficiency low maintenance air stripper and Oil/water separator
- 28 gallon internal LNAPL recovery tank
- (x3) conductivity level switches for produced liquids transfer pump (low level, high level and high high level)
  - Siemens' CLS 200 (Capacitance)
- (x2) conductivity level switches for LNAPL transfer pump (low level, high high level)
  - Siemens' CLS 200 (Capacitance)
- (x1) conductivity level switch for secondary containment
  - Siemens' CLS 200 (Capacitance)
- (x2) - 32" x 42"" clean out ports
- (x2) - liquid level site glass
- ASME 36 carbon steel construction
- Internally Novalac epoxy coated
- External Endura industrial coating

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MPVE MUD SEPARATOR VESSEL

- 350 gallon mud separator tank with high efficiency low maintenance design
- (x1) 32” x 42”" clean out port
- (x1) liquid level site glass
- (x1) 3” drain valve
- ASME 36 carbon steel construction
- Internally Novalac epoxy coated
- External Endura industrial coating

MPVE TRANSFER PUMP (MUD PUMP)

- Monoflo progressive cavity pump
  - Model E041
  - 25 gpm @ 30 psi TDH
  - 2 hp, XP, 420 rpm, 230/460 V, 3ph

MPVE LNAPL TRANSFER PUMP

- Moyno progressive cavity pump
  - Model 35601
  - 10 gpm @ 30 psi TDH
  - 1 hp, XP, 1730 rpm, 230/460 V, 3ph

BAG FILTER

- GEE 25 / 5 micron bag filter housings
  - Carbon steel construction
  - Tri-pod adjustable leg assembly
  - S/S internal basket for bag filters
  - Complete with (x5) 25 / 5 micron bag filters

LIQUID PHASE (GAC) GRANULAR ACTIVATED CARBON (X2)

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- 24" dia. x 3' h carbon steel constructed liquid phase carbon vessel
  - Carbon steel construction
  - Schd. 40 PVC internals
  - Maximum pressure: 40 Psig
  - Bed depth: 2.25 Ft (Based on a 8 x 30 mesh)
  - ASME 36 carbon steel construction
  - Internal epoxy coating
  - External Endura Industrial coated
  - 190 lbs of BC-830 GAC / vessel

GEE PNEUMATIC AIR LIFT SYSTEM

Performance Characteristics:

- Nominal capacity: 85 ACFM
- Motor: 10 HP
- Speed: 3600 RPM
- Maximum pressure: 28 psi
- Weight (approximate): 655 Lbs
- Maximum noise level (@ 3 feet): 76dBa

Advantages:

- Extremely low maintenance
- Auto start and stop
- Continuous operation over the full pressure range
- Air-cooled design is standard
- Heavy Duty construction

Pump Assembly:

(1) Busch Rotary claw type compressor

Pump Model: MM 1102 AP

Pump Capacity: 85 ACFM @ 20 psi

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Power consumption: 10 Hp

GEE PNEUMATIC FRACTURING SYSTEM

Performance Characteristics:

- Nominal capacity: 103 ACFM
- Motor: 25 HP
- Speed: 3600 RPM
- Maximum pressure: 100 psi
- Weight (approximate): 1065 Lbs
- Maximum noise level (@ 3 feet): 80dBa

Advantages:

- Extremely low maintenance
- Auto start and stop
- Continuous operation over the full pressure range
- Air-cooled design is standard
- Heavy Duty construction

Pump Assembly:

Ingersolrand screw type compressor

Pump Model: IR SSR-UP6-25-125
Pump Capacity: 103 ACFM @ 100 psi FAD
Power consumption: 25 Hp

- Complete with automated nutrient injection system
  - To include
    - (x14) - ¼" 316 stainless steel ball valves with pneumatic actuators
    - (x1) - 36 gallon stainless steel tank for nutrient solution with all hoses and fittings
    - (x1) - Series 'M' metering pump (Pulsatron model LC5454-VTC1-XXX) with 316 stainless steel head, check balls and seat, valve cap

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- TFE faced diaphragm, manual flow control, and a ½ hp 1725 rpm 115V motor and motor starter
- 316 stainless steel tubing for nutrient injection

BUILDING EXHAUST FAN

- 2000 cfm,1/3 hp, 1750 rpm, 230/460 V, 3 ph fan and thermostat complete with 18" x 30" gravity closing inlet louver

BUILDING HEATER(S)

- Ruffneck forced air XP heater
  - Model FX412-480360-150-T
  - 15 kw
  - Integral thermostat
  - 230 / 460V, 3ph
- Catadyne convection XP heater
  - Model W1248-0008
  - 5 Kw
  - Integral thermostat
  - Propane powered

INSTRUMENTS

- (x7) - Vacuum gauge; 0-30 "Hg, liquid filled, 4"
- (x7) - Level switch; Siemens Milltronics point level conductivity probes
- (x1) - Temperature indicator; 0-250 ^{0}F
- (x18) - Pressure gauge; 0-160 psi, liquid filled, 2.5"
- (x16) - Pressure gauge; 0-30 psi, liquid filled, 2.5"

INSTRUMENTATION

- (x1) Water Flow meter (Coriolis)
  - E&H Promass 80125

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    - 2” line size, 1” meter size
    - 3 – 50 gpm flow range
    - Flanged connection for ease of maintenance
    - 304 stainless steel body material
    - 120 V power supply
    - 4-20 mA analog output
    - Class I, Div. II
- (x1) Air flow meter
    - Rosemount 3051SFA
        - Annubar flowmeter
        - 4-20 mA output
        - Sized for 6” exhaust line
        - LCD display
- (x1) LEL Sensor
    - Draeger Polytron IREXIL
        - Infrared
        - 0 – 10,000 ppm range
        - Local Display
        - 4-20 mA analog output
- (x1) Vacuum Transmitter
    - Rosemount 2088 SMART
        - XP
        - -14.7 – 30 psig compound range
        - ½” MNPT process connection
        - SST wetted parts
        - 4-20 mA output, loop powered
- (x1) Vapour Temperature Transmitter
    - Watlow K-type thermocouple
        - Range: -333 – 2500 ^{o}F
        - ½” NPT connection

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- (x3) Pressure Transmitter
  - ASCO 43A00100P4M100
    - ½" NPT connection
    - 0 – 250 psig

MPVE BUILDING

- Mounting of the above items in a 10' x 30' all steel, sound attenuated, skid building
- Process Area to include
  - Double containment floor w/ HHL shutdown
  - MPVE vacuum pump (DVJ 412)
  - Electric motor (50 Hp)
  - Mud tank
  - ITS (Integral Treatment System) package
  - Produced liquids transfer pump
  - LNAPL transfer pump
  - Bag filter
  - (x2) carbon vessels
  - (x4) automated extraction header system
  - Heater (forced fan)
  - Heater (convection)
  - Exhaust fan
  - All necessary piping and instrumentation
  - All necessary XP wiring
- Controls Area to include
  - Pneumatic fracturing compressor
    - Pneumatic fracturing automated header system
    - Nutrient injection system complete with nutrient injection automated header system
  - Pneumatic air lift compressor
    - Pneumatic air lift automated header system
  - Control system complete with HMI

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- All necessary wiring

NOTES:

1. Building interior:	Process Area: Class 1, Div 2
	Controls Area – Non-hazardous
2. Control panel	Nema 3R
3. Power supply	480 Volt, 200 amp, 3 phase
4. Process piping	Schedule 40, steel
5. Valves & Fittings	Steel, 150 lb
6. Lighting:	Process Area: (x2) XP 150 Watt
	Controls Area: (x1) 100 Watt

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PRICING

MPVE 2750 Purchase Price	Unit # 1193 Titan 2750	$252,303.33 U.S.

Terms: 50% due upon order, 50% due upon delivery

2% net 30

Delivery: Call

Taxes: All applicable tax and insurance is extra

Freight: Included FOB Regina

Regards,

Sean Frisky

Appendix C

Comprehensive MPE System LNAPL Recovery Data

ENCORE
Environmental Corporate Remediation ©

Figure B.1
Vapor Phase Hydrocarbon Cumulative Total Recovery Data
LNAPL Area No. 3 Full Scale Recovery System 1
General Motors Pontiac North Campus
Pontiac, Michigan

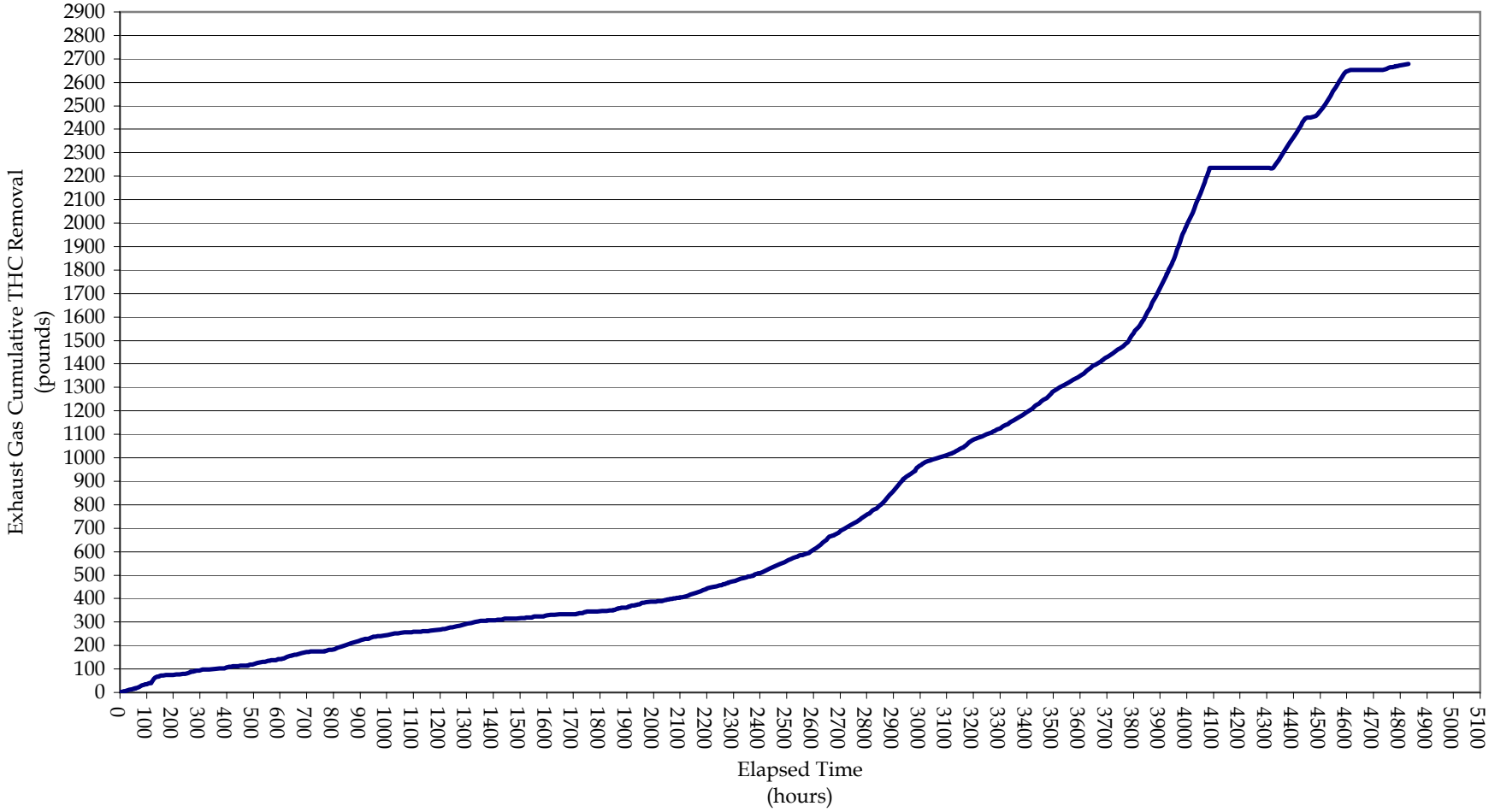


Figure B.2
Vapor Phase Hydrocarbon Recovery Rate Data
LNAPL Area No. 3 Full Scale Recovery System 1
General Motors North Campus
Pontiac, Michigan

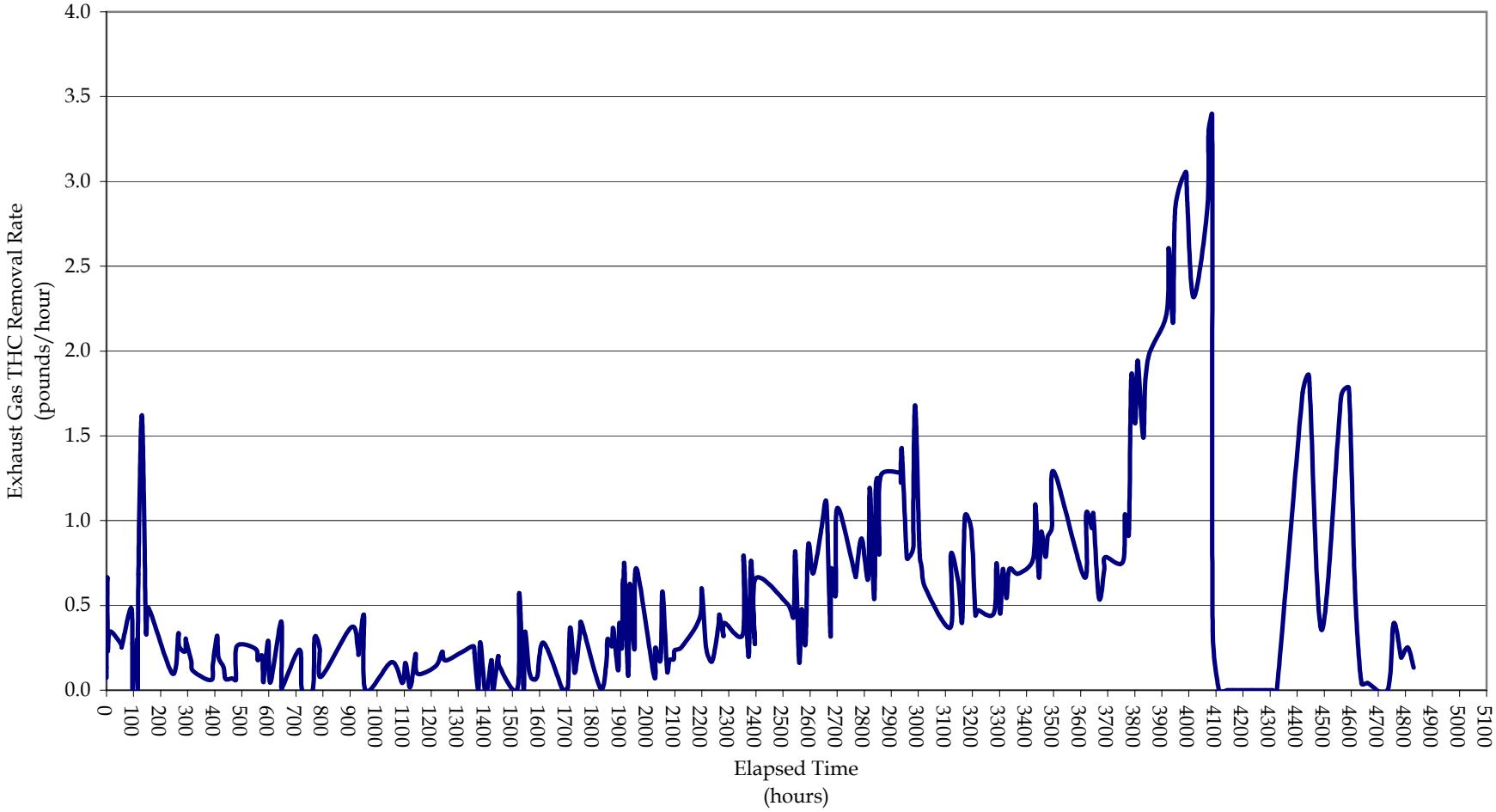


Figure B.3
Corrected Vapor Phase Hydrocarbon Cumulative Total Recovery Data
LNAPL Area No. 3 Full Scale Recovery System 1
General Motors Pontiac North Campus
Pontiac, Michigan

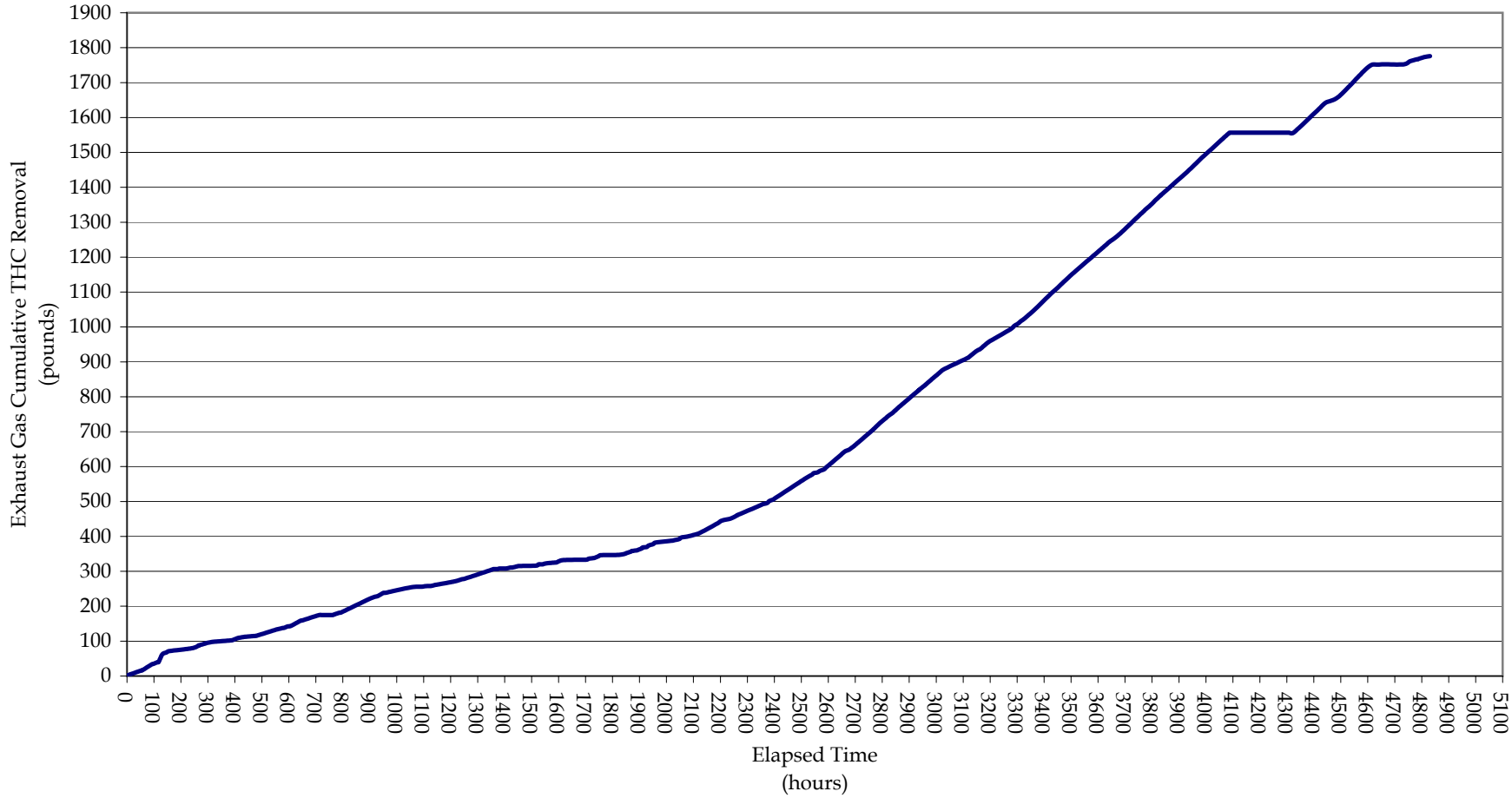


Figure B.4
Corrected Vapor Phase Hydrocarbon Recovery Rate Data
LNAPL Area No. 3 Full Scale Recovery System 1
General Motors North Campus
Pontiac, Michigan

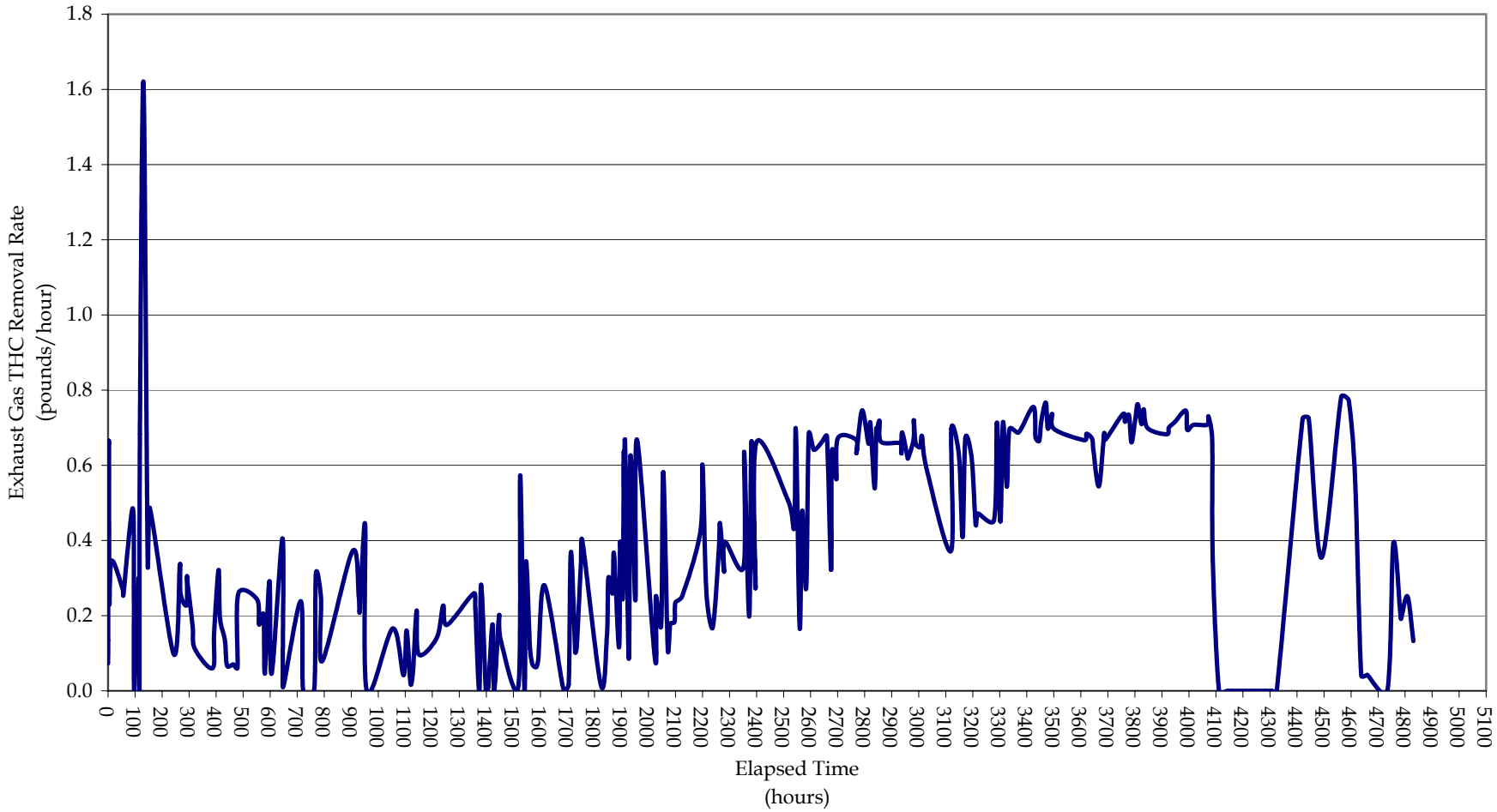


Figure B.5
Cumulative Phase-Specific LNAPL Recovery Fractions
LNAPL Area No. 3 Full Scale Recovery System 1
General Motors Pontiac North Campus
Pontiac, Michigan

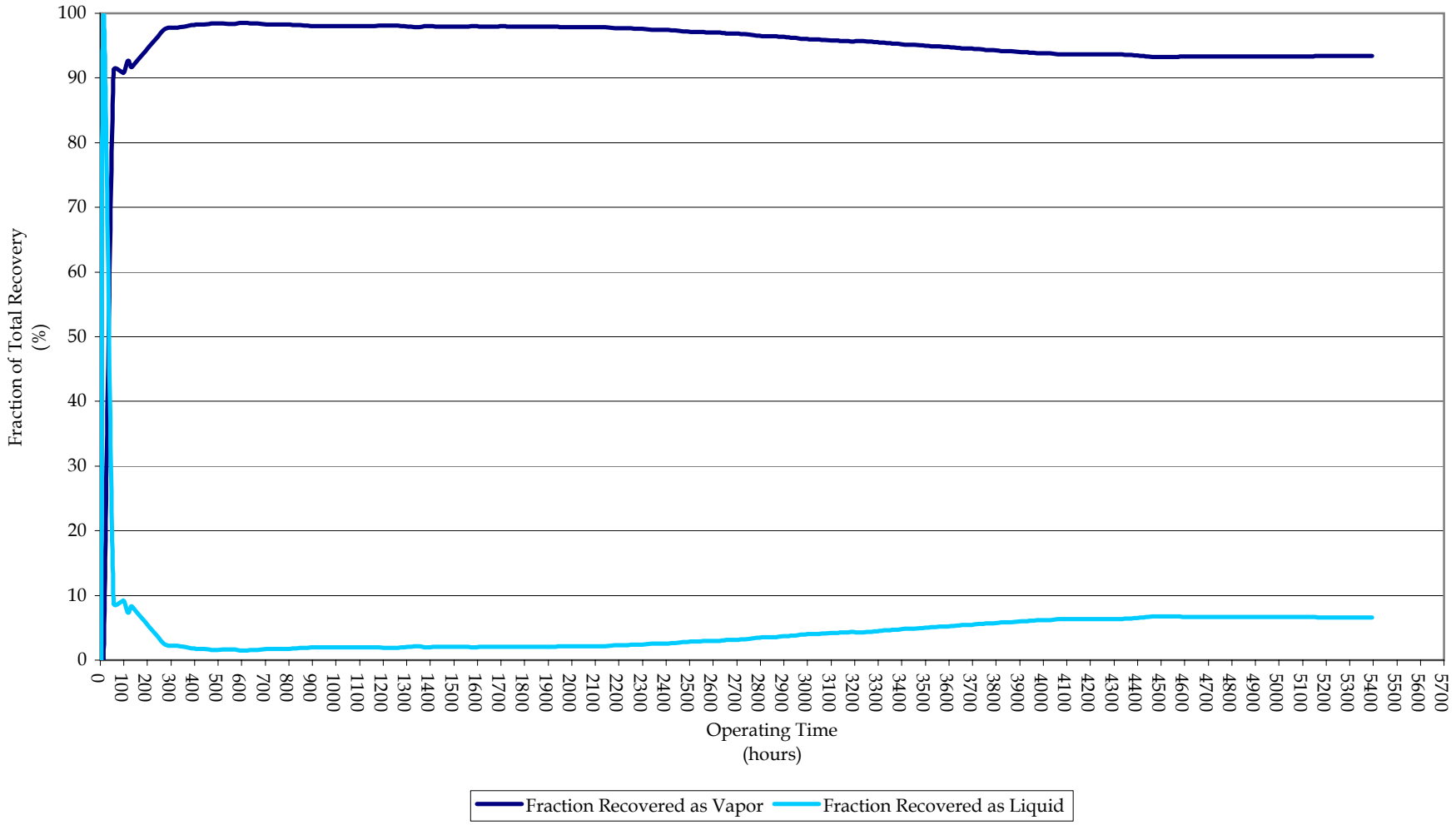


Figure B.6
Cumulative LNAPL Recovery vs. Water Production
LNAPL Area No. 3 Full Scale Recovery System 1
General Motors Pontiac North Campus
Pontiac, Michigan

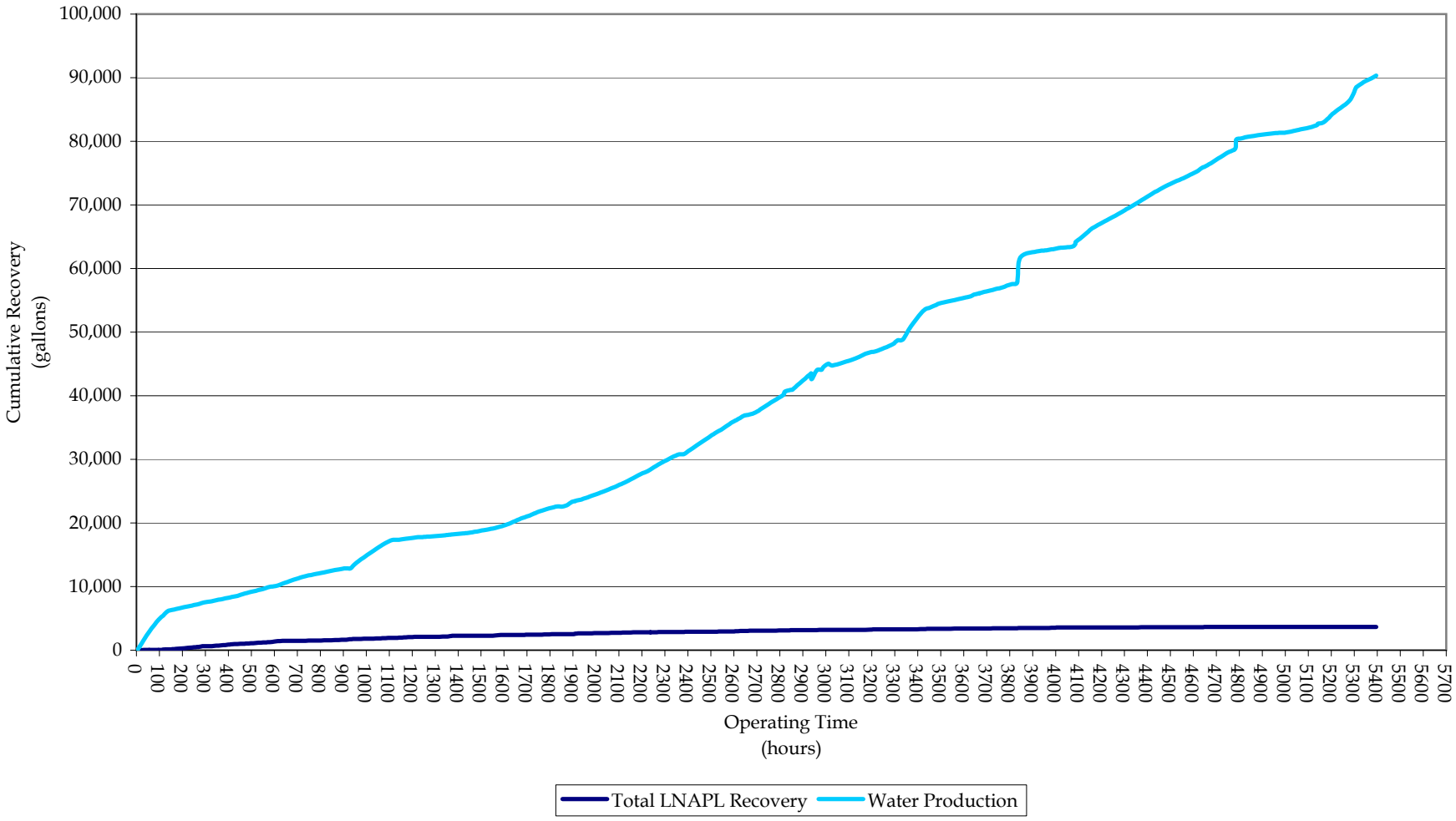


Figure B.7
Vapor Phase Hydrocarbon Cumulative Total Recovery Data
LNAPL Area No. 3 Full Scale Recovery System 2
General Motors Pontiac North Campus
Pontiac, Michigan

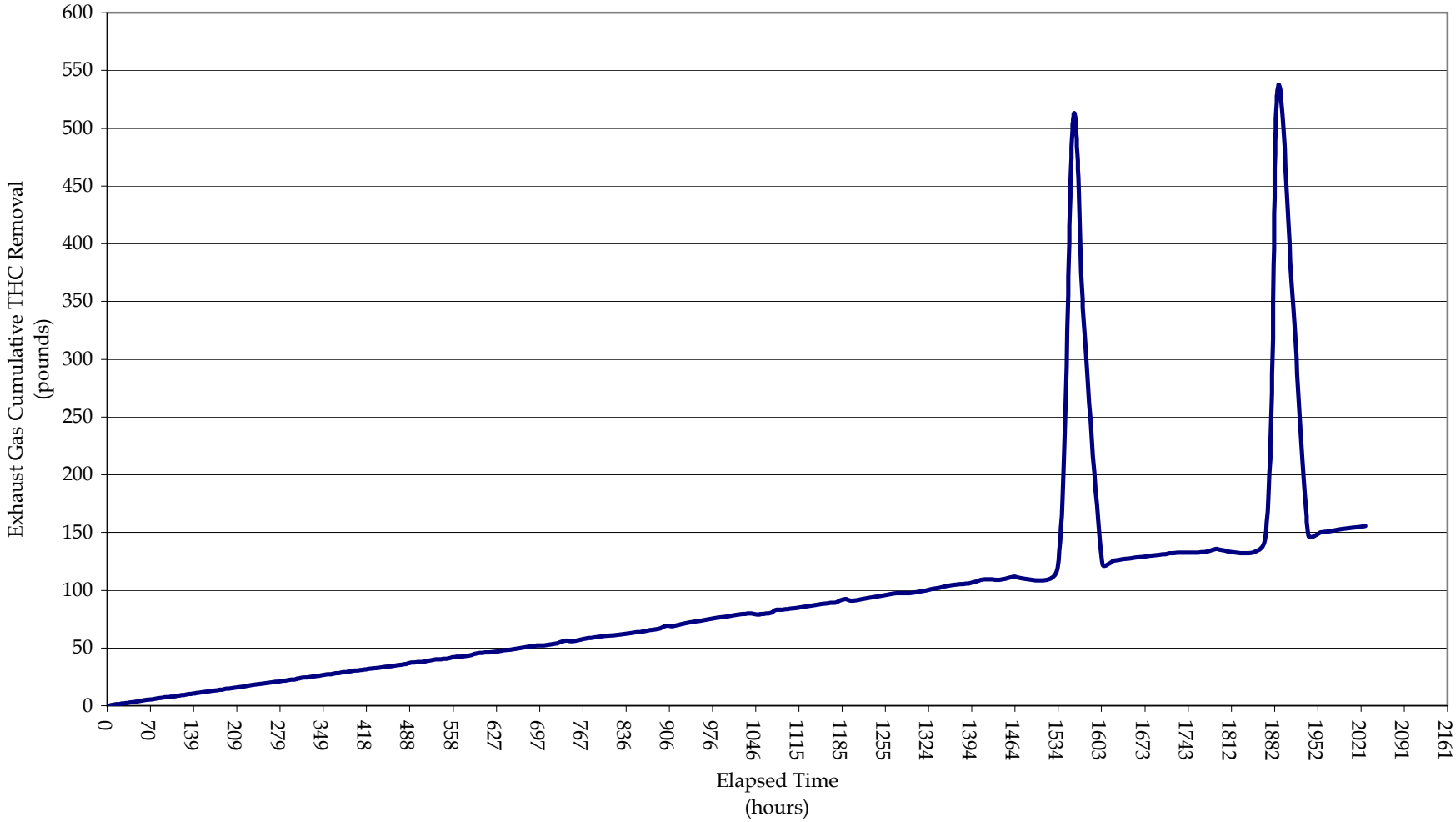


Figure B.8
Vapor Phase Hydrocarbon Recovery Rate Data
LNAPL Area No. 3 Full Scale Recovery System 2
General Motors North Campus
Pontiac, Michigan

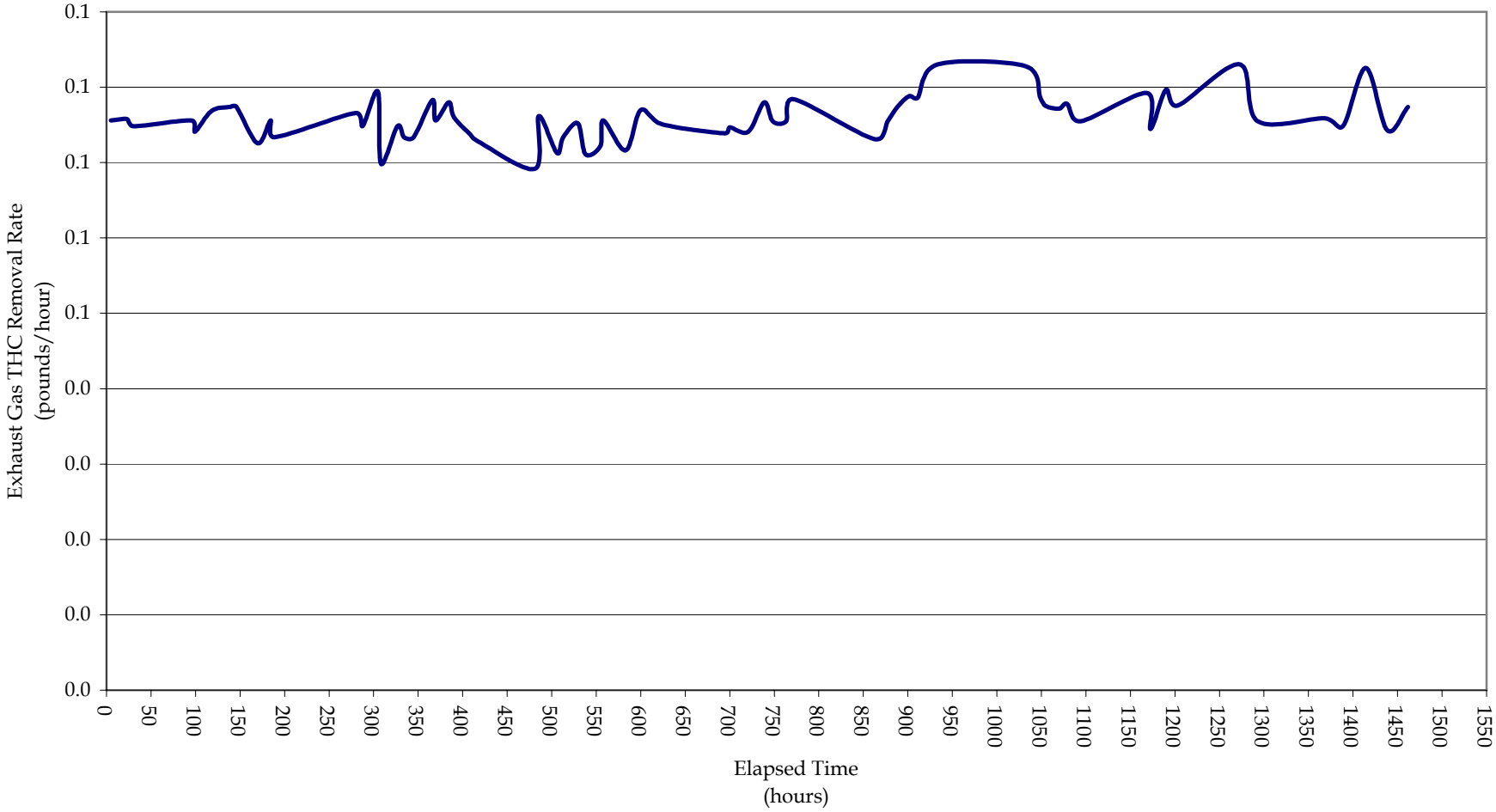


Figure B.9
Cumulative LNAPL Recovery vs. Water Production
LNAPL Area No. 3 Full Scale Recovery System 2
General Motors Pontiac North Campus
Pontiac, Michigan

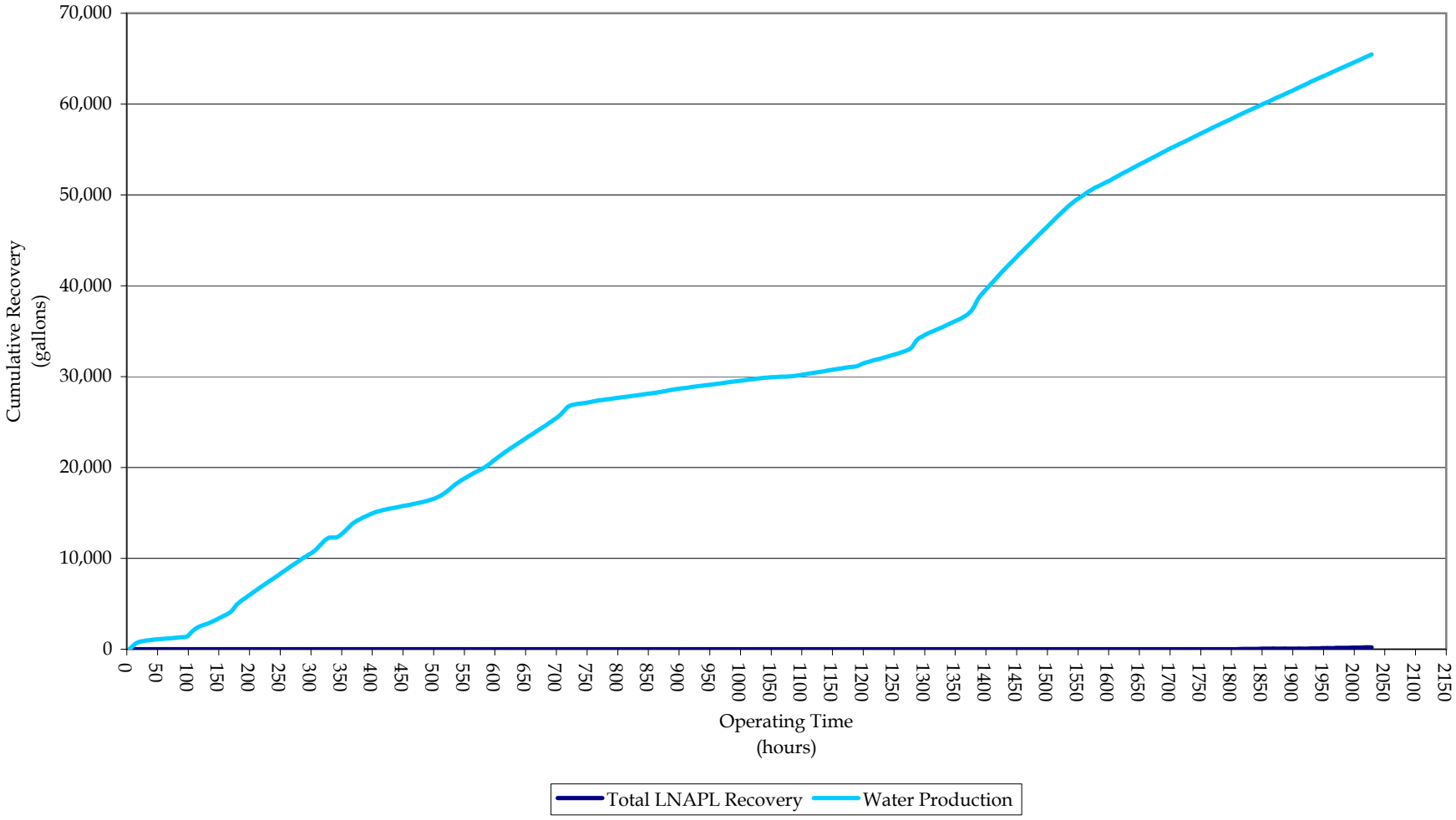


Figure B.10
Cumulative Phase-Specific LNAPL Recovery Fractions
LNAPL Area No. 3 Full Scale Recovery System 2
General Motors Pontiac North Campus
Pontiac, Michigan

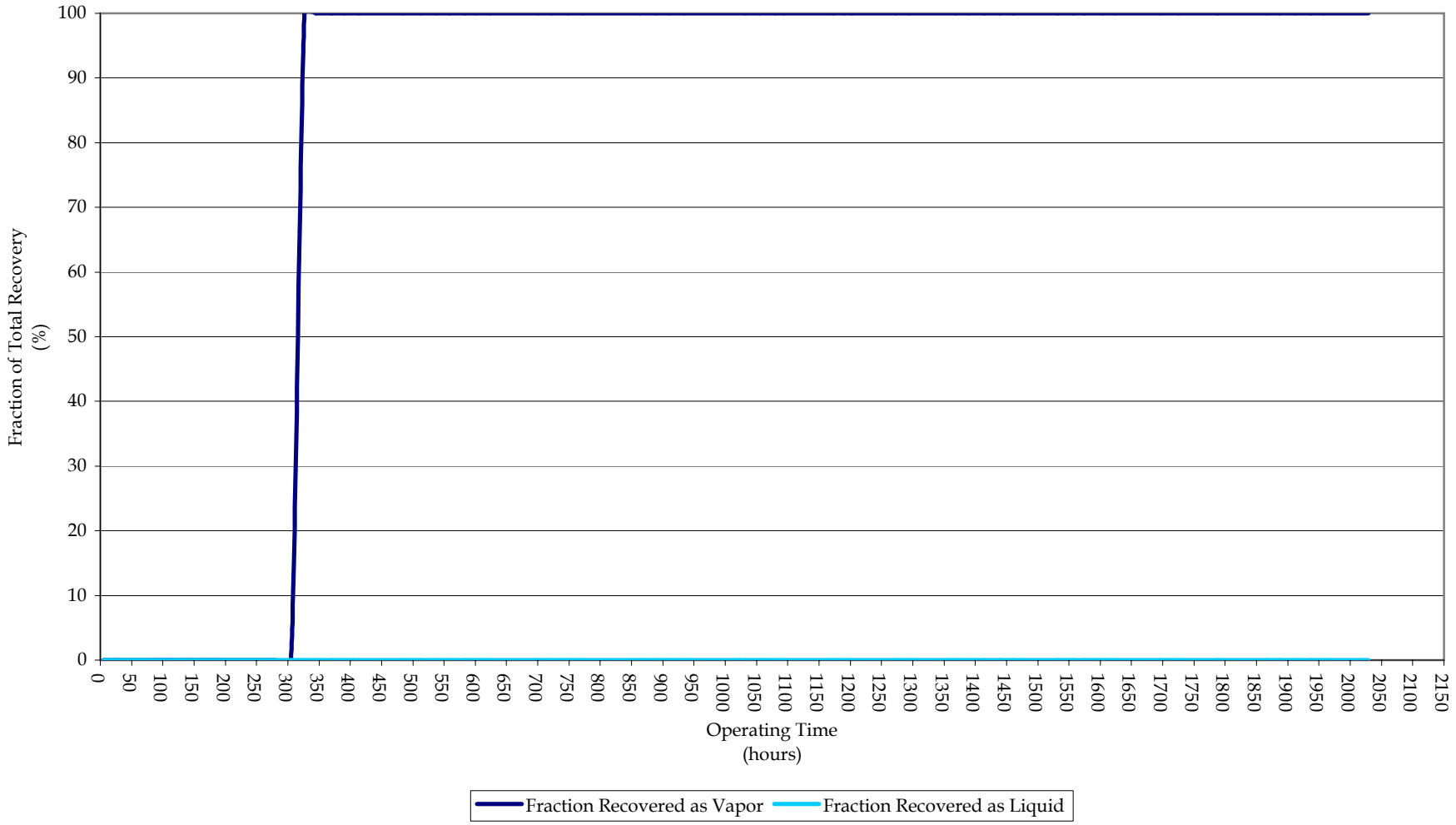


Figure B.11
Phase-Specific Cumulative LNAPL Recovery
LNAPL Area No. 3 Full Scale Recovery System 2
General Motors Pontiac North Campus
Pontiac, Michigan

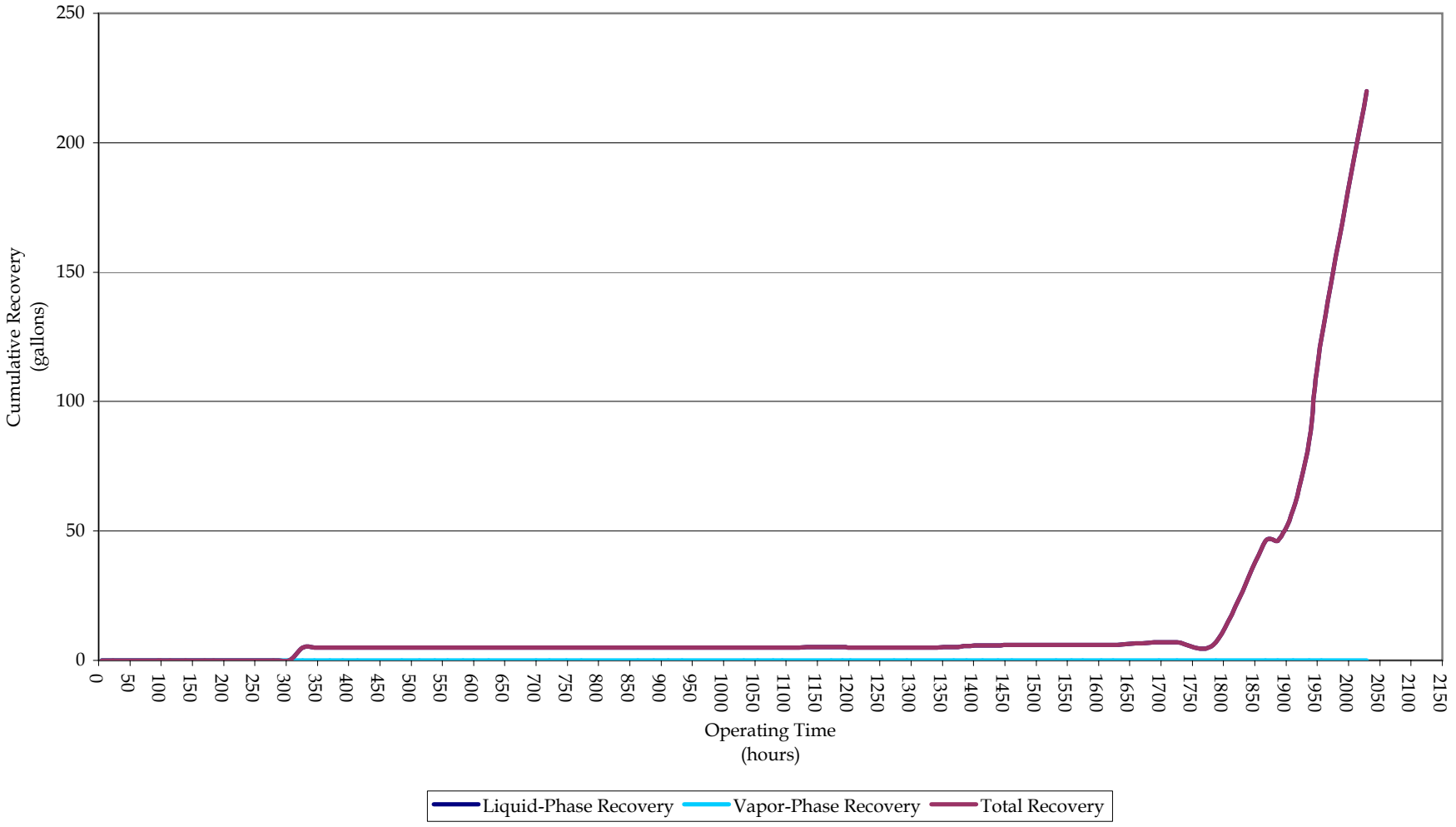


Figure B.12
Overall LNAPL Recovery Rate
LNAPL Area No. 3 Full Scale Recovery System 2
General Motors Pontiac North Campus
Pontiac, Michigan

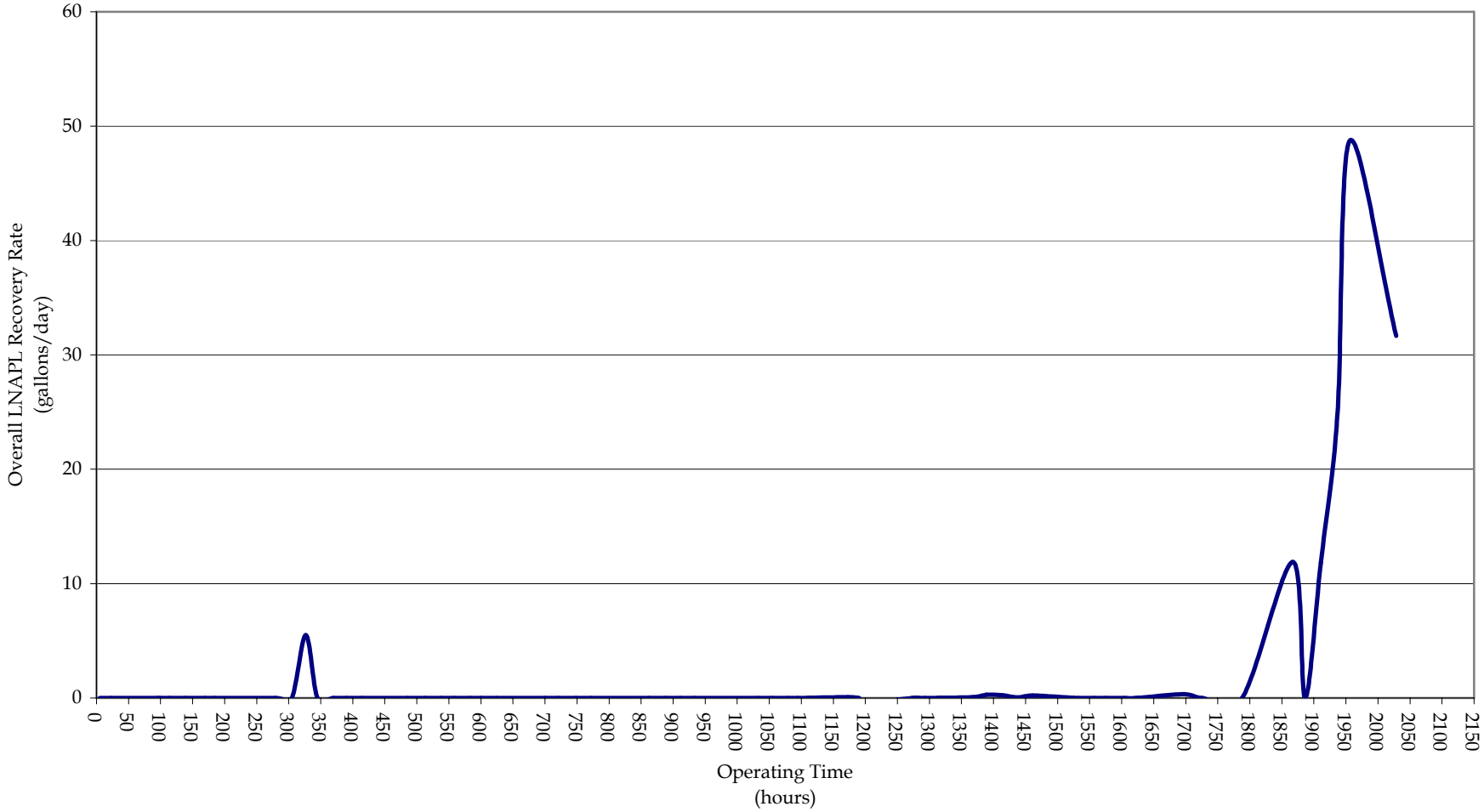


Figure B.13
Vapor Phase Hydrocarbon Cumulative Total Recovery Data
LNAPL Area No. 3 Full Scale Recovery System 3
General Motors Pontiac North Campus
Pontiac, Michigan

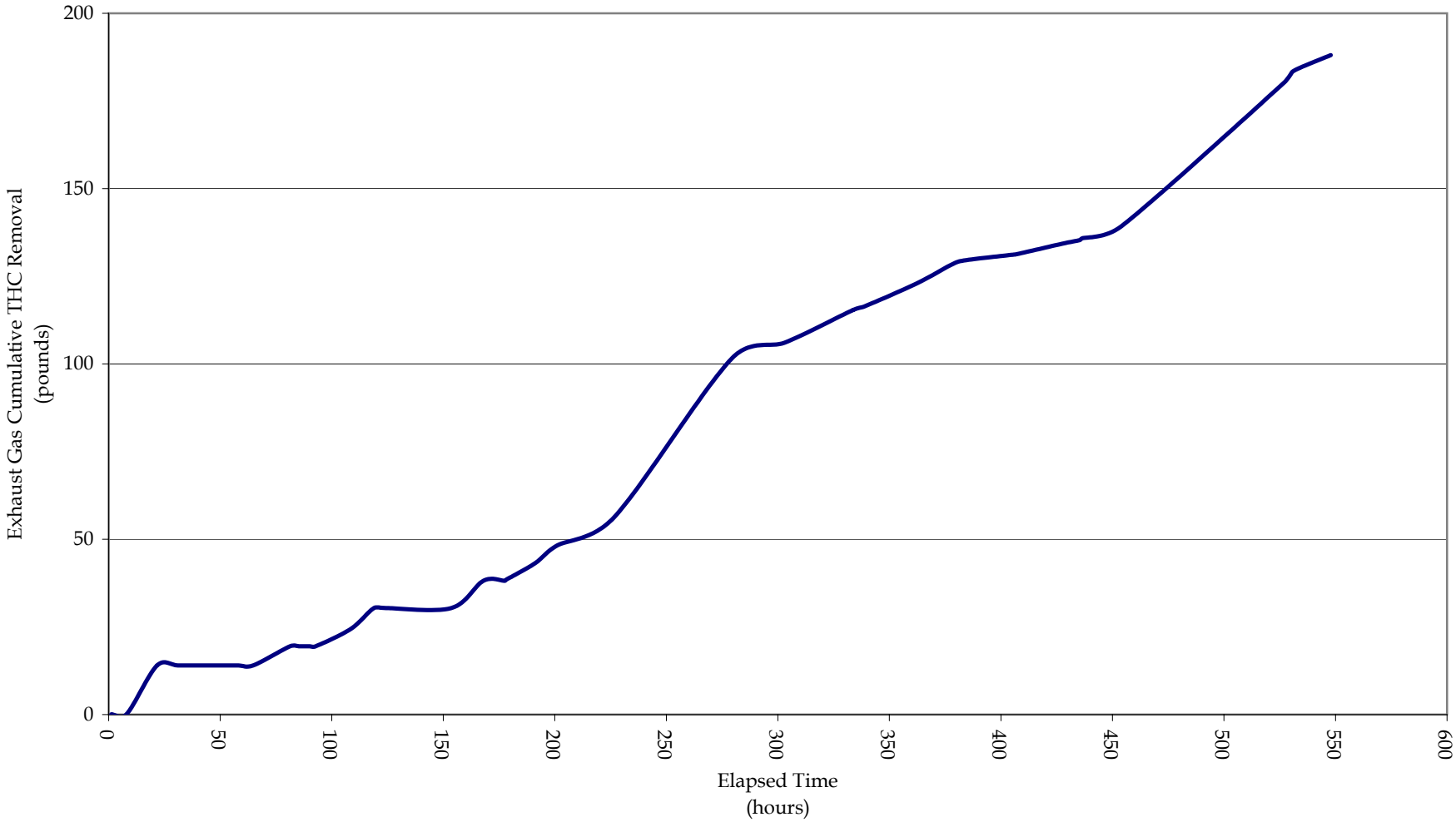


Figure B.14
Vapor Phase Hydrocarbon Recovery Rate Data
LNAPL Area No. 3 Full Scale Recovery System 3
General Motors North Campus
Pontiac, Michigan

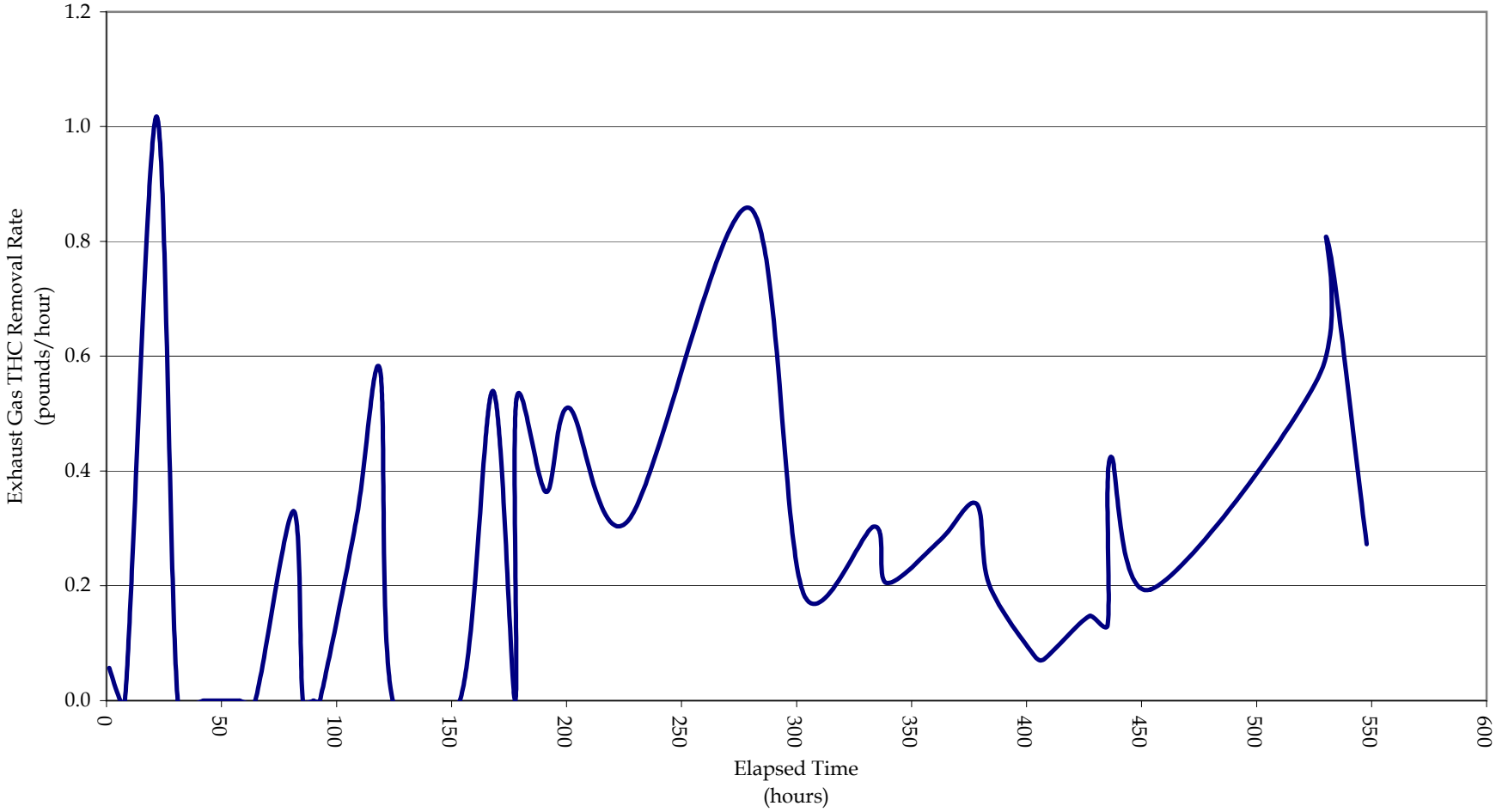


Figure B.15
Cumulative LNAPL Recovery vs. Water Production
LNAPL Area No. 3 Full Scale Recovery System 3
General Motors Pontiac North Campus
Pontiac, Michigan

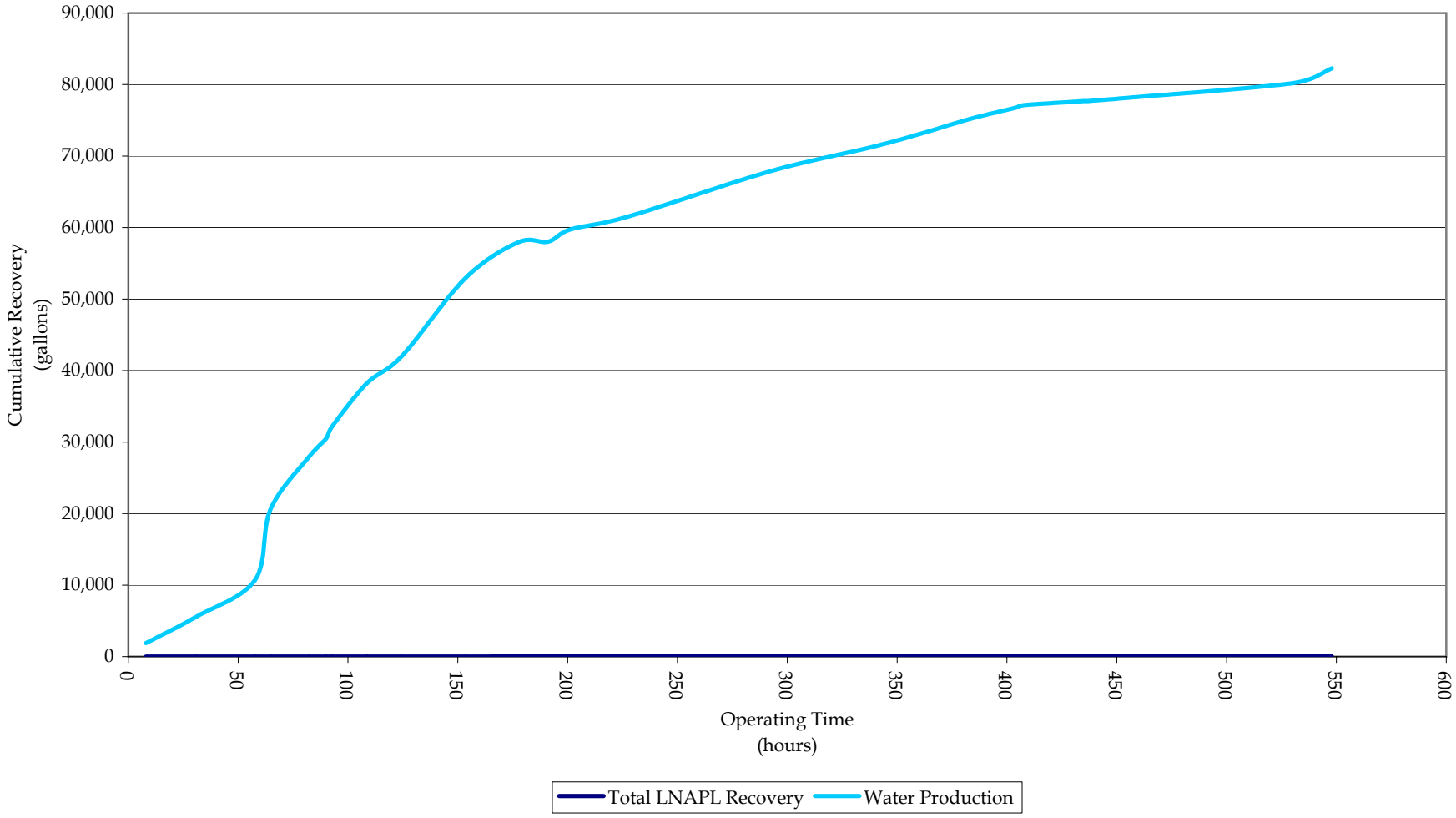


Figure B.16
Cumulative Phase-Specific LNAPL Recovery Fractions
LNAPL Area No. 3 Full Scale Recovery System 3
General Motors Pontiac North Campus
Pontiac, Michigan

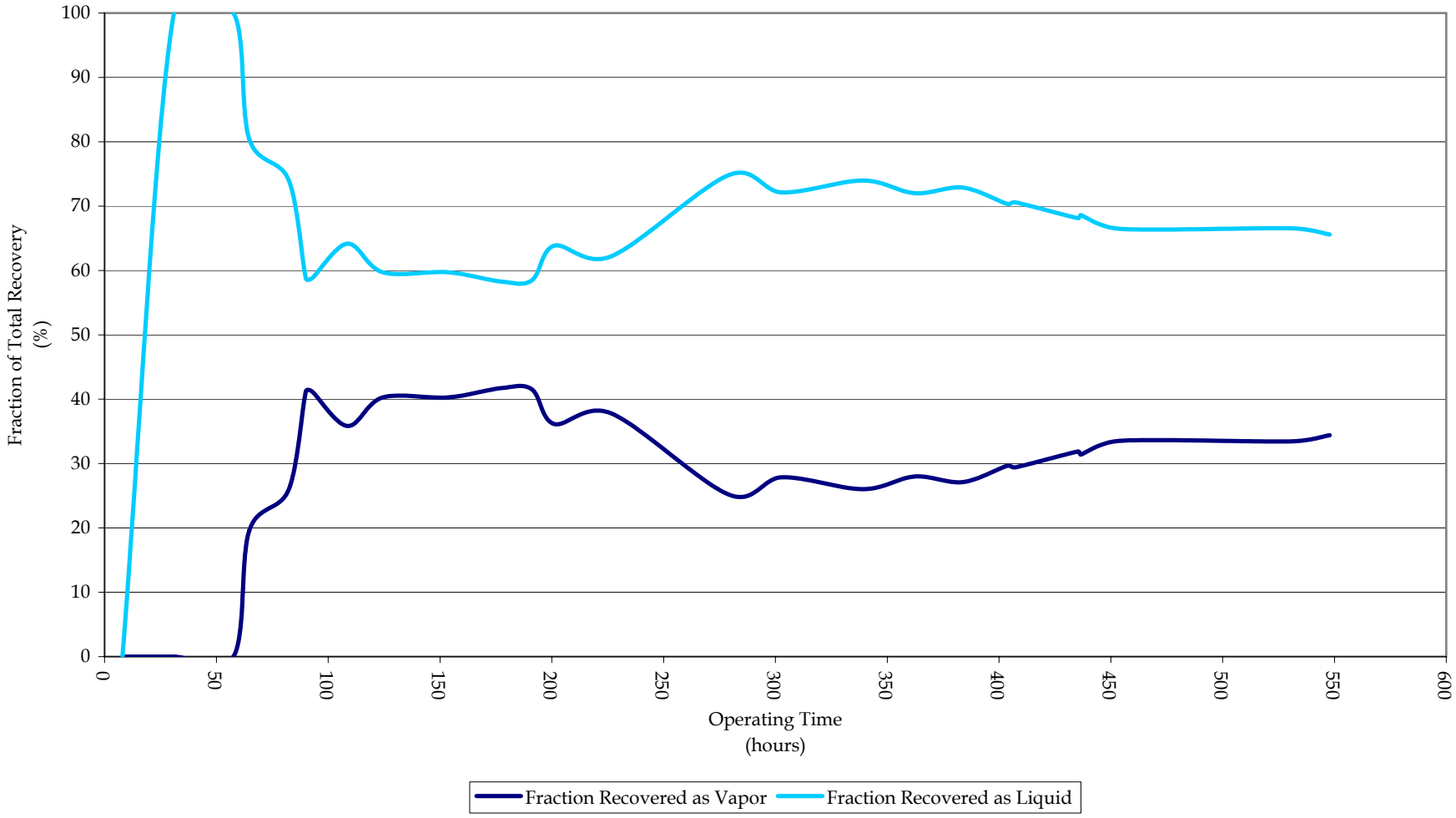


Figure B.17
Phase-Specific Cumulative LNAPL Recovery
LNAPL Area No. 3 Full Scale Recovery System 3
General Motors Pontiac North Campus
Pontiac, Michigan

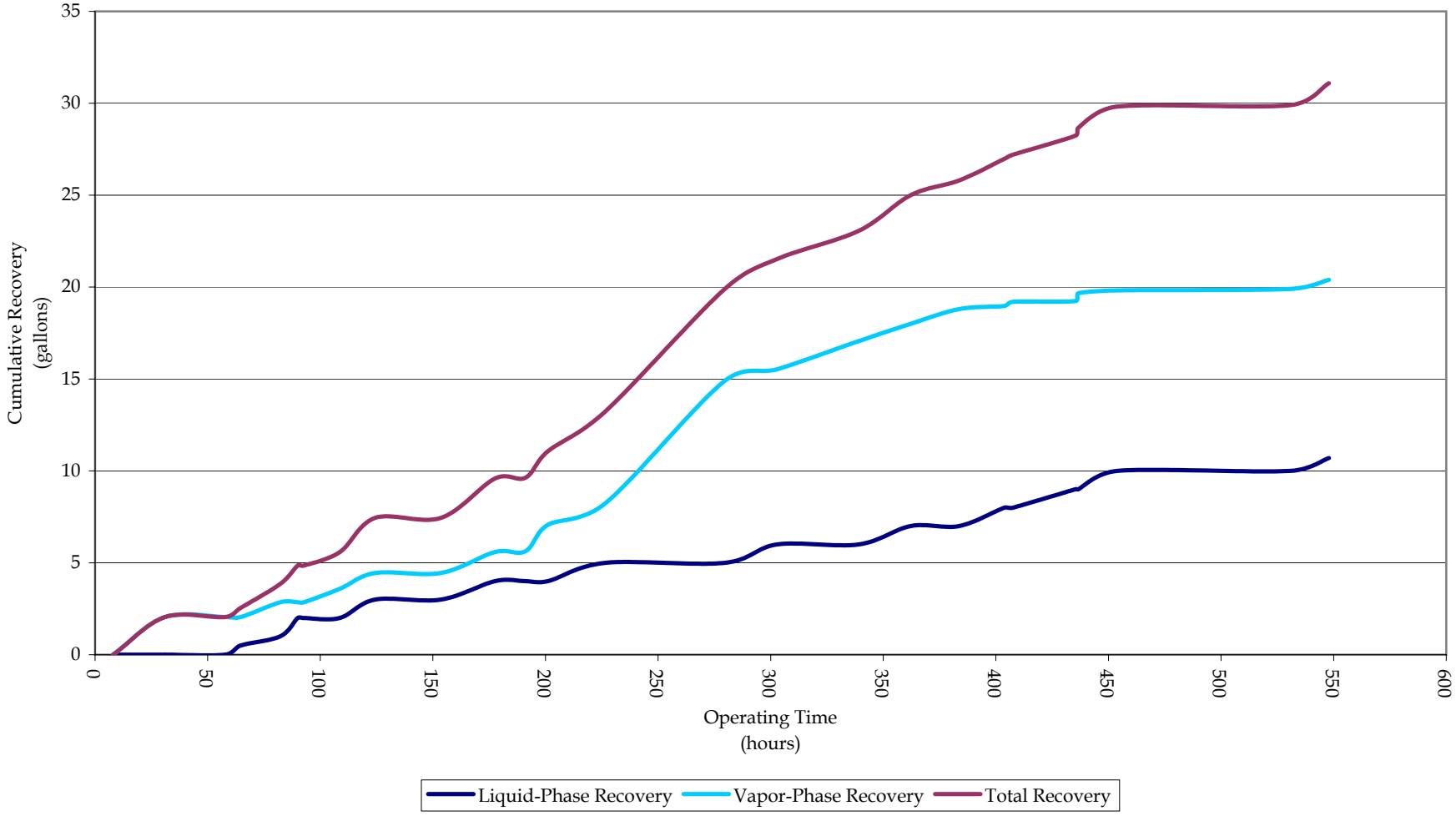


Figure B.18
Overall LNAPL Recovery Rate
LNAPL Area No. 3 Full Scale Recovery System 3
General Motors Pontiac North Campus
Pontiac, Michigan

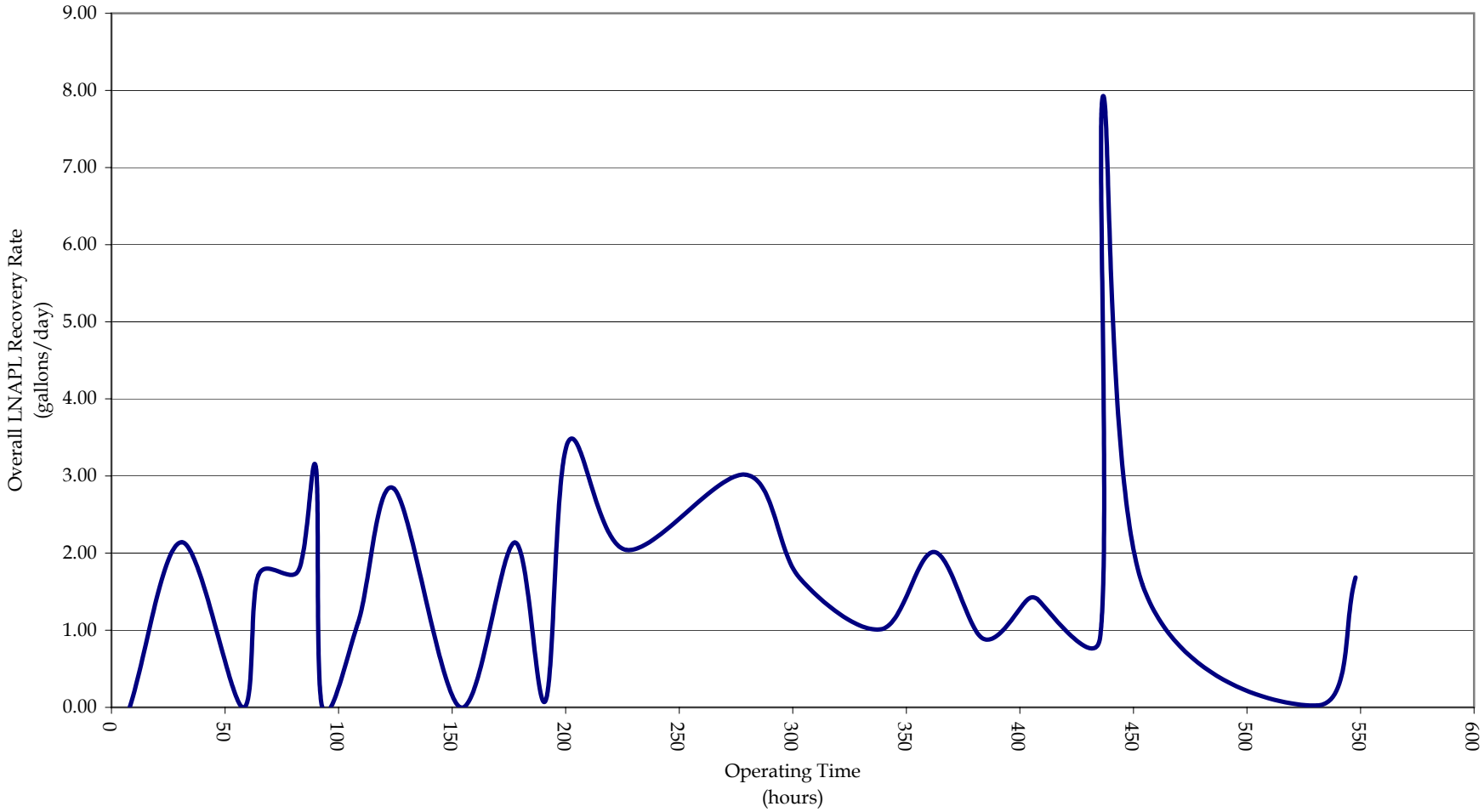


Table B.1

Vapor Phase Hydrocarbon Recovery Data- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:					Calculations:						
Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as hexane)*	*Corrected THC Concentration [1] (ppmv as hexane)*	*System Exhaust Gas Flowrate (acfm)*	*System Exhaust Gas Flowrate (scfm)*	*THC Mass Flowrate (pounds/hour)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*	*Corrected THC Mass Flowrate [1] (pounds/hour)*	*Corrected Cumulative THC [1] (pounds)*	*Corrected Cumulative THC [1] (gallons, product)*
2/26/2005	0.0	15	15	420.6	363.1	0.07	0	0.0	0.07	0	0.0
	0.3	28	28	433.4	364.4	0.13	0	0.0	0.13	0	0.0
	0.5	68	68	431.6	358.1	0.32	0	0.0	0.32	0	0.0
	0.8	83	83	385.0	316.1	0.35	0	0.0	0.35	0	0.0
	1.2	108	108	433.8	353.4	0.51	0	0.1	0.51	0	0.1
	2.2	125	125	425.3	343.2	0.57	1	0.1	0.57	1	0.1
	3.2	145	145	421.5	337.8	0.66	2	0.2	0.66	2	0.2
	4.4	55	55	436.0	353.4	0.26	2	0.3	0.26	2	0.3
	5.1	48	48	447.0	362.0	0.23	2	0.3	0.23	2	0.3
2/27/2005	13.6	75	75	425.9	344.6	0.35	5	0.7	0.35	5	0.7
3/1/2005	54.9	62	62	394.4	323.8	0.27	16	2.4	0.27	16	2.4
	56.3	60	60	386.3	316.6	0.25	17	2.4	0.25	17	2.4
3/3/2005	90.7	103	103	438.2	353.9	0.49	33	4.9	0.49	33	4.9
	95.5	93	93	279.2	223.5	0.28	35	5.1	0.28	35	5.1
	96.8	0	0	435.2	352.4	0.00	35	5.1	0.00	35	5.1
3/4/2005	112.8	63	63	444.4	358.0	0.30	39	5.8	0.30	39	5.8
	116.3	0	0	429.0	342.7	0.00	39	5.8	0.00	39	5.8
	117.6	153	153	423.3	334.7	0.68	40	5.9	0.68	40	5.9
3/10/2005	131.3	330	330	462.9	366.3	1.62	62	9.1	1.62	62	9.1
3/11/2005	146.7	113	113	287.1	227.0	0.34	68	9.9	0.34	68	9.9
	154.4	115	115	404.4	315.7	0.49	71	10.5	0.49	71	10.5
3/15/2005	243.4	28	28	332.6	264.3	0.10	80	11.7	0.10	80	11.7
3/16/2005	265.7	73	73	429.9	342.8	0.33	87	12.8	0.33	87	12.8
	268.4	73	73	338.8	266.3	0.26	88	12.9	0.26	88	12.9
3/17/2005	290.7	48	48	451.4	358.4	0.23	93	13.7	0.23	93	13.7
	292.2	70	70	410.9	325.2	0.30	94	13.7	0.30	94	13.7
	294.4	73	73	372.2	293.3	0.28	94	13.8	0.28	94	13.8
3/18/2005	313.0	45	45	361.2	287.3	0.17	98	14.3	0.17	98	14.3
	321.0	25	25	423.8	335.1	0.11	98	14.4	0.11	98	14.4
3/21/2005	387.2	18	18	326.5	258.1	0.06	102	15.0	0.06	102	15.0
	392.9	45	45	330.0	259.2	0.16	103	15.1	0.16	103	15.1
3/22/2005	408.7	73	73	417.6	331.3	0.32	108	15.9	0.32	108	15.9
	413.9	40	40	466.8	365.1	0.20	109	16.0	0.20	109	16.0
3/23/2005	432.4	28	28	461.6	367.7	0.14	112	16.4	0.14	112	16.4
	440.2	13	13	502.9	401.0	0.07	112	16.5	0.07	112	16.5
3/24/2005	463.9	18	18	382.8	300.7	0.07	114	16.7	0.07	114	16.7
3/25/2005	478.9	13	13	458.0	364.3	0.06	115	16.9	0.06	115	16.9
	482.1	48	48	513.9	407.0	0.26	116	17.0	0.26	116	17.0
3/28/2005	550.9	55	55	419.3	331.3	0.24	133	19.4	0.24	133	19.4
	558.8	35	35	484.0	376.1	0.18	134	19.6	0.18	134	19.6
3/29/2005	574.8	50	50	386.3	303.7	0.20	137	20.1	0.20	137	20.1
	578.4	13	13	409.1	318.6	0.05	138	20.1	0.05	138	20.1
	580.5	10	10	447.5	347.4	0.05	138	20.2	0.05	138	20.2
3/30/2005	597.6	55	55	505.6	396.7	0.29	143	20.9	0.29	143	20.9
	605.5	10	10	442.2	343.6	0.05	143	20.9	0.05	143	20.9
4/1/2005	645.7	80	80	479.6	378.3	0.41	159	23.3	0.41	159	23.3
	646.6	13	13	476.1	377.1	0.06	159	23.3	0.06	159	23.3
	648.8	3	3	445.7	348.9	0.01	159	23.3	0.01	159	23.3

Table B.1

Vapor Phase Hydrocarbon Recovery Data- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:					Calculations:						
Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as hexane)*	*Corrected THC Concentration [1] (ppmv as hexane)*	*System Exhaust Gas Flowrate (acfm)*	*System Exhaust Gas Flowrate (scfm)*	*THC Mass Flowrate (pounds/hour)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*	*Corrected THC Mass Flowrate [1] (pounds/hour)*	*Corrected Cumulative THC [1] (pounds)*	*Corrected Cumulative THC [1] (gallons, product)*
4/4/2005	713.2	48	48	473.0	374.6	0.24	175	25.6	0.24	175	25.6
	722.4	0	0	363.9	283.4	0.00	175	25.6	0.00	175	25.6
4/6/2005	762.6	0	0	433.0	337.5	0.00	175	25.6	0.00	175	25.6
	769.0	63	63	482.7	370.5	0.31	177	25.9	0.31	177	25.9
4/7/2005	788.0	63	63	378.4	296.7	0.25	181	26.6	0.25	181	26.6
	793.4	25	25	306.2	239.3	0.08	182	26.6	0.08	182	26.6
4/12/2005	904.1	73	73	481.8	382.2	0.37	223	32.6	0.37	223	32.6
4/13/2005	928.3	93	93	253.4	201.9	0.25	229	33.5	0.25	229	33.5
	931.5	48	48	427.7	334.0	0.21	230	33.6	0.21	230	33.6
4/14/2005	951.2	90	90	467.7	367.4	0.44	238	34.9	0.44	238	34.9
	957.7	0	0	163.0	127.9	0.00	238	34.9	0.00	238	34.9
4/18/2005	1,053.4	48	48	331.8	260.5	0.17	254	37.2	0.17	254	37.2
4/20/2005	1,093.8	10	10	398.6	311.8	0.04	256	37.5	0.04	256	37.5
	1,105.0	48	48	319.9	252.3	0.16	258	37.7	0.16	258	37.7
4/21/2005	1,119.7	5	5	335.3	267.8	0.02	258	37.8	0.02	258	37.8
	1,128.3	10	10	451.4	356.0	0.05	258	37.8	0.05	258	37.8
4/22/2005	1,142.1	48	48	426.8	336.0	0.21	261	38.3	0.21	261	38.3
	1,149.6	25	25	367.4	289.6	0.10	262	38.4	0.10	262	38.4
4/26/2005	1,216.4	35	35	367.4	301.6	0.14	271	39.8	0.14	271	39.8
4/27/2005	1,240.2	60	60	348.0	282.3	0.23	277	40.5	0.23	277	40.5
4/28/2005	1,254.6	35	35	455.4	374.5	0.18	279	40.9	0.18	279	40.9
5/2/2005	1,353.5	68	68	353.3	287.3	0.26	305	44.7	0.26	305	44.7
	1,359.2	55	55	363.4	296.6	0.22	306	44.9	0.22	306	44.9
5/3/2005	1,374.1	0	0	429.4	353.8	0.00	306	44.9	0.00	306	44.9
	1,380.8	60	60	429.9	351.1	0.28	308	45.1	0.28	308	45.1
5/4/2005	1,398.6	0	0	429.0	353.4	0.00	308	45.1	0.00	308	45.1
	1,407.2	2.5	3	355.5	287.9	0.01	308	45.1	0.01	308	45.1
5/5/2005	1,422.6	45	45	359.5	293.3	0.18	311	45.5	0.18	311	45.5
	1,428.8	0	0	429.9	347.2	0.00	311	45.5	0.00	311	45.5
5/6/2005	1,446.5	55	55	328.7	267.3	0.20	314	46.1	0.20	314	46.1
	1,453.6	35	35	354.2	282.9	0.13	315	46.2	0.13	315	46.2
5/9/2005	1,519.0	3	3	558.8	451.3	0.02	316	46.3	0.02	316	46.3
	1,525.2	93	93	590.0	462.6	0.57	320	46.9	0.57	320	46.9
5/10/2005	1,541.4	0	0	519.6	417.2	0.00	320	46.9	0.00	320	46.9
	1,546.7	60	60	597.1	427.9	0.34	322	47.1	0.34	322	47.1
5/11/2005	1,561.6	18	18	644.2	485.3	0.11	323	47.4	0.11	323	47.4
	1,570.8	10	10	683.3	525.9	0.07	324	47.5	0.07	324	47.5
5/12/2005	1,585.6	10	10	623.5	471.6	0.06	325	47.6	0.06	325	47.6
	1,592.2	13	13	645.9	492.1	0.08	326	47.7	0.08	326	47.7
5/13/2005	1,615.0	45	45	619.5	466.4	0.28	332	48.6	0.28	332	48.6
5/16/2005	1,681.3	3	3	646.8	497.6	0.02	333	48.8	0.02	333	48.8
	1,688.9	0	0	633.6	481.2	0.00	333	48.8	0.00	333	48.8
5/17/2005	1,704.9	3	3	684.2	526.8	0.02	333	48.8	0.02	333	48.8
	1,712.9	58	58	633.6	479.3	0.37	336	49.3	0.37	336	49.3
5/18/2005	1,729.3	15	15	672.3	513.1	0.10	338	49.5	0.10	338	49.5
5/19/2005	1,734.0	18	18	642.0	488.7	0.11	339	49.6	0.11	339	49.6
5/20/2005	1,749.9	48	48	692.6	530.7	0.34	344	50.4	0.34	344	50.4
	1,755.3	68	68	607.3	439.6	0.40	346	50.7	0.40	346	50.7
5/23/2005	1,823.5	3	3	630.7	473.4	0.02	347	50.8	0.02	347	50.8

Table B.1

Vapor Phase Hydrocarbon Recovery Data- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as hexane)*	*Corrected THC Concentration [1] (ppmv as hexane)*	*System Exhaust Gas Flowrate (acfm)*
5/24/2005	1,845.9	23	23	633.6
	1,851.5	45	45	660.0
5/25/2005	1,867.2	40	40	646.4
	1,872.4	58	58	641.1
5/26/2005	1,891.2	18	18	667.0
	1,895.1	63	63	642.0
5/27/2005	1,904.3	40	40	621.3
	1,907.8	73	73	646.3
6/7/2005	1,909.0	103	100	654.7
6/8/2005	1,910.0	58	58	623.5
	1,912.9	113	100	667.9
6/9/2005	1,927.3	13	13	666.2
	1,933.3	95	95	662.2
6/10/2005	1,951.4	38	38	648.6
	1,957.7	108	100	672.8
6/13/2005	2,023.5	13	13	683.3
	2,027.8	35	35	697.4
6/14/2005	2,047.3	25	25	695.6
	2,054.9	85	85	686.4
6/15/2005	2,071.6	15	15	709.3
	2,079.9	25	25	697.0
6/16/2005	2,096.4	25	25	704.9
	2,099.8	35	35	667.9
6/17/2005	2,124.6	35	35	691.2
6/20/2005	2,191.8	60	60	682.4
	2,199.8	93	93	658.2
6/21/2005	2,214.9	38	38	669.7
6/22/2005	2,237.5	23	23	719.8
6/23/2005	2,260.6	55	55	667.0
	2,264.6	68	68	669.7
6/24/2005	2,279.8	48	48	663.1
	2,282.9	60	60	665.7
6/27/2005	2,351.7	48	48	693.4
	2,354.5	125	100	658.7
6/28/2005	2,372.9	28	28	719.0
	2,381.5	115	100	674.1
6/29/2005	2,396.0	40	40	671.0
	2,399.1	95	95	694.3
7/4/2005	2,516.5	73	73	693.0
7/5/2005	2,539.4	60	60	711.0
	2,545.4	118	100	693.4
7/6/2005	2,559.7	23	23	723.4
	2,568.9	70	70	667.9
7/7/2005	2,583.5	38	38	707.1
	2,593.3	125	100	683.3
7/8/2005	2,611.2	108	100	653.4
7/11/2005	2,643.4	145	100	672.8
7/13/2005	2,660.1	163	100	684.6

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*	*Corrected THC Mass Flowrate [1] (pounds/hour)*	*Corrected Cumulative THC [1] (pounds)*	*Corrected Cumulative THC [1] (gallons, product)*
477.0	0.14	350	51.3	0.14	350	51.3
497.6	0.30	352	51.6	0.30	352	51.6
485.4	0.26	356	52.2	0.26	356	52.2
473.5	0.36	358	52.4	0.36	358	52.4
496.2	0.12	360	52.8	0.12	360	52.8
472.3	0.40	362	53.0	0.40	362	53.0
456.0	0.24	364	53.3	0.24	364	53.3
476.2	0.46	366	53.5	0.46	366	53.5
474.7	0.65	366	53.7	0.64	366	53.7
458.7	0.35	367	53.7	0.35	367	53.7
496.8	0.75	369	54.0	0.67	369	54.0
507.1	0.08	370	54.2	0.08	370	54.2
491.8	0.63	374	54.8	0.63	374	54.7
479.4	0.24	378	55.4	0.24	378	55.4
498.9	0.72	383	56.1	0.67	382	56.0
517.7	0.09	388	56.9	0.09	388	56.8
537.0	0.25	390	57.0	0.25	389	57.0
526.2	0.18	393	57.6	0.18	392	57.5
511.0	0.58	397	58.2	0.58	397	58.1
547.9	0.11	399	58.5	0.11	399	58.4
530.2	0.18	401	58.7	0.18	400	58.6
547.2	0.18	404	59.1	0.18	403	59.0
502.4	0.24	405	59.2	0.24	404	59.2
538.4	0.25	411	60.2	0.25	410	60.1
525.9	0.42	439	64.3	0.42	439	64.2
483.5	0.60	444	65.0	0.60	443	64.9
509.4	0.26	448	65.6	0.26	447	65.5
557.9	0.17	452	66.1	0.17	451	66.1
511.5	0.38	460	67.4	0.38	460	67.3
493.5	0.45	462	67.7	0.45	462	67.6
498.8	0.32	467	68.4	0.32	466	68.3
494.0	0.40	468	68.6	0.40	468	68.5
518.7	0.33	491	71.9	0.33	490	71.8
473.5	0.79	493	72.2	0.63	492	72.1
536.1	0.20	497	72.7	0.20	496	72.6
496.3	0.76	503	73.7	0.66	501	73.4
509.6	0.27	507	74.3	0.27	505	74.0
519.4	0.66	509	74.6	0.66	507	74.3
522.1	0.51	569	83.3	0.51	567	83.0
543.9	0.44	579	84.8	0.44	577	84.5
518.7	0.82	584	85.5	0.69	581	85.1
554.7	0.17	586	85.8	0.17	583	85.4
511.0	0.48	590	86.5	0.48	588	86.1
544.5	0.27	594	87.1	0.27	592	86.7
510.7	0.85	603	88.3	0.68	599	87.7
479.2	0.69	615	90.1	0.64	610	89.3
495.7	0.96	646	94.6	0.66	631	92.5
506.1	1.10	665	97.3	0.68	643	94.1

Table B.1

Vapor Phase Hydrocarbon Recovery Data- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as hexane)*	*Corrected THC Concentration [1] (ppmv as hexane)*	*System Exhaust Gas Flowrate (acfm)*
7/14/2005	2,675.9	50	50	654.7
	2,678.3	113	100	641.1
7/15/2005	2,695.2	85	85	654.7
	2,700.7	160	100	684.2
7/18/2005	2,767.8	93	93	718.1
	2,770.2	108	100	639.8
7/19/2005	2,790.7	120	100	721.6
	2,814.7	90	90	711.5
7/20/2005	2,821.3	168	100	705.6
7/21/2005	2,837.0	75	75	706.6
	2,842.9	175	100	698.7
7/25/2005	2,847.9	185	100	671.0
7/26/2005	2,848.6	125	100	656.9
7/27/2005	2,855.9	113	100	690.8
7/29/2005	2,860.3	190	100	654.7
8/1/2005	2,932.6	195	100	666.0
	2,935.6	210	100	646.8
8/2/2005	2,935.8	185	100	641.1
	2,936.3	223	100	642.0
8/3/2005	2,938.6	208	100	685.5
8/4/2005	2,957.4	126	100	635.8
	2,960.3	125	100	627.9
8/5/2005	2,981.2	125	100	677.1
8/9/2005	2,981.8	145	100	696.0
	2,988.8	255	100	661.8
8/10/2005	3,005.0	125	100	649.9
	3,012.2	108	100	686.8
8/11/2005	3,028.7	83	83	706.6
8/15/2005	3,119.4	63	63	619.1
	3,121.0	115	100	696.5
8/16/2005	3,148.9	98	98	656.5
8/17/2005	3,162.7	60	60	680.7
	3,172.6	153	100	688.5
8/18/2005	3,195.5	153	100	640.2
8/19/2005	3,210.8	73	73	627.9
	3,219.6	73	73	656.5
8/22/2005	3,278.8	63	63	699.6
	3,289.4	105	100	694.8
8/23/2005	3,302.3	63	63	701.8
	3,312.2	98	98	722.0
8/24/2005	3,326.3	68	68	766.9
	3,335.9	103	100	684.6
8/26/2005	3,370.0	98	98	699.2
8/29/2005	3,424.6	103	100	737.9
	3,432.1	163	100	675.0
8/30/2005	3,445.9	90	90	718.2
	3,454.3	130	100	700.9
8/31/2005	3,470.6	103	100	737.9
	3,478.0	130	100	688.6

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*	*Corrected THC Mass Flowrate [1] (pounds/hour)*	*Corrected Cumulative THC [1] (pounds)*	*Corrected Cumulative THC [1] (gallons, product)*
481.7	0.32	670	98.1	0.32	648	94.9
475.0	0.72	671	98.3	0.64	649	95.1
494.4	0.56	681	99.7	0.56	659	96.5
502.2	1.08	687	100.6	0.67	663	97.0
540.1	0.67	732	107.1	0.67	707	103.6
474.0	0.68	733	107.4	0.63	709	103.8
557.5	0.90	752	110.1	0.75	724	106.1
545.6	0.66	767	112.4	0.66	740	108.4
532.0	1.19	775	113.5	0.71	745	109.1
536.6	0.54	784	114.8	0.54	753	110.3
521.0	1.22	791	115.8	0.70	757	110.9
504.7	1.25	797	116.8	0.68	761	111.4
526.0	0.88	798	116.8	0.70	761	111.5
535.9	0.81	804	117.7	0.72	766	112.2
495.2	1.26	809	118.5	0.66	769	112.7
492.3	1.29	902	132.1	0.66	817	119.6
478.1	1.34	906	132.7	0.64	819	119.9
494.0	1.22	906	132.7	0.66	819	119.9
472.3	1.41	907	132.9	0.63	819	120.0
513.6	1.43	910	133.3	0.69	821	120.2
467.7	0.79	925	135.5	0.63	833	121.9
461.9	0.77	927	135.8	0.62	834	122.2
500.5	0.84	945	138.4	0.67	848	124.3
537.7	1.04	946	138.5	0.72	849	124.3
491.5	1.68	957	140.2	0.66	853	125.0
484.2	0.81	970	142.1	0.65	864	126.5
506.1	0.73	976	142.9	0.68	869	127.2
536.2	0.59	985	144.3	0.59	879	128.7
444.7	0.37	1,019	149.3	0.37	912	133.6
521.0	0.80	1,020	149.4	0.70	914	133.8
480.4	0.63	1,038	152.0	0.63	931	136.3
508.7	0.41	1,044	152.8	0.41	937	137.2
502.2	1.03	1,054	154.3	0.67	943	138.1
464.8	0.95	1,075	157.5	0.62	958	140.2
456.1	0.44	1,082	158.5	0.44	964	141.2
486.4	0.47	1,086	159.1	0.47	968	141.8
543.6	0.45	1,113	163.1	0.45	995	145.8
533.2	0.75	1,121	164.2	0.71	1,003	146.9
538.6	0.45	1,127	165.1	0.45	1,009	147.7
547.5	0.71	1,134	166.1	0.71	1,016	148.8
601.3	0.54	1,142	167.2	0.54	1,024	149.9
519.9	0.71	1,149	168.2	0.70	1,030	150.9
526.7	0.69	1,172	171.7	0.69	1,054	154.3
564.5	0.77	1,214	177.9	0.76	1,095	160.3
503.3	1.09	1,223	179.1	0.67	1,100	161.1
551.6	0.66	1,232	180.4	0.66	1,109	162.4
537.1	0.93	1,240	181.5	0.72	1,115	163.3
572.9	0.79	1,252	183.4	0.77	1,128	165.1
521.0	0.91	1,259	184.4	0.70	1,133	165.9

Table B.1

Vapor Phase Hydrocarbon Recovery Data- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as hexane)*	*Corrected THC Concentration [1] (ppmv as hexane)*	*System Exhaust Gas Flowrate (acfm)*
9/1/2005	3,493.7	130	100	711.9
	3,501.6	185	100	694.3
9/6/2005	3,613.1	98	98	682.0
	3,620.9	153	100	688.6
9/7/2005	3,642.3	143	100	675.4
	3,646.5	163	100	658.7
9/8/2005	3,666.9	75	75	708.4
9/9/2005	3,686.2	103	100	679.8
	3,691.0	118	100	675.0
9/12/2005	3,756.0	103	100	732.6
	3,763.5	145	100	723.4
9/13/2005	3,778.1	126	100	730.0
	3,787.2	280	100	676.7
9/14/2005	3,801.7	218	100	722.9
	3,810.7	255	100	756.8
9/15/2005	3,824.7	225	100	700.5
	3,832.4	200	100	726.9
9/16/2005	3,846.7	278	100	689.5
9/19/2005	3,917.5	325	100	686.4
	3,925.8	373	100	699.6
9/20/2005	3,941.4	305	100	699.2
	3,949.7	397	100	717.6
9/22/2005	3,988.4	410	100	740.5
	3,993.5	418	100	689.5
9/23/2005	4,017.1	328	100	704.0
9/26/2005	4,067.7	400	100	704.9
	4,072.6	453	100	713.7
9/29/2005	4,086.0	505	100	675.4
10/6/2005	4,087.9	45	45	737.4
10/26/2005	4,111.7	0	0	771.3
10/27/2005	4,141.9	0	0	722.0
10/28/2005	4,160.2	0	0	765.2
10/31/2005	4,231.7	0	0	717.2
11/2/2005	4,283.3	0	0	740.1
11/3/2005	4,307.4	0	0	726.9
11/4/2005	4,324.8	0	0	748.0
11/7/2005	4,420.6	243	100	697.0
11/8/2005	4,443.1	255	100	695.6
11/11/2005	4,490.7	48	48	704.0
11/14/2005	4,563.5	222.5	100	730.0
11/15/2005	4,591.1	230	100	725.6
11/16/2005	4,614.3	73	73	741.8
11/17/2005	4,637.9	5	5	749.8
11/18/2005	4,660.2	5	5	780.1
11/21/2005	4,734.4	0	0	693.0
11/22/2005	4,756.4	47.5	48	755.7
11/23/2005	4,782.1	27.5	28	705.3
1/4/2006	4,785.1	25	25	729.5
1/5/2006	4,809.1	35	35	682.0

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*	*Corrected THC Mass Flowrate [1] (pounds/hour)*	*Corrected Cumulative THC [1] (pounds)*	*Corrected Cumulative THC [1] (gallons, product)*
550.4	0.96	1,274	186.6	0.74	1,144	167.6
520.2	1.29	1,284	188.1	0.70	1,150	168.4
510.9	0.67	1,359	199.0	0.67	1,224	179.3
511.0	1.04	1,367	200.2	0.68	1,230	180.1
500.4	0.95	1,387	203.2	0.67	1,244	182.2
476.8	1.04	1,392	203.8	0.64	1,247	182.6
541.9	0.54	1,403	205.4	0.54	1,258	184.2
511.3	0.70	1,418	207.7	0.68	1,271	186.1
499.3	0.79	1,422	208.2	0.67	1,274	186.6
550.2	0.75	1,470	215.3	0.74	1,322	193.6
534.7	1.04	1,478	216.4	0.72	1,327	194.4
547.8	0.92	1,491	218.4	0.73	1,338	196.0
493.6	1.85	1,508	220.9	0.66	1,344	196.8
540.3	1.57	1,531	224.2	0.72	1,355	198.4
569.7	1.94	1,548	226.8	0.76	1,361	199.4
529.9	1.60	1,568	229.6	0.71	1,371	200.8
559.7	1.50	1,579	231.3	0.75	1,377	201.7
522.4	1.94	1,607	235.3	0.70	1,387	203.1
509.8	2.22	1,764	258.3	0.68	1,435	210.2
522.9	2.61	1,786	261.5	0.70	1,441	211.1
531.0	2.17	1,819	266.5	0.71	1,452	212.7
535.1	2.84	1,843	269.9	0.72	1,458	213.6
557.0	3.06	1,961	287.2	0.75	1,487	217.8
519.0	2.90	1,976	289.4	0.69	1,491	218.3
528.7	2.32	2,031	297.4	0.71	1,507	220.8
528.9	2.83	2,174	318.4	0.71	1,543	226.0
545.1	3.30	2,190	320.8	0.73	1,547	226.5
501.6	3.39	2,236	327.4	0.67	1,556	227.8
581.1	0.35	2,236	327.5	0.35	1,556	227.9
643.3	0.00	2,236	327.5	0.00	1,556	227.9
582.1	0.00	2,236	327.5	0.00	1,556	227.9
631.5	0.00	2,236	327.5	0.00	1,556	227.9
584.2	0.00	2,236	327.5	0.00	1,556	227.9
598.9	0.00	2,236	327.5	0.00	1,556	227.9
593.0	0.00	2,236	327.5	0.00	1,556	227.9
600.1	0.00	2,236	327.5	0.00	1,556	227.9
540.6	1.76	2,404	352.1	0.72	1,626	238.1
542.3	1.85	2,446	358.2	0.73	1,642	240.5
557.6	0.35	2,463	360.7	0.35	1,659	243.0
584.0	1.74	2,590	379.3	0.78	1,716	251.3
578.1	1.78	2,639	386.5	0.77	1,737	254.4
591.0	0.57	2,652	388.4	0.57	1,751	256.4
612.3	0.04	2,653	388.5	0.04	1,752	256.5
632.2	0.04	2,654	388.7	0.04	1,752	256.7
544.7	0.00	2,654	388.7	0.00	1,752	256.7
616.7	0.39	2,663	389.9	0.39	1,761	257.9
568.7	0.21	2,668	390.7	0.21	1,766	258.7
572.0	0.19	2,669	390.8	0.19	1,767	258.8
535.6	0.25	2,675	391.7	0.25	1,773	259.7

Table B.1

Vapor Phase Hydrocarbon Recovery Data- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as hexane)*	*Corrected THC Concentration [1] (ppmv as hexane)*	*System Exhaust Gas Flowrate (acfm)*
1/6/2006	4,830.7	17.5	18	706.6
1/9/2006	4,899.5	55	55	691.2
1/12/2006	4,973.3	40	40	612.5
1/13/2005	4,997.5	10	10	670.6
1/16/2006	5,047.2	25	25	642.4
1/17/2006	5,067.2	37.5	38	673.2
1/18/2006	5,092.7	25	25	710.6
1/19/2006	5,115.9	10	10	633.2
1/20/2006	5,137.6	10	10	685.5
1/23/2006	5,141.3	22.5	23	689.5
1/24/2006	5,164.0	22.5	23	668.8
1/26/2006	5,187.9	257.5	100	683.3
1/27/2006	5,206.1	137.5	100	633.2
1/30/2006	5,277.7	82.5	83	627.0
1/31/2006	5,306.9	90	90	675.4
2/6/2006	5,309.5	72.5	73	694.8
2/7/2006	5,328.0	80	80	660.4
2/8/2006	5,351.9	97.5	98	720.3
2/9/2006	5,372.6	82.5	83	743.6
2/10/2006	5,395.3	72.5	73	649.9

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*	*Corrected THC Mass Flowrate [1] (pounds/hour)*	*Corrected Cumulative THC [1] (pounds)*	*Corrected Cumulative THC [1] (gallons, product)*
565.4	0.13	2,677	392.1	0.13	1,776	260.1
539.8	0.40	2,705	396.1	0.40	1,803	264.1
439.0	0.24	2,722	398.7	0.24	1,821	266.6
508.4	0.07	2,724	398.9	0.07	1,822	266.9
500.8	0.17	2,732	400.1	0.17	1,831	268.1
526.5	0.26	2,737	400.9	0.26	1,836	268.9
557.6	0.19	2,742	401.6	0.19	1,841	269.6
487.5	0.07	2,744	401.8	0.07	1,842	269.8
532.6	0.07	2,745	402.0	0.07	1,844	270.0
543.8	0.16	2,746	402.1	0.16	1,844	270.1
523.5	0.16	2,749	402.7	0.16	1,848	270.6
536.7	1.85	2,794	409.1	0.72	1,865	273.1
478.9	0.88	2,810	411.5	0.64	1,877	274.9
491.5	0.54	2,849	417.2	0.54	1,916	280.5
518.4	0.62	2,867	419.8	0.62	1,934	283.2
546.1	0.53	2,868	420.0	0.53	1,935	283.4
513.1	0.55	2,878	421.5	0.55	1,945	284.9
570.0	0.74	2,896	424.1	0.74	1,963	287.5
574.5	0.63	2,909	426.1	0.63	1,976	289.4
496.4	0.48	2,920	427.7	0.48	1,987	291.0

NOTES:

[1]Values have been adjusted to correct for analyzer drift of the System 1 LEL Sensor

Table B.2

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
2/26/2005	5.1	0	50	0	0	0.0	0.0	0	233
2/27/2005	13.6	0	539	1	1	0.0	100.0	3	1,382
3/1/2005	56.3	25	2,915	2	27	91.2	8.8	15	1,335
3/3/2005	96.8	50	4,779	5	55	90.7	9.3	16	1,105
3/4/2005	117.6	75	5,470	6	81	92.7	7.3	30	798
3/10/2005	131.3	100	6,005	9	109	91.7	8.3	49	937
3/11/2005	146.7	125	6,258	11	136	92.3	7.7	41	394
3/16/2005	268.4	500	7,215	13	513	97.5	2.5	74	189
3/17/2005	290.7	600	7,470	14	614	97.8	2.2	109	275
3/18/2005	321.0	625	7,635	14	639	97.7	2.3	20	130
3/21/2005	392.9	825	8,207	15	840	98.2	1.8	67	191
3/22/2005	413.9	888	8,367	16	904	98.2	1.8	72	183
3/23/2005	440.2	950	8,522	17	967	98.3	1.7	57	142
3/24/2005	463.9	988	8,830	17	1,004	98.3	1.7	38	312
3/25/2005	482.1	1,050	8,988	17	1,067	98.4	1.6	83	208
3/28/2005	558.8	1,188	9,700	20	1,207	98.4	1.6	44	223
3/29/2005	580.5	1,250	9,941	20	1,270	98.4	1.6	70	267
3/30/2005	605.5	1,375	10,098	21	1,396	98.5	1.5	121	151
4/1/2005	648.8	1,438	10,635	23	1,461	98.4	1.6	36	298
4/4/2005	722.4	1,438	11,492	26	1,463	98.3	1.7	1	280
4/6/2005	769.0	1,475	11,884	26	1,501	98.3	1.7	19	202
4/7/2005	793.4	1,500	12,047	27	1,527	98.3	1.7	25	160
4/12/2005	904.1	1,625	12,847	33	1,658	98.0	2.0	28	174
4/13/2005	931.5	1,688	12,847	34	1,721	98.0	2.0	56	0
4/14/2005	957.7	1,750	13,738	35	1,785	98.0	2.0	58	816
4/18/2005	1,053.4	1,813	16,191	37	1,850	98.0	2.0	16	615
4/20/2005	1,105.0	1,875	17,235	38	1,913	98.0	2.0	29	486
4/21/2005	1,128.3	1,906	17,333	38	1,944	98.1	1.9	32	101
4/22/2005	1,149.6	1,938	17,410	38	1,976	98.1	1.9	36	86
4/26/2005	1,216.4	2,049	17,731	40	2,089	98.1	1.9	40	115
4/27/2005	1,240.2	2,061	17,768	41	2,102	98.1	1.9	13	37
4/28/2005	1,254.6	2,080	17,798	41	2,121	98.1	1.9	32	50
5/2/2005	1,353.5	2,080	18,100	45	2,125	97.9	2.1	1	73
5/3/2005	1,374.1	2,205	18,186	45	2,250	98.0	2.0	146	100
5/4/2005	1,398.6	2,205	18,263	45	2,250	98.0	2.0	0.3	75
5/5/2005	1,422.6	2,205	18,376	46	2,251	98.0	2.0	0.4	114
5/6/2005	1,446.5	2,205	18,447	46	2,251	98.0	2.1	1	70
5/9/2005	1,519.0	2,205	18,906	47	2,251	97.9	2.1	0.1	152
5/10/2005	1,541.4	2,205	19,056	47	2,252	97.9	2.1	1	161
5/11/2005	1,561.6	2,268	19,213	48	2,315	98.0	2.1	75	186
5/12/2005	1,585.6	2,330	19,438	48	2,378	98.0	2.0	63	225

Table B.2

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
5/13/2005	1,615.0	2,330	19,800	49	2,379	98.0	2.0	1	295
5/16/2005	1,681.3	2,330	20,804	49	2,379	97.9	2.1	0.1	364
5/17/2005	1,704.9	2,393	21,112	49	2,441	98.0	2.0	64	313
5/18/2005	1,729.3	2,393	21,456	50	2,442	98.0	2.0	1	339
5/19/2005	1,734.0	2,393	21,526	50	2,442	98.0	2.0	0.4	356
5/20/2005	1,749.9	2,393	21,753	51	2,443	97.9	2.1	1	343
5/23/2005	1,823.5	2,455	22,572	51	2,506	98.0	2.0	21	267
5/24/2005	1,851.5	2,455	22,572	52	2,507	97.9	2.1	1	0
5/25/2005	1,872.4	2,480	22,792	52	2,532	97.9	2.1	30	253
5/26/2005	1,895.1	2,483	23,327	53	2,536	97.9	2.1	4	566
5/27/2005	1,907.8	2,518	23,399	54	2,571	97.9	2.1	66	136
6/7/2005	1,909.0	2,549	23,399	54	2,602	97.9	2.1	629	0
6/8/2005	1,912.9	2,555	23,486	54	2,609	97.9	2.1	40	536
6/9/2005	1,933.3	2,580	23,647	55	2,635	97.9	2.1	30	189
6/10/2005	1,957.7	2,580	23,968	56	2,636	97.9	2.1	1	315
6/13/2005	2,027.8	2,611	24,855	57	2,668	97.9	2.1	11	304
6/14/2005	2,054.9	2,643	25,246	58	2,701	97.8	2.2	29	346
6/15/2005	2,079.9	2,674	25,626	59	2,732	97.9	2.1	30	364
6/16/2005	2,099.8	2,686	25,951	59	2,745	97.8	2.2	16	392
6/17/2005	2,124.6	2,705	26,343	60	2,765	97.8	2.2	19	380
6/20/2005	2,199.8	2,730	27,758	65	2,795	97.7	2.3	10	452
6/21/2005	2,214.9	2,755	27,984	66	2,821	97.7	2.3	41	359
6/22/2005	2,237.5	2,755	28,388	66	2,821	97.7	2.3	1	429
6/23/2005	2,264.6	2,768	29,037	68	2,835	97.6	2.4	12	574
6/24/2005	2,282.9	2,770	29,411	69	2,839	97.6	2.4	4	490
6/27/2005	2,354.5	2,773	30,710	72	2,845	97.5	2.5	2	435
6/28/2005	2,381.5	2,785	30,799	73	2,858	97.4	2.6	12	79
6/29/2005	2,399.1	2,805	31,199	74	2,879	97.4	2.6	29	545
7/4/2005	2,516.5	2,818	34,093	83	2,901	97.1	2.9	4	592
7/5/2005	2,545.4	2,843	34,671	85	2,928	97.1	2.9	23	480
7/6/2005	2,568.9	2,855	35,267	86	2,941	97.1	2.9	14	608
7/7/2005	2,593.3	2,868	35,847	88	2,955	97.0	3.0	14	571
7/8/2005	2,611.2	2,893	36,191	89	2,982	97.0	3.0	36	461
7/11/2005	2,643.4	2,930	36,869	93	3,023	96.9	3.1	30	506
7/13/2005	2,660.1	2,943	36,962	94	3,037	96.9	3.1	20	133
7/14/2005	2,678.3	2,955	37,136	95	3,050	96.9	3.1	18	230
7/15/2005	2,700.7	2,968	37,542	97	3,065	96.8	3.2	15	435
7/18/2005	2,770.2	2,974	39,123	104	3,078	96.6	3.4	5	546
7/19/2005	2,814.7	2,983	40,124	108	3,091	96.5	3.5	7	540
7/20/2005	2,821.3	2,985	40,633	109	3,094	96.5	3.5	12	1,853

Table B.2

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
7/21/2005	2,842.9	2,988	40,876	111	3,098	96.4	3.6	5	270
7/25/2005	2,847.9	3,036	40,937	111	3,147	96.5	3.5	235	290
7/26/2005	2,848.6	3,039	40,937	112	3,150	96.5	3.5	89	0
7/27/2005	2,855.9	3,041	40,966	112	3,153	96.4	3.6	11	96
7/29/2005	2,860.3	3,044	41,131	113	3,156	96.4	3.6	16	375
8/1/2005	2,935.6	3,044	43,522	120	3,163	96.2	3.8	2	713
8/2/2005	2,936.3	3,044	43,522	120	3,164	96.2	3.8	3	680
8/3/2005	2,938.6	3,046	42,613	120	3,166	96.2	3.8	28	444
8/4/2005	2,960.3	3,049	43,976	122	3,171	96.1	3.9	5	653
8/5/2005	2,981.2	3,050	44,092	124	3,174	96.1	3.9	4	558
8/9/2005	2,988.8	3,051	44,451	125	3,176	96.1	3.9	6	599
8/10/2005	3,012.2	3,052	45,026	127	3,179	96.0	4.0	4	600
8/11/2005	3,028.7	3,054	44,759	129	3,182	96.0	4.0	5	520
8/15/2005	3,121.0	3,056	45,742	134	3,190	95.8	4.2	2	424
8/16/2005	3,148.9	3,059	46,186	136	3,195	95.7	4.3	4	300
8/17/2005	3,172.6	3,061	46,582	138	3,199	95.7	4.3	4	311
8/18/2005	3,195.5	3,089	46,853	140	3,229	95.7	4.3	31	396
8/19/2005	3,219.6	3,139	47,035	142	3,280	95.7	4.3	51	283
8/22/2005	3,289.4	3,139	48,055	147	3,285	95.5	4.5	2	309
8/23/2005	3,312.2	3,139	48,690	149	3,287	95.5	4.5	2	315
8/24/2005	3,335.9	3,139	48,859	151	3,289	95.4	4.6	2	284
8/26/2005	3,370.0	3,140	50,877	154	3,294	95.3	4.7	3	430
8/29/2005	3,424.6	3,176	53,379	161	3,337	95.2	4.8	19	604
8/30/2005	3,454.3	3,182	53,861	163	3,346	95.1	4.9	7	603
8/31/2005	3,478.0	3,189	54,262	166	3,354	95.1	4.9	9	603
9/1/2005	3,501.6	3,207	54,568	168	3,376	95.0	5.0	22	605
9/6/2005	3,620.9	3,214	55,561	180	3,394	94.7	5.3	4	510
9/7/2005	3,646.5	3,220	55,909	183	3,402	94.6	5.4	8	528
9/8/2005	3,666.9	3,226	56,079	184	3,410	94.6	5.4	9	500
9/9/2005	3,691.0	3,232	56,341	187	3,419	94.5	5.5	9	506
9/12/2005	3,763.5	3,239	56,956	194	3,433	94.3	5.7	5	371
9/13/2005	3,787.2	3,245	57,314	197	3,442	94.3	5.7	9	260
9/14/2005	3,810.7	3,251	57,581	199	3,450	94.2	5.8	9	251
9/15/2005	3,832.4	3,257	57,822	202	3,459	94.2	5.8	9	241
9/16/2005	3,846.7	3,264	61,773	203	3,467	94.1	5.9	13	501
9/19/2005	3,925.8	3,276	62,712	211	3,487	93.9	6.1	6	563
9/20/2005	3,949.7	3,289	62,801	214	3,502	93.9	6.1	15	546
9/22/2005	3,993.5	3,314	63,068	218	3,532	93.8	6.2	16	514
9/23/2005	4,017.1	3,339	63,248	221	3,559	93.8	6.2	28	508

Table B.2

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
9/26/2005	4,072.6	3,345	63,428	227	3,572	93.7	6.3	5	502
9/29/2005	4,086.0	3,352	63,896	228	3,579	93.6	6.4	14	529
10/6/2005	4,087.9	3,352	64,203	228	3,579	93.6	6.4	1	573
10/26/2005	4,111.7	3,352	64,881	228	3,579	93.6	6.4	0	607
10/27/2005	4,141.9	3,352	65,785	228	3,579	93.6	6.4	0	326
10/28/2005	4,160.2	3,352	66,329	228	3,579	93.6	6.4	0	370
10/31/2005	4,231.7	3,352	67,770	228	3,579	93.6	6.4	0	423
11/2/2005	4,283.3	3,357	68,776	228	3,584	93.6	6.4	2	473
11/3/2005	4,307.4	3,359	69,315	228	3,587	93.6	6.4	2	502
11/4/2005	4,324.8	3,362	69,673	228	3,589	93.7	6.3	3	594
11/7/2005	4,420.6	3,364	71,779	238	3,602	93.4	6.6	3	565
11/8/2005	4,443.1	3,367	72,241	241	3,607	93.3	6.7	5	543
11/11/2005	4,490.7	3,369	73,172	243	3,612	93.3	6.7	3	525
11/14/2005	4,563.5	3,372	74,317	243	3,615	93.3	6.7	1	486
11/15/2005	4,591.1	3,385	74,845	243	3,628	93.3	6.7	11	474
11/16/2005	4,614.3	3,388	75,251	243	3,631	93.3	6.7	3	469
11/17/2005	4,637.9	3,391	75,833	243	3,634	93.3	6.7	3	478
11/18/2005	4,660.2	3,394	76,234	243	3,637	93.3	6.7	3	471
11/21/2005	4,734.4	3,397	77,902	243	3,640	93.3	6.7	1	482
11/22/2005	4,756.4	3,400	78,375	243	3,643	93.3	6.7	3	471
11/23/2005	4,782.1	3,403	78,881	243	3,646	93.3	6.7	3	470
1/4/2006	4,785.1	3,403	80,242	243	3,646	93.3	6.7	0	576
1/5/2006	4,809.1	3,406	80,481	243	3,649	93.3	6.7	2	602
1/6/2006	4,830.7	3,408	80,656	243	3,651	93.3	6.7	3	582
1/9/2006	4,899.5	3,410	81,066	243	3,653	93.3	6.7	1	489
1/12/2006	4,973.3	3,412	81,350	243	3,655	93.4	6.6	1	395
1/13/2005	4,997.5	3,414	81,358	243	3,657	93.4	6.6	2	365
1/16/2006	5,047.2	3,415	81,730	243	3,658	93.4	6.6	0.5	294
1/17/2006	5,067.2	3,416	81,898	243	3,659	93.4	6.6	1.2	272
1/18/2006	5,092.7	3,417	82,065	243	3,660	93.4	6.6	0.9	246
1/19/2006	5,115.9	3,419	82,248	243	3,662	93.4	6.6	2.1	146
1/20/2006	5,137.6	3,420	82,559	243	3,663	93.4	6.6	1.1	152
1/23/2006	5,141.3	3,421	82,763	243	3,664	93.4	6.6	3.2	163
1/24/2006	5,164.0	3,422	82,951	243	3,665	93.4	6.6	1.6	171
1/26/2006	5,187.9	3,423	83,637	243	3,666	93.4	6.6	0.5	256
1/27/2006	5,206.1	3,423	84,320	243	3,666	93.4	6.6	0.7	341
1/30/2006	5,277.7	3,424	86,348	243	3,667	93.4	6.6	0.2	481
1/31/2006	5,306.9	3,425	88,415	243	3,668	93.4	6.6	1.2	653
2/6/2006	5,309.5	3,426	88,517	243	3,669	93.4	6.6	4.6	714

Table B.2

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*
2/7/2006	5,328.0	3,426	88,979
2/8/2006	5,351.9	3,427	89,524
2/9/2006	5,372.6	3,427	89,892
2/10/2006	5,395.3	3,427	90,345

Calculations:

Cumulative Vapor-Phase LNAPL Recovery (gallons, product)	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*
243	3,669	93.4	6.6
243	3,670	93.4	6.6
243	3,670	93.4	6.6
243	3,670	93.4	6.6

Rate Estimates:

Intermittent LNAPL Recovery Rate (gallons per day)	*Intermittent Water Production Rate (gallons per day)*
0.6	762
0.5	780
0.6	740
0.0	767

Table B.3

Vapor Phase Hydrocarbon Recovery Data- System 2
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as methane)*	*System Exhaust Gas Flowrate (acfm)*
5/5/2005	5.0	50	808.5
5/6/2005	23.2	50	808.5
	30.3	50	808.5
5/9/2005	95.5	50	808.5
5/10/2005	99.0	50	808.5
5/11/2005	114.0	50	808.5
	123.5	50	808.5
5/12/2005	138.8	50	808.5
	146.0	50	808.5
5/19/2005	169.5	50	770.0
5/20/2005	184.3	50	808.5
	188.6	50	808.5
5/24/2005	279.7	50	808.5
	287.4	50	808.5
5/25/2005	305.0	50	862.4
	308.2	50	770.0
5/26/2005	326.8	50	808.5
	334.1	50	808.5
6/7/2005	345.1	50	808.5
6/8/2005	365.9	50	847.0
	369.7	50	808.5
6/9/2005	384.4	50	808.5
	390.3	50	808.5
6/10/2005	408.5	50	808.5
	414.6	50	808.5
6/13/2005	481.3	50	770.0
	485.5	50	808.5
6/14/2005	505.9	50	770.0
	512.9	50	808.5
6/15/2005	529.3	50	808.5
	538.1	50	770.0
6/16/2005	554.8	50	770.0
	558.2	50	808.5
6/17/2005	583.1	50	770.0
9/22/2005	600.2	50	808.5
9/23/2005	624.2	50	770.0
9/26/2005	694.8	50	770.0
	699.9	50	770.0
9/27/2005	720.9	50	770.0
9/28/2005	738.6	50	808.5
	748.2	50	770.0
9/29/2005	763.3	50	770.0
	772.1	50	808.5
10/4/2005	862.5	50	770.0
10/5/2005	877.4	50	770.0
	888.3	50	808.5

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour,)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*
608.3	0.08	0	0.1
609.9	0.08	2	0.3
602.2	0.07	2	0.3
608.3	0.08	7	1.1
596.1	0.07	7	1.1
614.6	0.08	9	1.3
621.0	0.08	9	1.4
622.6	0.08	11	1.5
622.6	0.08	11	1.6
583.8	0.07	13	1.9
608.3	0.08	14	2.0
590.2	0.07	14	2.1
616.2	0.08	21	3.1
602.2	0.07	22	3.2
639.1	0.08	23	3.4
562.1	0.07	23	3.4
602.2	0.07	25	3.6
590.2	0.07	25	3.7
590.2	0.07	26	3.8
629.9	0.08	28	4.1
608.3	0.08	28	4.1
627.6	0.08	29	4.3
611.5	0.08	30	4.3
593.2	0.07	31	4.5
587.3	0.07	31	4.6
556.6	0.07	36	5.3
613.0	0.08	37	5.4
573.5	0.07	38	5.5
590.2	0.07	38	5.6
605.2	0.08	40	5.9
572.0	0.07	40	5.9
580.8	0.07	42	6.1
608.3	0.08	42	6.1
576.4	0.07	43	6.3
619.4	0.08	46	6.7
604.1	0.08	47	6.8
594.6	0.07	52	7.6
600.9	0.07	52	7.7
596.1	0.07	53	7.8
627.6	0.08	56	8.2
607.3	0.08	56	8.2
607.3	0.08	57	8.4
630.9	0.08	58	8.5
588.4	0.07	64	9.4
607.3	0.08	66	9.6
622.6	0.08	66	9.7

Table B.3

Vapor Phase Hydrocarbon Recovery Data- System 2
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as methane)*	*System Exhaust Gas Flowrate (acfm)*
10/6/2005	901.7	50	808.5
	911.1	50	808.5
10/7/2005	933.6	50	847.0
10/11/2005	1,032.5	50	847.0
10/12/2005	1,048.6	50	808.5
	1,054.7	50	808.5
10/13/2005	1,069.7	50	808.5
	1,078.9	50	808.5
10/14/2005	1,094.2	50	770.0
10/17/2005	1,168.4	50	808.5
	1,172.5	50	770.0
10/18/2005	1,189.8	50	808.5
1/9/2006	1,203.0	50	770.0
1/12/2006	1,272.8	50	847.0
1/13/2006	1,293.0	50	770.0
1/16/2006	1,368.0	50	770.0
1/17/2006	1,388.8	50	770.0
1/18/2006	1,414.3	50	847.0
1/19/2006	1,438.6	50	770.0
1/20/2006	1,461.6	50	808.5
1/23/2006	1,532.2	50	808.5
1/24/2006	1,556.9	780	770.0
1/25/2006	1,574.8	520	770.0
1/26/2006	1,604.3	50	847.0
1/27/2006	1,622.9	50	847.0
1/30/2006	1,696.3	50	847.0
1/31/2006	1,725.9	50	770.0
2/2/2006	1,769.1	50	770.0
	1,788.0	50	770.0
2/6/2006	1,867.2	50	770.0
2/7/2006	1,886.4	50	770.0
2/8/2006	1,910.9	50	770.0
2/9/2006	1,936.6	50	770.0
2/10/2006	1,956.1	50	770.0
2/23/2006	2,028.6	50	770.0

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour,)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*
634.3	0.08	69	10.1
632.6	0.08	69	10.1
668.0	0.08	71	10.5
666.2	0.08	80	11.7
632.6	0.08	79	11.6
623.9	0.08	80	11.7
621.0	0.08	80	11.8
625.9	0.08	83	12.1
607.3	0.08	84	12.3
637.7	0.08	89	13.1
599.3	0.07	89	13.1
641.1	0.08	92	13.5
624.0	0.08	91	13.3
668.0	0.08	98	14.3
607.3	0.08	97	14.2
610.6	0.08	105	15.4
602.5	0.07	106	15.5
664.5	0.08	109	16.0
597.7	0.07	109	16.0
622.6	0.08	112	16.3
629.2	0.08	119	17.4
607.3	1.18	508	74.3
600.9	0.78	332	48.7
664.5	0.08	123	18.0
654.0	0.08	126	18.4
659.2	0.08	131	19.2
594.6	0.07	133	19.4
591.4	0.07	133	19.5
594.6	0.07	136	19.9
604.1	0.08	144	21.1
597.7	0.07	532	77.9
600.9	0.07	357	52.3
604.1	0.08	148	21.7
597.7	0.07	150	22.0
602.5	0.07	156	22.8

Table B.4

Phase-Specific LNAPL Recovery and Water Production Summary- System 2
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per hour)*
5/5/2005	5.0	0	50	0	0	N/A	N/A	0.0	10
5/6/2005	23.2	0	850	0	0	N/A	N/A	0.0	44
5/9/2005	95.5	0	1,340	0	0	N/A	N/A	0.0	7
5/10/2005	99.0	0	1,426	0	0	N/A	N/A	0.0	24
5/11/2005	114.0	0	2,351	0	0	N/A	N/A	0.0	62
5/12/2005	138.8	0	3,017	0	0	N/A	N/A	0.0	27
5/19/2005	169.5	0	4,121	0	0	N/A	N/A	0.0	36
5/20/2005	184.3	0	5,220	0	0	N/A	N/A	0.0	75
5/24/2005	279.7	0	9,664	0	0	N/A	N/A	0.0	47
5/25/2005	305.0	0	10,756	0	0	N/A	N/A	0.0	43
5/26/2005	326.8	5	12,182	0	5	100.0	0.0	5.5	65
6/7/2005	345.1	5	12,410	0	5	100.0	0.0	0.0	12
6/8/2005	369.7	5	13,912	0	5	100.0	0.0	0.0	61
6/9/2005	390.3	5	14,648	0	5	100.0	0.0	0.0	36
6/10/2005	414.6	5	15,268	0	5	100.0	0.0	0.0	30
6/13/2005	485.5	5	16,267	0	5	100.0	0.0	0.0	14
6/14/2005	512.9	5	16,972	0	5	100.0	0.0	0.0	26
6/15/2005	538.1	5	18,264	0	5	100.0	0.0	0.0	51
6/16/2005	558.2	5	19,111	0	5	100.0	0.0	0.0	42
6/17/2005	583.1	5	20,023	0	5	100.0	0.0	0.0	43
9/22/2005	600.2	5	20,893	0	5	100.0	0.0	0.0	42
9/23/2005	624.2	5	22,059	0	5	100.0	0.0	0.0	45
9/26/2005	699.9	5	25,455	0	5	100.0	0.0	0.0	47
9/27/2005	720.9	5	26,763	0	5	100.0	0.0	0.0	49
9/28/2005	748.2	5	27,130	0	5	100.0	0.0	0.0	41
9/29/2005	772.1	5	27,398	0	5	100.0	0.0	0.0	27
10/4/2005	862.5	5	28,249	0	5	100.0	0.0	0.0	10
10/5/2005	888.3	5	28,553	0	5	100.0	0.0	0.0	10
10/6/2005	911.1	5	28,771	0	5	100.0	0.0	0.0	10
10/7/2005	933.6	5	28,958	0	5	100.0	0.0	0.0	10
10/11/2005	1,032.5	5	29,810	0	5	100.0	0.0	0.0	9
10/12/2005	1,054.7	5	29,946	0	5	100.0	0.0	0.0	8
10/13/2005	1,078.9	5	30,016	0	5	100.0	0.0	0.0	7
10/14/2005	1,094.2	5	30,152	0	5	100.0	0.0	0.0	6
10/17/2005	1,172.5	5	31,005	0	5	100.0	0.0	0.1	9
10/18/2005	1,189.8	5	31,145	0	5	100.0	0.0	0.0	10
1/9/2006	1,203.0	5	31,522	0	5	100.0	0.0	-0.5	13
1/12/2006	1,272.8	5	32,936	0	5	100.0	0.0	0.0	19
1/13/2006	1,293.0	5	34,329	0	5	100.0	0.0	0.0	31
1/16/2006	1,368.0	5	36,776	0	5	100.0	0.0	0.1	32
1/17/2006	1,388.8	6	38,695	0	6	100.0	0.0	0.3	50
1/18/2006	1,414.3	6	40,655	0	6	100.0	0.0	0.2	52
1/19/2006	1,438.6	6	42,405	0	6	100.0	0.0	0.0	80
1/20/2006	1,461.6	6	43,981	0	6	100.0	0.0	0.2	73
1/23/2006	1,532.2	6	48,661	0	6	100.0	0.0	0.0	68
1/24/2006	1,556.9	6	49,886	0	6	100.0	0.0	0.0	63
1/25/2006	1,574.8	6	50,665	0	6	100.0	0.0	0.0	59
1/26/2006	1,604.3	6	51,685	0	6	100.0	0.0	0.0	42
1/27/2006	1,622.9	6	52,368	0	6	100.0	0.0	0.0	38

Table B.4

Phase-Specific LNAPL Recovery and Water Production Summary- System 2
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*
1/30/2006	1,696.3	7	54,967
1/31/2006	1,725.9	7	55,939
2/2/2006	1,788.0	7	57,986
2/6/2006	1,867.2	46	60,509
2/7/2006	1,886.4	46	61,091
2/8/2006	1,910.9	58	61,867
2/9/2006	1,936.6	85	62,665
2/10/2006	1,956.1	124	63,255
2/23/2006	2,028.6	220	65,484

Calculations:

Cumulative Vapor-Phase LNAPL Recovery (gallons, product)	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*
0	7	100.0	0.0
0	7	100.0	0.0
0	7	100.0	0.0
0	46	100.0	0.0
0	46	100.0	0.0
0	58	100.0	0.0
0	85	100.0	0.0
0	124	100.0	0.0
0	220	100.0	0.0

Rate Estimates:

Intermittent LNAPL Recovery Rate (gallons per day)	*Intermittent Water Production Rate (gallons per hour)*
0.3	35
0.0	35
0.0	34
11.9	32
0.0	32
11.8	32
24.8	31
48.7	31
31.6	31

Table B.5

Vapor Phase Hydrocarbon Recovery Data- System 3
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:

Date	*Elapsed Time (hours)*	*THC Concentration (ppmv as methane)*	*System Exhaust Gas Flowrate (acfm)*
8/29/2005	1.2	23	1237.4
	8.0	0	1202.3
8/30/2005	21.7	440	1191.4
	31.0	0	1159.5
8/31/2005	42.1	0	1171.9
	57.7	0	1196.0
9/1/2005	64.7	0	1180.5
9/2/2005	81.3	140	1196.0
	85.3	0	1180.5
9/6/2005	90.0	0	1208.1
9/7/2005	92.8	0	1190.8
9/8/2005	108.6	138	1181.1
9/9/2005	118.9	237	1215.6
	124.4	0	1189.1
9/12/2005	153.6	0	1204.6
9/13/2005	168.0	220	1212.1
	177.6	0	1167.3
9/14/2005	178.2	220	1189.1
	191.1	163	1180.5
9/15/2005	201.1	220	1207.5
9/16/2005	226.5	138	1175.9
9/19/2005	279.5	360	1209.2
9/20/2005	302.9	83	1193.7
9/22/2005	333.7	138	1157.5
	339.1	93	1167.8
9/23/2005	362.3	125	1165.9
9/26/2005	378.2	150	1186.8
	383.8	93	1154.0
10/7/2005	403.7	35	1151.7
10/11/2005	407.5	33	1178.2
10/12/2005	427.4	68	1156.9
	435.3	60	1148.9
10/13/2005	436.6	180	1165.5
10/14/2005	454.0	90	1143.1
10/17/2005	526.7	230	1214.4
	530.9	340	1200.3
10/18/2005	547.9	113	1206.9

Calculations:

System Exhaust Gas Flowrate (scfm)	*THC Mass Flowrate (pounds/hour,)*	*Cumulative THC (pounds)*	*Cumulative THC (gallons, product)*
1018.6	0.06	0	0.0
917.5	0.00	0	0.0
930.5	1.02	14	2.1
913.6	0.00	14	2.1
907.6	0.00	14	2.1
935.4	0.00	14	2.1
914.5	0.00	14	2.1
948.1	0.33	19	2.9
920.5	0.00	19	2.9
929.9	0.00	19	2.9
905.8	0.00	19	2.9
918.1	0.31	24	3.6
976.7	0.58	30	4.4
920.0	0.00	30	4.4
931.5	0.00	30	4.4
986.5	0.54	38	5.6
876.9	0.00	38	5.6
961.3	0.53	38	5.6
900.5	0.36	43	6.3
933.3	0.51	48	7.1
913.9	0.31	56	8.2
959.2	0.86	102	14.9
912.6	0.19	106	15.5
886.9	0.30	115	16.9
892.8	0.21	116	17.1
898.2	0.28	123	18.0
920.1	0.34	128	18.8
878.9	0.20	130	19.0
880.5	0.08	131	19.2
890.3	0.07	131	19.2
878.1	0.15	134	19.7
886.5	0.13	135	19.8
949.1	0.42	136	19.9
865.8	0.19	139	20.4
982.7	0.56	180	26.4
947.0	0.80	183	26.9
974.5	0.27	188	27.5

Table B.6

Phase-Specific LNAPL Recovery and Water Production Summary- System 3
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per hour)*	*Intermittent Water Production Rate (gallons per hour)*
8/29/2005	8.0	0	1,885	0	0	0.0	0.0	0.0	236
8/30/2005	31.0	0	5,592	2	2	0.0	100.0	2.1	161
8/31/2005	57.7	0	10,695	2	2	0.0	100.0	0.0	191
9/1/2005	64.7	1	20,616	2	3	19.6	80.4	1.7	1,417
9/2/2005	82.3	1	27,966	3	4	25.9	74.1	1.8	418
9/6/2005	90.0	2	30,472	3	5	41.2	58.8	3.1	325
9/7/2005	92.8	2	32,202	3	5	41.2	58.8	0.0	618
9/8/2005	108.6	2	38,221	4	6	35.8	64.2	1.1	381
9/9/2005	124.4	3	41,985	4	7	40.3	59.7	2.8	238
9/12/2005	153.6	3	52,958	4	7	40.3	59.7	0.0	376
9/13/2005	177.6	4	57,947	6	10	41.7	58.3	2.1	208
9/14/2005	191.1	4	58,021	6	10	41.5	58.5	0.1	5
9/15/2005	201.1	4	59,723	7	11	36.1	63.9	3.4	170
9/16/2005	226.5	5	61,438	8	13	37.8	62.2	2.0	68
9/19/2005	279.5	5	66,695	15	20	25.1	74.9	3.0	89
9/20/2005	302.9	6	68,742	16	22	27.9	72.1	1.7	87
9/22/2005	339.1	6	71,310	17	23	26.0	74.0	1.0	71
9/23/2005	362.3	7	73,267	18	25	28.0	72.0	2.0	84
9/26/2005	383.8	7	75,245	19	26	27.1	72.9	0.9	92
10/7/2005	403.7	8	76,731	19	27	29.7	70.3	1.4	75
10/11/2005	407.5	8	77,120	19	27	29.4	70.6	1.4	102
10/12/2005	435.3	9	77,694	19	28	31.9	68.1	0.9	21
10/13/2005	436.6	9	77,694	20	29	31.4	68.6	7.9	0
10/14/2005	454.0	10	78,130	20	30	33.5	66.5	1.6	25
10/17/2005	530.9	10	80,227	20	30	33.4	66.6	0.0	27
10/18/2005	547.9	11	82,266	20	31	34.4	65.6	1.7	120

Table B.7
Total Hydrocarbon Recovery Data as of 02/10/06
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

System	***Phase***	***Full-Scale MPVE Hydrocarbon Recovery***			***% Recovery***
		Pounds	***Litres***	***Gallons***	
1	LNAPL	23,400	12,971	3,427	92.9
	Vapor	1,776	984	260	7.1
	Water	0	0	0	0.0
2	LNAPL	1,502	833	220	73.8
	Vapor	532	295	78	26.2
	Water	0	0	0	0.0
3	LNAPL	0	40	11	28.0
	Vapor	188	104	28	72.0
	Water	0	0	0	0.0
TOTAL		**27,398**	**15,228**	**4,023**	

Skimmer System Recovery: **588 gallons**
MPVE Pilot Study Recovery: **147 gallons**
Cumulative Total LNAPL Recovery To Date: **4,758 gallons**

Full-Scale MPVE Operation Time: **5,395.3 hours**
224.8 days

Full-Scale MPVE Average LNAPL Recovery Rate: **0.7 gallons/hour**
17.9 gallons/day
125 gallons/week
501 gallons/month
5.1 pounds/hour
121.9 pounds/day

Full-Scale MPVE Average Water Production Rate: **44.1 gallons/hour**
1,059.1 gallons/day
7,414 gallons/week

Appendix D

MPE System Activity Logs

ENCORE
Environmental Corporate Remediation ©

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: FEBRUARY 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Start System 1 up at 10:19 am.	11.6		
27		24.0		
28	Generator slightly smoking. JDE informed.	24.0		
TOTALS		59.6	0	0
Monthly Up-Time (%)*				**100.00**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: March 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24.0		
2	Generator being switched over to temp-gen. Gen being rebuilt.	16.0		8.0
3		24.0		
4		24.0		
5		24.0		0.0
6	System down over weekend.	0.0		24.0
7	Vac pump not running. Breaker tripped. Cannot reset. GEE returning.	0.0		24.0
8	Damage to VFD.	0.0		24.0
9	New parts not in yet. System still down.	0.0		24.0
10	Start System 1 up @ 15:00.	9.0		15.0
11		24.0		
12		24.0		
13		24.0		
14		24.0		
15	JDE on site for oil change.	22.5	1.5	
16		24.0		
17	Pump off product from skimmer.	24.0		
18	Product coming up through soil. Fracturing stays at 10 seconds, delay increased to 20 minutes.	24.0		
19		24.0		
20		24.0		
21	Turned off frac well #9.	24.0		
22	Reset times of frac compressor to 15 sec on 15 sec off.	24.0		
23	JDE inspecting generator. One hour off for inspection.	23.0		1.0
24		24.0		
25		24.0		
26		24.0		
27		24.0		
28		24.0		
29	JDE serviced generator.	22.0	2.0	
30		24.0		
31		24.0		
TOTALS		620.5	3.5	120.0
Monthly Up-Time (%)*				**84.71**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: APRIL 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 shuts down. R. Swayze and K. Coulson troubleshoot system.	22.0		2.0
2		24.0		
3		24.0		
4		24.0		
5		24.0		
6		24.0		
7		24.0		
8		24.0		
9		24.0		
10		24.0		
11		24.0		
12		24.0		
13	JDE Generator Oil Change.	22.5	1.5	
14		24.0		
15		24.0		
16		24.0		
17		24.0		
18		24.0		
19		24.0		
20	10:15 System 1 off for reprogramming. 13:45 System 1 started up.	21.5		3.5
21		24.0		
22		24.0		
23		24.0		
24		24.0		
25	Clean out vessel on system.	23.0		1.0
26	JDE servicing generator.	18.0		6.0
27		24.0		
28		24.0		
29		24.0		
30		24.0		
TOTALS		707.0	1.5	12.5
Monthly Up-Time (%)*				**98.54**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: MAY 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24.0		
2		24.0		
3		24.0		
4		24.0		
5		24.0		
6		24.0		
7		24.0		
8		24.0		
9	During levels/pressures, system temp. became high. Shut-down until levels/pressures complete.	23.0		1.0
10	JDE Generator Oil Change. High temp. alarm @ 13:00. System off for 1.0 hour.	21.5	1.5	1.0
11	Loud noise in dual phase. Shut-down system to inspect. Turn back on.	23.8		0.2
12	Loud noise in dual phase. Shut-down system to inspect. Turn back on.	23.2		0.8
13		24.0		
14		24.0		
15		24.0		
16		24.0		
17		24.0		
18	Emulsified product build-up in vessel. Instructions to leave product overnight to see if it liquefies again.	11.0		13.0
19	System 1 is turned back on. Emulsified product remains.	9.5		14.5
20		24.0		
21		24.0		
22		24.0		
23		24.0		
24	JDE Generator Oil Change.	21.0	3.0	
25				
26	Add anti-gel to break up emulsified oil. Let sit.	20.5		3.5
27	LNAPL sensor kicked system off at 12:00 midnight. System turned off at 16:00 to see how fast LNAPL recovers in the wells over the weekend.	7.0	8.0	9.0
28			24.0	
29			24.0	
30			24.0	
31			24.0	
TOTALS		568.5	108.5	43.0
Monthly Up-Time (%)*				**92.97**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: JUNE 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 being cleaned by Inland Waters.		24.0	
2			24.0	
3			24.0	
4			24.0	
5			24.0	
6			24.0	
7	JDE Generator Oil Change. At 21:00 h, GEE turned off the system via satellite because a well-head blew off causing a low vacuum and high flow rate.	3.0	15.5	5.5
8		10.5		13.5
9		24.0		
10		24.0		
11		24.0		
12		24.0		
13		24.0		
14		24.0		
15		24.0		
16		24.0		
17		24.0		
18		24.0		
19		24.0		
20		24.0		
21	JDE Generator Oil Change. System 1 turned off @ 11:10.	22.0	2.0	
22		24.0		
23	Pumping water from LNAPL tank back into system. Then, backwash system.	18.0	6.0	
24		24.0		
25				
26				
27	Repairing air lines.	21.5		2.5
28		24.0		
29		24.0		
30		24.0		
TOTALS		483.0	167.5	21.5
Monthly Up-Time (%)*				**95.74**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: JULY 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24		
2		24		
3		24		
4	Add CB4 @ 9:05. System turned off.	20	4	
5	JDE Oil Change.	23	1	
6		24		
7		24		
8		24		
9	System 1 went down on Saturday afternoon. Showed a high temp alarm.	12		12
10				24
11	Turn System 1 back on when on-site.	16		8
12	System 1 went down. High temp alarm.	14		10
13		24		
14	Add CB4.	23	1	
15		24		
16		24		
17		24		
18		24		
19		24		
20	JDE Oil Change.	22	2	
21		24		
22	System 1 off. High temp alarm. Cleaning system. System to sit over the weekend to let carbon sit.	0		
23		0		
24		0		
25	Problem with pressure in carbon vessel.	5		19
26	Problem with pressure in carbon vessel.	2.0		22.0
27	Problem with pressure in carbon vessel.	2.0		22.0
28	Problem with pressure in carbon vessel. Temporarily by-passing carbon vessel.	10.0		14.0
29		24.0		
30		24.0		
31		24.0		
TOTALS		533	8	131
Monthly Up-Time (%)*				**80.27**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: AUGUST 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 shuts off @ approximately 13:00.	13	11	
2	JDE Oil Change.	12	12	
3	Inland powerwashes radiator.	22	2	
4		20		
5	Generator turned off @ 10:00 am. CRA could not restart.	10		14
6		0		24
7		0		24
8	JDE replaces alternator.	0		24
9	System 1 started @ 9:00.	15		9
10		24		
11	System 1 turned off between 11:00-12:00 to take levels in extraction wells and repair air lines.	23	1	
12		24		
13		24		
14		24		
15	System 1 went down at 8:37. Fault was reset at 8:55. Air filter changed. System 1 restarted at 10:50.	21.5	2.5	
16	System 1 turned off for oil change. 12:05-13:10.	23	1	
17		24		
18		24		
19		24		
20		24		
21		24		
22		24		
23		24		
24	System 1 went down at 18:40. Valve on discharge pump was closed causing water to get to HH level and turn System 1 off.	20.5		3.5
25		16		8
26	System 1 turned off and CB4 added.	14.0	10.0	
27		24.0		
28		24.0		
29		24.0		
30		24.0		
31		24.0		
TOTALS		594	39.5	106.5
Monthly Up-Time (%)*				**86.53**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: SEPTEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24		
2		24		
3		24		
4		24		
5		24		
6		24		
7		24		
8		24		
9	Turn System 1 off to repair air lines.	23	1	
10		24		
11		24		
12		24		
13	System 1 turned off for oil change.	23	1	
14	System 1 turned off to change bag filter.	23.5	0.5	
15	Backwashing system to try and return carbon pressure to normal.	16	8	
16		24		
17		24		
18		24		
19		24		
20		24		
21		20	4	
22		24		
23		24		
24		24		
25	System 1 down at 13:00 to high temp. fault.	13		11
26	Reset fault at 8:40. Start System 1 again	15.5		8.5
27	System 1 down at 14:15 due to high pressure on bag filter.	14.3		9.7
28	Problem with generator. Battery replaced. Decide to leave system off until tomorrow.		16.0	8.0
29	System 1 started at 9:00. At 16:40 air compressor is not working. Shows "low pressure in sump". GEE says filter needs to be replaced. System 1 shut off until it can be repaired.	9.0	9.0	6.0
30			24.0	
TOTALS		613.25	63.5	43.2
Monthly Up-Time (%)*				**93.42**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: OCTOBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1			24	
2			24	
3			24	
4	Cleaning system 1		24	
5			24	
6	Start up System 1 at 16:30.	7.5	16.5	
7	System 1 shut down at 5:56 due to high pressures on carbon bag.	6		18
8	Air compressor broken.			24
9				24
10				24
11	Cleaning system 1			24
12				24
13				24
14				24
15				24
16				24
17				24
18				24
19				24
20				24
21				24
22				24
23				24
24	Compressor running again. Problem was valve in separator. Pressure still greater than 80 psi. Keep System 1 off overnight.			24
25	System 1 started. Carbon is being bypassed.	7		17
26		24.0		
27		24.0		
28		24.0		
29		24.0		
30		24.0		
31		24.0		
TOTALS		164.5	136.5	443
Monthly Up-Time (%)*				**27.08**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: NOVEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 turned off for oil change.	21	3	
2		24		
3		24		
4		24		
5		24		
6		24		
7		24		
8		24		
9		24		
10		24		
11	System 1 turned off to check oil levels on generator, compressor and vacuum pump.	23.5	0.5	
12		24		
13		24		
14		24		
15		24		
16	Turn System 1 off to recalibrate LEL sensor.	23.5	0.5	
17		24		
18	System 1 turned off to check oil levels on generator, compressor and vacuum pump.	23.5	0.5	
19		24		
20		24		
21		24		
22		24		
23	High flow alarm for produced liquids discharge pump went off.	24		
24	Compressor only getting up to 14-18 psi. System 1 turned off leaving generator on.	18		6
25	System 1 turned off at request of GM (methane monitoring)		24	
26			24.0	
27			24.0	
28			24.0	
29			24.0	
30			24.0	
TOTALS		565.5	148.5	6
Monthly Up-Time (%)*				**98.95**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: DECEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 turned off at request of GM (methane monitoring)		24.0	
2	System 1 turned off at request of GM (methane monitoring)		24.0	
3	System 1 turned off at request of GM (methane monitoring)		24.0	
4	System 1 turned off at request of GM (methane monitoring)		24.0	
5	System 1 turned off at request of GM (methane monitoring)		24.0	
6	System 1 turned off at request of GM (methane monitoring)		24.0	
7	System 1 turned off at request of GM (methane monitoring)		24.0	
8	System 1 turned off at request of GM (methane monitoring)		24.0	
9	System 1 turned off at request of GM (methane monitoring)		24.0	
10	System 1 turned off at request of GM (methane monitoring)		24.0	
11	System 1 turned off at request of GM (methane monitoring)		24.0	
12	System 1 turned off at request of GM (methane monitoring)		24.0	
13	System 1 turned off at request of GM (methane monitoring)		24.0	
14	System 1 turned off at request of GM (methane monitoring)		24.0	
15	System 1 turned off at request of GM (methane monitoring)		24.0	
16	System 1 turned off at request of GM (methane monitoring)		24.0	
17	System 1 turned off at request of GM (methane monitoring)		24.0	
18	System 1 turned off at request of GM (methane monitoring)		24.0	
19	System 1 turned off at request of GM (methane monitoring)		24.0	
20	Turn System 1 back on.	9.5	14.5	
21		24		
22		24		
23	System 1 turned off over holiday break.	12	12.0	
24			24.0	
25			24.0	
26			24.0	
27			24.0	
28			24.0	
29			24.0	
30			24.0	
31			24.0	
TOTALS		69.5	674.5	0
Monthly Up-Time (%)*				**100.00**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: JANUARY 2006

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 shut down over holiday break.		24.0	
2	System 1 on for 20 minutes.	0.33	23.7	
3			24.0	
4	Start up System 1.	11.5	12.5	
5		24		
6		24		
7		24		
8		24		
9	System 1 turned off for oil change.	22	2.0	
10		24		
11		24		
12		24		
13		24		
14		24		
15		24		
16	System 1 turned off: no vacuum.	18		6
17		24		
18	Warning Message appears: WARNING! CPU has been changed. Please re-enter CPU settings in CMOS setup and remember to save before quit!	24		
19		24		
20		24		
21	System 1 shut down over the weekend. Computer malfunction.			24
22				24
23	Start up System 1: all recorded parameters have been reset.	12		12
24	System 1 turned off for oil change. System 1 shuts off at 17:00.	18	1.0	5
25	Air lift valves are not working at all.			24
26	Start System 1 several times with various problems occurring. LEL values get high, tech must recalibrate equipment repeatedly. LEL valves shut off, recalibration needed again.	14.5		9.5
27		24.0		
28		24.0		
29		24.0		
30	Check oil levels in System 1.	23.5	0.5	
31	Turn System 1 off @ 15:50 because Frac Tank is full. No room for water.	15.8	8.2	
TOTALS		543.66	95.86	104.5
Monthly Up-Time (%)*				**83.88**

REMEDIATION SYSTEM 1 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0018

MONTH: FEBRUARY 2006

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 1 off because Frac Tanks are full.		24.0	
2	System 1 off because Frac Tanks are full.		24.0	
3	System 1 off because Frac Tanks are full.		24.0	
4	System 1 off because Frac Tanks are full.		24.0	
5	System 1 off because Frac Tanks are full.		24.0	
6	Start System 1 @ 15:15.	8.5	15.5	
7	Turn System 1 off for oil change.	23	1.0	
8	Turn System 1 off to check oil and for generator maintenance.	23	1.0	
9	System 1 turned off at the request of GM.	17	5.0	
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
TOTALS		71.5	142.5	0
Monthly Up-Time (%)*				**100.00**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: MAY 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1				
2				
3				
4	Start System 2 up @ 15:00. Frac lines not working. System 2 off @ 16:45.	1.3		22.7
5	System 2 up and running after adjustments @ 12:05.	12.0		12.0
6		24.0		
7		24.0		
8		24.0		
9	High temperature. Turn System 2 off @ 10:39.	10.4		13.6
10	Start System 2 up @ 15:00.	9.0		15.0
11		24.0		
12		24.0		
13	Fuel line broke. System 2 shut down @ 8:35.	8.5		15.5
14				24.0
15				24.0
16				24.0
17				24.0
18				24.0
19	Turn on System 2 @ 10:45. Generator producing black smoke @ 14:30. Turn System 2 off. Start System 2 again @ 16:15.	11.2		12.8
20		24.0		
21		24.0		
22		24.0		
23		24.0		
24	JDE Generator Oil Change.	22.5	1.5	
25		24.0		
26	System 2 shut down because of high water production and lack of room in the frac tank.	17.0	7.0	
27	System 2 remains off to see how LNAPL recovers in wells over the weekend.		24.0	
28			24.0	
29			24.0	
30			24.0	24.0
31			24.0	
TOTALS		331.9	128.5	235.6
Monthly Up-Time (%)*				**62.29**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: JUNE 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 2 being cleaned out by Inland Waters.		24.0	
2	System 2 still down because frac tank needs to be emptied.		24.0	
3			24.0	
4			24.0	
5			24.0	
6			24.0	
7	JDE Generator Oil Change.	9.0	15.0	
8		24.0		
9		24.0		
10		24.0		
11		24.0		
12		24.0		
13		24.0		
14		24.0		
15		24.0		
16		24.0		
17	System 2 turned off @15:55 because of silt build-up.	16.0		8.0
18				24.0
19				24.0
20	System 2 off-line because of high silt production and minimal product production.		24	
21			24	
22			24	
23			24	
24			24	
25			24	
26			24	
27			24	
28			24	
29			24	
30			24	
			24	
TOTALS		241.0	447.0	56.0
Monthly Up-Time (%)*				**81.14**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: JULY 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1			24	
2			24	
3			24	
4			24	
5			24	
6			24	
7			24	
8			24	
9			24	
10			24	
11			24	
12			24	
13			24	
14			24	
15			24	
16			24	
17			24	
18			24	
19			24	
20			24	
21			24	
22			24	
23			24	
24			24	
25			24	
26			24	
27			24	
28			24	
29			24	
30			24	
31			24	
TOTALS		0	744	0
Monthly Up-Time (%)*				**#DIV/0!**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: AUGUST 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1			24	
2			24	
3			24	
4			24	
5			24	
6			24	
7			24	
8			24	
9			24	
10			24	
11			24	
12			24	
13			24	
14			24	
15			24	
16			24	
17			24	
18			24	
19			24	
20			24	
21			24	
22			24	
23			24	
24			24	
25			24	
26			24	
27			24	
28			24	
29			24	
30			24	
31			24	
TOTALS		0	744	0
Monthly Up-Time (%)*				**#DIV/0!**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: SEPTEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1			24	
2			24	
3			24	
4			24	
5			24	
6			24	
7			24	
8			24	
9			24	
10			24	
11			24	
12			24	
13			24	
14			24	
15	Start up System 2. Turn System 2 off because water was at HHL.	6	10	8
16				
17				
18				
19				
20				
21	System 2 restarted at 12:45.	11.25	13.75	
22	System 2 down. High level went off on discharge pump. Discharge pump not working. Change bag filter as per GEE. System 2 started at 10:30	13.50	10.50	
23		24		
24		24		
25		24		
26		24		
27	System 2 turned off to do levels.	23	1	
28		24		
29		24		
30		24		
TOTALS		221.75	371.25	8.00
Monthly Up-Time (%)*				**96.52**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: OCTOBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24		
2		24		
3	System 2 turned off at 9:20. Air compressor was off. Coolant needed.	9.5	14.5	
4	System 2 turned on at 15:45.	8.25	15.75	
5		24		
6		24		
7		24		
8		24		
9		24		
10		24		
11		24		
12	Turn System 2 off at 10:45 to fix LNAPL sensor. System start at 12:10.	22.5	1.5	
13		24		
14		24		
15		24		
16		24		
17		24		
18	Shut system 2 down as per GM request (methane monitoring)	15.5	8.5	
19	Shut system 2 down as per GM request (methane monitoring)		24	
20	Shut system 2 down as per GM request (methane monitoring)		24	
21	Shut system 2 down as per GM request (methane monitoring)		24	
22	Shut system 2 down as per GM request (methane monitoring)		24	
23	Shut system 2 down as per GM request (methane monitoring)		24	
24	Shut system 2 down as per GM request (methane monitoring)		24	
25	Shut system 2 down as per GM request (methane monitoring)		24	
26	Shut system 2 down as per GM request (methane monitoring)		24	
27	Shut system 2 down as per GM request (methane monitoring)		24	
28	Shut system 2 down as per GM request (methane monitoring)		24	
29	Shut system 2 down as per GM request (methane monitoring)		24	
30	Shut system 2 down as per GM request (methane monitoring)		24	
31	Shut system 2 down as per GM request (methane monitoring)		24	
TOTALS		391.75	352.25	0
Monthly Up-Time (%)*				**100.00**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: NOVEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	Shut system 2 down as per GM request (methane monitoring)		24	
2	Shut system 2 down as per GM request (methane monitoring)		24	
3	Shut system 2 down as per GM request (methane monitoring)		24	
4	Shut system 2 down as per GM request (methane monitoring)		24	
5	Shut system 2 down as per GM request (methane monitoring)		24	
6	Shut system 2 down as per GM request (methane monitoring)		24	
7	Shut system 2 down as per GM request (methane monitoring)		24	
8	Shut system 2 down as per GM request (methane monitoring)		24	
9	Shut system 2 down as per GM request (methane monitoring)		24	
10	Shut system 2 down as per GM request (methane monitoring)		24	
11	Shut system 2 down as per GM request (methane monitoring)		24	
12	Shut system 2 down as per GM request (methane monitoring)		24	
13	Shut system 2 down as per GM request (methane monitoring)		24	
14	Shut system 2 down as per GM request (methane monitoring)		24	
15	Shut system 2 down as per GM request (methane monitoring)		24	
16	Shut system 2 down as per GM request (methane monitoring)		24	
17	Shut system 2 down as per GM request (methane monitoring)		24	
18	Shut system 2 down as per GM request (methane monitoring)		24	
19	Shut system 2 down as per GM request (methane monitoring)		24	
20	Shut system 2 down as per GM request (methane monitoring)		24	
21	Shut system 2 down as per GM request (methane monitoring)		24	
22	Shut system 2 down as per GM request (methane monitoring)		24	
23	Shut system 2 down as per GM request (methane monitoring)		24	
24	Shut system 2 down as per GM request (methane monitoring)		24	
25	Shut system 2 down as per GM request (methane monitoring)		24	
26	Shut system 2 down as per GM request (methane monitoring)		24	
27	Shut system 2 down as per GM request (methane monitoring)		24	
28	Shut system 2 down as per GM request (methane monitoring)		24	
29	Shut system 2 down as per GM request (methane monitoring)		24	
30	Shut system 2 down as per GM request (methane monitoring)		24	
31				
TOTALS		0	720	0
Monthly Up-Time (%)*				**#DIV/0!**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: DECEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	Shut system 2 down as per GM request (methane monitoring)		24	
2	Shut system 2 down as per GM request (methane monitoring)		24	
3	Shut system 2 down as per GM request (methane monitoring)		24	
4	Shut system 2 down as per GM request (methane monitoring)		24	
5	Shut system 2 down as per GM request (methane monitoring)		24	
6	Shut system 2 down as per GM request (methane monitoring)		24	
7	Shut system 2 down as per GM request (methane monitoring)		24	
8	Shut system 2 down as per GM request (methane monitoring)		24	
9	Shut system 2 down as per GM request (methane monitoring)		24	
10	Shut system 2 down as per GM request (methane monitoring)		24	
11	Shut system 2 down as per GM request (methane monitoring)		24	
12	Shut system 2 down as per GM request (methane monitoring)		24	
13	Shut system 2 down as per GM request (methane monitoring)		24	
14	Shut system 2 down as per GM request (methane monitoring)		24	
15	Shut system 2 down as per GM request (methane monitoring)		24	
16	Shut system 2 down as per GM request (methane monitoring)		24	
17	Shut system 2 down as per GM request (methane monitoring)		24	
18	Shut system 2 down as per GM request (methane monitoring)		24	
19	Shut system 2 down as per GM request (methane monitoring)		24	
20	Start up System 2.	12.0	12	
21	High reset on System 2 went off and system shut down. Valve below back end of vessel leading to discharge pump was closed. Valve opened, discharge pump run. System 2 turned on @ 9:15. System 2 shuts off. System 2 turned on @ 12:45. System 2 turned off @ 15:15 for precaution.	4.0		20
22	Turn System 2 on. Sample port is leaking before flow meter. Replace sample port. Discharge flow is too low. Start System 2 up @ 16:00. Turn System 2 off @ 17:00	1.0		23
23	Start up System 2 @ 8:45.Turn System 2 off @ 11:00 over holiday break.	2.3	21.7	
24	System 2 off over holiday break.		24	
25	System 2 off over holiday break.		24	
26	System 2 off over holiday break.		24	
27	System 2 off over holiday break.		24	
28	System 2 off over holiday break.		24	
29	System 2 off over holiday break.		24	
30	System 2 off over holiday break.		24	
31	System 2 off over holiday break.		24	
TOTALS		19.25	681.7	43
Monthly Up-Time (%)*				**30.92**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: JANUARY 2006

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 2 off over holiday break.		24	
2	System 2 issue from 12/20/05 was the STATER on the discharge pump. Will have to be replaced.			24
3				24
4				24
5				24
6				24
7				24
8				24
9	GEE replaced STATER. System 2 turned on @16:00.	8		16
10		24		
11		24		
12		24		
13				
14				
15				
16	Three well heads were off and caused one of the well heads to freeze up inside well and clear PVC. System turned off @ 9 for levels. System turned on @ 15:30	17.5	6.5	
17		24		
18		24		
19		24		
20	Turn System 2 off to change both bag filters because pressure is getting too high. .	22	2	
21	System 2 turned off to switch over wells @ 11. Turn System 2 on @ 15:15.	19.75	4.25	
22		24		
23		24		
24	Turn System 2 off for oil change @ 11. Turn System 2 on @ 12.	23	1	
25	Check oil in System 2.	23.5	0.5	
26		24.0		
27		24.0		
28		24.0		
29		24.0		
30	Check oil in System 2.	23.5	0.5	
31		24.0		
TOTALS		449.25	38.75	184
Monthly Up-Time (%)*				**83.62**

REMEDIATION SYSTEM 2 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: FEBRUARY 2006

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24.0		
2	Turn System 2 off @ 12:00. Start System 2 back up @ 16:10.	19.8	4.2	
3	Checking oil levels.	23.5	0.5	
4		24.0		
5		24.0		
6		24.0		
7	System 2 off for oil change.	23.0	1.0	
8		24.0		
9		24.0		
10	System 2 turned off as per GM request.	17.0	5.0	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
TOTALS		227.3	10.7	0
Monthly Up-Time (%)*				**100.00**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: AUGUST 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29	System 3 started at 17:50	6.5		
30		24.0		
31	System 3 shut off due to well heads blowing off. Start System 3 up at 7:19.	16.0		8.0
	TOTALS	46.5	0.0	8.0
	Monthly Up-Time (%)*			**85.32**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: SEPTEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1		24		
2	System 3 producing a large amount of water. Not enough room in frac tank to run system overnight. System shut off at 14:00.	14	10	
3			24	
4			24	
5			24	
6	System 3 started at 12:25. System shut down at 13:38 because of well heads blowing off.	9	15	
7	Bridgeway onsite to look at generator.	4.0		20.0
8	High level sensor went off on liquids discharge pump.	12.0		12.0
9	System 3 shut down- well caps blew off. (@ 00:00, @ 13:24). System 3 started at 8:40.	15.5	8.5	
10				24.0
11				24.0
12	Generator shut down over the weekend. Start System 3 at 10:25.	13.5		10.5
13	System 3 turned off for 0.5h to switch over wells. System 3 turned off at 18:00 because there is no room for water in frac tank.	17.5	6.5	
14	System 3 started at 8:15.	15.75	8.25	
15		24		
16		24		
17				24
18				24
19	Generator shut down over the weekend. Start System 3 at 8:35.	15.5		8.5
20	Turn System 3 off overnight because fuel is low. (17:30)	17.5	6.5	
21	Turn on System 3 at 10:50	12.25	11.75	
22		24		
23		24		
24		24		
25		24		
26		24.0		
27	System 3 off due to a high pressure fault before bag filter. System off until it is cleaned.		16.0	8.0
28			24.0	
29			24.0	
30			24.0	
TOTALS		338.5	226.5	155
Monthly Up-Time (%)*				**68.59**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: OCTOBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1			24.0	
2			24.0	
3			24.0	
4			24.0	
5			24.0	
6			24.0	
7	Start System 3 at 9:15. Turn System 3 off at 14:00 because of broken sensor.	5.0	9.0	10.0
8			24.0	
9			24.0	
10			24.0	
11	Start System 3 at 8:15.	8.0	16.0	
12	System 3 off at 15:36 due to VDF tripped. Start System 3 at 17:10.	22.5		1.5
13	System 3 off during night due to vacuum pump VDF=overvoltage. Start System 3 at 10:15. System off at 10:35 due to VDF tripped. Start System 3 at 16:15.	8.0		16.0
14		24.0		
15		24.0		
16		24.0		
17		24.0		
18	Shut down System 3 as per GM request (methane)	15.5	8.5	
19			24.0	
20			24.0	
21			24.0	
22			24.0	
23			24.0	
24			24.0	
25			24.0	
26			24.0	
27			24.0	
28			24.0	
29			24.0	
30			24.0	
31			24.0	
TOTALS		155.0	561.5	27.5
Monthly Up-Time (%)*				**84.93**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: NOVEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	Shut down System 3 as per GM request (methane)		24.0	
2	Shut down System 3 as per GM request (methane)		24.0	
3	Shut down System 3 as per GM request (methane)		24.0	
4	Shut down System 3 as per GM request (methane)		24.0	
5	Shut down System 3 as per GM request (methane)		24.0	
6	Shut down System 3 as per GM request (methane)		24.0	
7	Shut down System 3 as per GM request (methane)		24.0	
8	Shut down System 3 as per GM request (methane)		24.0	
9	Shut down System 3 as per GM request (methane)		24.0	
10	Shut down System 3 as per GM request (methane)		24.0	
11	Shut down System 3 as per GM request (methane)		24.0	
12	Shut down System 3 as per GM request (methane)		24.0	
13	Shut down System 3 as per GM request (methane)		24.0	
14	Shut down System 3 as per GM request (methane)		24.0	
15	Shut down System 3 as per GM request (methane)		24.0	
16	Shut down System 3 as per GM request (methane)		24.0	
17	Shut down System 3 as per GM request (methane)		24.0	
18	Shut down System 3 as per GM request (methane)		24.0	
19	Shut down System 3 as per GM request (methane)		24.0	
20	Shut down System 3 as per GM request (methane)		24.0	
21	Shut down System 3 as per GM request (methane)		24.0	
22	Shut down System 3 as per GM request (methane)		24.0	
23	System 3 being moved from LNAPL Area 3 to LNAPL Area 9 & 10.		24.0	
24	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
25	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
26	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
27	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
28	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
29	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
30	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
31				
TOTALS		0.0	720.0	0.0
Monthly Up-Time (%)*				**#DIV/0!**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: DECEMBER 2005

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
2	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
3	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
4	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
5	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
6	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
7	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
8	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
9	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
10	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
11	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
12	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
13	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
14	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
15	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
16	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
17	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
18	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
19	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
20	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
21	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
22	Instillation of System 3 in LNAPL Area 9 & 10.		24.0	
23	Holiday break.		24.0	
24	Holiday break.		24.0	
25	Holiday break.		24.0	
26	Holiday break.		24.0	
27	Holiday break.		24.0	
28	Holiday break.		24.0	
29	Holiday break.		24.0	
30	Holiday break.		24.0	
31	Holiday break.		24.0	
TOTALS		0.0	744.0	0.0
Monthly Up-Time (%)*				**#DIV/0!**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: JANUARY 2006

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	Holiday break.		24.0	
2	System 3 generator is dead.			24.0
3	Bridgeway installs new battery as well as a switch to turn power off.			24.0
4				24.0
5	CRA staff notices discharge pump is broken from flange at the back end of vessel and broke off at flange leading to discharge line outside. Pictures were taken.			24.0
6				24.0
7				24.0
8				24.0
9	GEE on-site and evaluates discharge pump damage.			24.0
10				24.0
11				24.0
12				24.0
13				24.0
14				24.0
15				24.0
16				24.0
17				24.0
18	GEE replaces discharge pump on System 3.			24.0
19	System 3 running @ 14:45	9.2		14.8
20	System 3 producing high volumes of water. System 3 shut down @ 8:00. System 3 left off over the weekend due to water production.	8.0	16.0	
21			24.0	
22			24.0	
23			24.0	
24	System 3 back on @ 12:40. System 3 turned off @ 14:50 to check oil levels. System 3 turned back on @ 15:10. System 3 turned off @ 16:50 due to high water production.	3.0	21.0	
25			24.0	
26	System 3 on @ 10:45. System 3 off @ 11:15. System 3 on @ 13:30. System 3 off @ 16:00. Limited System 3 usage because system is only running on select wells with product to minimize water production.	3.0	21.0	
27			24.0	
28			24.0	
29			24.0	
30	System 3 turned on @ 12:30.	11.5	12.5	
31	System 3 shut off @ 8:00 to check oil levels. CRA discovers broken pulley. GEE ships out new pulley.	8.0		16.0
TOTALS		42.7	262.5	438.8
Monthly Up-Time (%)*				**11.08**

REMEDIATION SYSTEM 3 ACTIVITY LOG

Remedial Pilot Study
LNAPL Area No. 3
Pontiac, Michigan

CRA Project No. 17487-33-0026

MONTH: FEBRUARY 2006

Day	Comments	System Run Time (hours)	Scheduled Shutdown Time (hours)	Unscheduled Shutdown Time (hours)
1	System 3 down until pulley replaced.			24.0
2	Bridgeway installs pulley on System 3 as per GEE specifications.		12.0	12.0
3	System 3 started @ 8:00. System 3 turned off @ 11:40 to minimize water production over the weekend.	3.6	20.4	
4			24.0	
5			24.0	
6	System 3 on to optimize product recovery from wells.	12.0	12.0	
7	System 3 turned off for oil change.	23.0	1.0	
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
TOTALS		38.6	93.4	36.0
Monthly Up-Time (%)*				**100.00**

Appendix E

Post-MPE Well Measurements

ENCORE
Environmental Corporate Remediation ©

APPENDIX D

POST-MPE WELL MEASUREMENTS
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

MW I.D.	Date	T.O.C. (feet)	Ground (feet)	DTP[1] (feet)	DTW[1] (feet)	LNAPL Thickness (feet)	LNAPL Elevations (feet)	Groundwater Elevations (feet)	Corrected Groundwater Elevations[3]
MWW8-03	02/14/06	970.37	967.91	NA	NA	--	--	--	--
MWW8-03	04/05/06	970.37	967.91	28.35	28.71	0.36	942.02	941.66	941.96
MWW8-06	02/14/06	970.37	967.94	27.45	32.00	4.55	942.92	938.37	942.10
MWW8-06	04/03/06	970.37	967.94	--	--	--	--	--	--
MWW8-07	02/14/06	970.15	970.52	30.98	33.35	2.37	939.17	936.80	938.74
MWW8-07	04/05/06	970.15	970.52	25.38	31.73	6.35	944.77	938.42	943.63
MWW8-08	02/14/06	970.27	967.81	--	32.40	--	--	937.87	937.87
MWW8-08	04/05/06	970.27	967.81	--	31.95	--	--	938.32	938.32
MWW8-09	02/14/06	970.32	968.08	22.08	22.95	0.87	948.24	947.37	948.08
MWW8-09	04/05/06	970.32	968.08	13.65	14.00	0.35	956.67	956.32	956.61
MWW8-14	02/14/06	970.23	967.65	--	31.38	--	--	938.85	938.85
MWW8-14	04/05/06	970.23	967.65	30.44	31.07	0.63	939.79	939.16	939.68
MWW8-15	02/14/06	970.19	967.68	26.26	27.90	1.64	943.93	942.29	943.63
MWW8-15	04/05/06	970.19	967.68	24.02	25.24	1.22	946.17	944.95	945.95
MWW8-16	02/14/06	970.46	967.95	26.89	28.87	1.98	943.57	941.59	943.21
MWW8-16	04/05/06	970.46	967.95	23.58	28.05	4.47	946.88	942.41	946.08
MWW8-24	02/14/06	970.67	967.75	24.89	24.90	0.01	945.78	945.77	945.78
MWW8-24	04/03/06	970.67	967.75	23.14	23.15	0.01	947.53	947.52	947.53
MWW8-26	02/14/06	970.67	967.69	9.67	9.82	0.15	961.00	960.85	960.97
MWW8-26	04/03/06	970.67	967.69	10.17	11.14	0.97	960.50	959.53	960.33
MWW8-27	02/14/06	970.77	967.82	NA	NA	NA	NA	NA	NA
MWW8-27	04/03/06	970.77	967.82	NA	NA	NA	NA	NA	NA
MWW8-33	02/14/06	969.37	967.87	19.39	19.40	0.01	949.98	949.97	949.98
MWW8-33	04/03/06	969.37	967.87	--	18.97	--	--	950.40	950.40
MWW8-34	02/14/06	966.55	964.33	15.52	16.32	0.80	951.03	950.23	950.89
MWW8-34	04/03/06	966.55	964.33	15.08	16.85	1.77	951.47	949.70	951.15
MWW8-36	02/14/06	968.62	963.27	17.03	17.91	0.88	951.59	950.71	951.43
MWW8-36	04/03/06	968.62	963.27	NA	NA	NA	NA	NA	NA
MWW8-45	02/14/06	968.40	967.87	--	18.43	--	--	949.97	949.97
MWW8-45	04/03/06	968.40	967.87	--	18.08	--	--	950.32	950.32
MWW8-47	02/14/06	971.26	968.16	26.41	26.84	0.43	944.85	944.42	944.77
MWW8-47	04/03/06	971.26	968.16	24.11	25.07	0.96	947.15	946.19	946.98
MWW8-48	02/14/06	971.08	967.95	20.75	21.21	0.46	950.33	949.87	950.25
MWW8-48	04/03/06	971.08	967.95	20.16	22.23	2.07	950.92	948.85	950.55
MWW8-58	02/14/06	973.82	971.58	NA	NA	NA	NA	NA	NA
MWW8-58	04/03/06	973.82	971.58	16.71	17.68	0.97	957.11	956.14	956.94
RWW8-01	02/14/06	970.32	967.83	26.75	26.76	0.01	943.57	943.56	943.57
RWW8-01	04/05/06	970.32	967.83	24.95	25.36	0.41	945.37	944.96	945.30
RWW8-02	02/14/06	970.74	967.88	--	31.77	--	--	938.97	938.97
RWW8-02	04/03/06	970.74	967.88	27.38	30.89	3.51	943.36	939.85	942.73
RWW8-03	02/14/06	971.15	967.61	--	21.17	--	--	949.98	949.98
RWW8-03	04/05/06	971.15	967.61	NA	NA	NA	NA	NA	NA
RWW8-04	02/14/06	971.30	967.78	--	43.52	--	--	927.78	927.78
RWW8-04	04/03/06	971.30	967.78	--	43.26	--	--	928.04	928.04
RWW8-05	02/14/06	970.30	967.70	--	DRY	--	--	--	--
RWW8-05	04/05/06	970.30	967.70	NA	NA	NA	NA	NA	NA
RWW8-06	02/14/06	970.92	968.02	26.28	26.55	0.27	944.64	944.37	944.59
RWW8-06	04/03/06	970.92	968.02	24.37	24.77	0.40	946.55	946.15	946.48
RWW8-07	02/14/06	970.14	968.20	--	26.54	--	--	943.60	943.60
RWW8-07	04/05/06	970.14	968.20	NA	NA	NA	NA	NA	NA
RWW8-08	02/14/06	970.98	968.09	27.33	32.00	4.67	943.65	938.98	942.81
RWW8-08	04/03/06	970.98	968.09	24.69	33.55	8.86	946.29	937.43	944.70

APPENDIX D

POST-MPE WELL MEASUREMENTS
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

MW I.D.	Date	T.O.C. (feet)	Ground (feet)	DTP[1] (feet)	DTW[1] (feet)	LNAPL Thickness (feet)	LNAPL Elevations (feet)	Groundwater Elevations (feet)	Corrected Groundwater Elevations[3]
RWW8-09	02/14/06	970.98	968.00	NA	NA	NA	NA	NA	NA
RWW8-09	04/05/06	970.98	968.00	NA	NA	NA	NA	NA	NA
RWW8-10	02/14/06	970.96	968.00	25.85	26.08	0.23	945.11	944.88	945.07
RWW8-10	04/03/06	970.96	968.00	23.95	24.88	0.93	947.01	946.08	946.84
RWW8-11	02/14/06	971.36	968.19	28.39	29.28	0.89	942.97	942.08	942.81
RWW8-11	04/03/06	971.36	968.19	26.85	28.05	1.20	944.51	943.31	944.29
RWW8-12	02/14/06	971.15	968.20	27.28	27.90	0.62	943.87	943.25	943.76
RWW8-12	04/03/06	971.15	968.20	25.80	29.00	3.20	945.35	942.15	944.77
RWW8-13	02/14/06	971.07	968.10	--	12.41	--	--	958.66	958.66
RWW8-13	04/03/06	971.07	968.10	--	4.62	--	--	966.45	966.45
RWW8-14	02/14/06	971.25	968.30	--	36.84	--	--	934.41	934.41
RWW8-14	04/03/06	971.25	968.30	31.92	31.95	0.03	939.33	939.30	939.32
RWW8-15	02/14/06	970.73	968.20	22.10	22.16	0.06	948.63	948.57	948.62
RWW8-15	04/03/06	970.73	968.20	19.77	20.62	0.85	950.96	950.11	950.81
RWW8-16	02/14/06	971.13	968.30	25.82	26.10	0.28	945.31	945.03	945.26
RWW8-16	04/03/06	971.13	968.30	25.50	27.80	2.30	945.63	943.33	945.22
RWW8-17	02/14/06	971.18	968.10	37.45	37.47	0.02	933.73	933.71	933.73
RWW8-17	04/03/06	971.18	968.10	37.10	37.60	0.50	934.08	933.58	933.99
RWW8-18	02/14/06	971.07	967.80	32.07	32.11	0.04	939.00	938.96	938.99
RWW8-18	04/03/06	971.07	967.80	29.38	30.10	0.72	941.69	940.97	941.56
RWW8-19	02/14/06	971.43	968.20	--	39.05	--	--	932.38	932.38
RWW8-19	04/05/06	971.43	968.20	NA	NA	NA	NA	NA	NA
RWW8-20	02/14/06	970.94	968.00	--	38.13	--	--	932.81	932.81
RWW8-20	04/05/06	970.94	968.00	NA	NA	NA	NA	NA	NA
RWW8-21	02/14/06	970.91	967.90	--	38.58	--	--	932.33	932.33
RWW8-21	04/03/06	970.91	967.90	35.55	38.57	3.02	935.36	932.34	934.82
RWW8-22	02/14/06	970.77	967.90	36.45	36.50	0.05	934.32	934.27	934.31
RWW8-22	04/03/06	970.77	967.90	33.92	33.95	0.03	936.85	936.82	936.84
RWW8-23	02/14/06	970.92	967.90	--	37.13	--	--	933.79	933.79
RWW8-23	04/03/06	970.92	967.90	28.40	29.13	0.73	942.52	941.79	942.39
RWW8-24	02/14/06	970.88	967.90	--	27.52	--	--	943.36	943.36
RWW8-24	04/03/06	970.88	967.90	--	23.85	--	--	947.03	947.03
RWW8-25	02/14/06	970.97	967.90	31.50	31.52	0.02	939.47	939.45	939.47
RWW8-25	04/03/06	970.97	967.90	27.91	39.25	11.34	943.06	931.72	941.02
RWW8-26	02/14/06	970.88	968.00	--	33.62	--	--	937.26	937.26
RWW8-26	04/03/06	970.88	968.00	--	30.63	--	--	940.25	940.25
RWW8-27	02/14/06	970.89	967.90	--	34.82	--	--	936.07	936.07
RWW8-27	04/03/06	970.89	967.90	29.44	32.94	3.50	941.45	937.95	940.82
RWW8-28	02/14/06	970.95	968.10	24.47	24.91	0.44	946.48	946.04	946.40
RWW8-28	04/03/06	970.95	968.10	20.65	21.09	0.44	950.30	949.86	950.22
RWW8-29	02/14/06	970.83	967.90	29.48	29.50	0.02	941.35	941.33	941.35
RWW8-29	04/03/06	970.83	967.90	26.70	32.00	5.30	944.13	938.83	943.18
RWW8-30	02/14/06	970.95	967.90	19.90	26.25	6.35	951.05	944.70	949.91
RWW8-30	04/03/06	970.95	967.90	17.93	25.63	7.70	953.02	945.32	951.63
RWW8-31	02/14/06	970.82	967.90	27.31	34.70	7.39	943.51	936.12	942.18
RWW8-31	04/03/06	970.82	967.90	25.48	32.71	7.23	945.34	938.11	944.04
RWW8-32	02/14/06	971.03	968.00	29.45	29.46	0.01	941.58	941.57	941.58
RWW8-32	04/03/06	971.03	968.00	27.89	28.67	0.78	943.14	942.36	943.00
RWW8-33	02/14/06	970.69	968.10	--	26.83	--	--	943.86	943.86
RWW8-33	04/03/06	970.69	968.10	--	23.00	--	--	947.69	947.69
RWW8-34	02/14/06	971.24	968.30	--	20.56	--	--	950.68	950.68
RWW8-34	04/03/06	971.24	968.30	--	18.15	--	--	953.09	953.09

APPENDIX D

POST-MPE WELL MEASUREMENTS
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

MW I.D.	Date	T.O.C. (feet)	Ground (feet)	DTP[1] (feet)	DTW[1] (feet)	LNAPL Thickness (feet)	LNAPL Elevations (feet)	Groundwater Elevations (feet)	Corrected Groundwater Elevations[3]
RWW8-35	02/14/06	971.27	968.30	--	31.26	--	--	940.01	940.01
RWW8-35	04/03/06	971.27	968.30	--	24.67	--	--	946.60	946.60
RWW8-36	02/14/06	971.40	968.60	--	30.03	--	--	941.37	941.37
RWW8-36	04/03/06	971.40	968.60	--	25.93	--	--	945.47	945.47
RWW8-37	02/14/06	971.44	968.50	28.46	28.93	0.47	942.98	942.51	942.90
RWW8-37	04/03/06	971.44	968.50	23.69	24.44	0.75	947.75	947.00	947.62
RWW8-38	02/14/06	971.34	968.40	--	22.55	--	--	948.79	948.79
RWW8-38	04/03/06	971.34	968.40	--	20.85	--	--	950.49	950.49
RWW8-39	02/14/06	970.88	967.90	--	--	--	--	--	--
RWW8-39	04/05/06	970.88	967.90	NA	NA	NA	NA	NA	NA
RWW8-40	02/14/06	971.18	968.30	--	25.26	--	--	945.92	945.92
RWW8-40	04/05/06	971.18	968.30	NA	NA	NA	NA	NA	NA
RWW8-41	02/14/06	971.21	968.00	--	27.59	--	--	943.62	943.62
RWW8-41	04/05/06	971.21	968.00	NA	NA	NA	NA	NA	NA
RWW8-42	02/14/06	971.02	968.10	--	27.37	--	--	943.65	943.65
RWW8-42	04/05/06	971.02	968.10	NA	NA	NA	NA	NA	NA
RWW8-43	02/14/06	970.97	968.00	--	27.60	--	--	943.37	943.37
RWW8-43	04/05/06	970.97	968.00	NA	NA	NA	NA	NA	NA
RWW8-44	02/14/06	971.13	967.70	27.48	27.60	0.12	943.65	943.53	943.63
RWW8-44	04/05/06	971.13	967.70	25.51	25.65	0.14	945.62	945.48	945.59
RWW8-45	02/14/06	970.12	967.20	--	17.24	--	--	952.88	952.88
RWW8-45	04/05/06	970.12	967.20	21.41	26.15	4.74	948.71	943.97	947.86
RWW8-46	02/14/06	970.72	967.70	26.00	33.45	7.45	944.72	937.27	943.38
RWW8-46	04/05/06	970.72	967.70	23.90	34.81	10.91	946.82	935.91	944.86
RWW8-47	02/14/06	970.80	967.50	27.49	27.89	0.40	943.31	942.91	943.24
RWW8-47	04/05/06	970.80	967.50	25.40	26.30	0.90	945.40	944.50	945.24
RWW8-48	02/14/06	970.74	967.50	--	28.03	--	--	942.71	942.71
RWW8-48	04/05/06	970.74	967.50	NA	NA	NA	NA	NA	NA
RWW8-49	02/14/06	971.00	967.80	--	24.60	--	--	946.40	946.40
RWW8-49	04/05/06	971.00	967.80	NA	NA	NA	NA	NA	NA
RWW8-50	02/14/06	970.80	967.60	--	23.27	--	--	947.53	947.53
RWW8-50	04/05/06	970.80	967.60	NA	NA	NA	NA	NA	NA
RWW8-51	02/14/06	970.77	967.70	--	22.16	--	--	948.61	948.61
RWW8-51	04/05/06	970.77	967.70	NA	NA	NA	NA	NA	NA
RWW8-52	02/14/06	970.65	967.60	--	21.79	--	--	948.86	948.86
RWW8-52	04/05/06	970.65	967.60	NA	NA	NA	NA	NA	NA
RWW8-53	02/14/06	970.36	967.40	24.05	24.12	0.07	946.31	946.24	946.30
RWW8-53	04/05/06	970.36	967.40	22.78	22.80	0.02	947.58	947.56	947.58
RWW8-54	02/14/06	970.32	967.80	--	17.25	--	--	953.07	953.07
RWW8-54	04/05/06	970.32	967.80	--	15.51	--	--	954.81	954.81
RWW8-55	02/14/06	970.56	968.10	24.25	24.46	0.21	946.31	946.10	946.27
RWW8-55	04/05/06	970.56	968.10	23.05	24.00	0.95	947.51	946.56	947.34
RWW8-56	02/14/06	970.16	967.60	22.75	23.13	0.38	947.41	947.03	947.34
RWW8-56	04/05/06	970.16	967.60	22.54	27.84	5.30	947.62	942.32	946.67
RWW8-57	02/14/06	983.78	981.10	--	DRY	--	--	--	--
RWW8-57	04/03/06	983.78	981.10	34.72	34.91	0.19	949.06	948.87	949.03
RWW8-58	02/14/06	984.07	981.50	44.12	44.15	0.03	939.95	939.92	939.94
RWW8-58	04/03/06	984.07	981.50	--	35.28	--	--	948.79	948.79
RWW8-59	02/14/06	984.53	981.00	--	DRY	--	--	--	--
RWW8-59	04/03/06	984.53	981.00	39.42	41.17	1.75	945.11	943.36	944.80
RWW8-60	02/14/06	983.62	981.00	44.24	44.70	0.46	939.38	938.92	939.30
RWW8-60	04/03/06	983.62	981.00	39.90	41.42	1.52	943.72	942.20	943.45

APPENDIX D

POST-MPE WELL MEASUREMENTS
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

MW I.D.	Date	T.O.C. (feet)	Ground (feet)	DTP[1] (feet)	DTW[1] (feet)	LNAPL Thickness (feet)	LNAPL Elevations (feet)	Groundwater Elevations (feet)	Corrected Groundwater Elevations[3]
RWW8-61	02/14/06	983.91	981.00	43.81	43.85	0.04	940.10	940.06	940.09
RWW8-61	04/03/06	983.91	981.00	38.74	45.55	6.81	945.17	938.36	943.94
RWW8-62	02/14/06	983.42	980.80	--	24.42	--	--	959.00	959.00
RWW8-62	04/03/06	983.42	980.80	--	24.97	--	--	958.45	958.45
RWW8-63	02/14/06	984.29	981.50	--	29.37	--	--	954.92	954.92
RWW8-63	04/03/06	984.29	981.50	--	28.18	--	--	956.11	956.11
RWW8-64	02/14/06	984.42	981.40	43.36	44.02	0.66	941.06	940.40	940.94
RWW8-64	04/03/06	984.42	981.40	42.52	43.15	0.63	941.90	941.27	941.79
RWW8-65	02/14/06	984.42	981.40	39.65	39.87	0.22	944.77	944.55	944.73
RWW8-65	04/03/06	984.42	981.40	38.66	38.90	0.24	945.76	945.52	945.72
RWW8-66	02/14/06	983.75	981.30	--	33.04	--	--	950.71	950.71
RWW8-66	04/03/06	983.75	981.30	--	32.96	--	--	950.79	950.79
RWW8-67	02/14/06	984.03	981.20	33.41	33.67	0.26	950.62	950.36	950.57
RWW8-67	04/03/06	984.03	981.20	33.37	33.57	0.20	950.66	950.46	950.62
RWW8-68	02/14/06	984.04	981.10	33.71	33.95	0.24	950.33	950.09	950.29
RWW8-68	04/03/06	984.04	981.10	33.06	33.42	0.36	950.98	950.62	950.92
RWW8-69	02/14/06	984.27	981.70	NA	NA	NA	NA	NA	NA
RWW8-69	04/03/06	984.27	981.70	--	29.99	--	--	954.28	954.28
RWW8-70	02/14/06	983.30	980.70	NA	NA	NA	NA	NA	NA
RWW8-70	04/03/06	983.30	980.70	NA	NA	NA	NA	NA	NA
RWW8-71	02/14/06	983.59	980.90	--	39.07	--	--	944.52	944.52
RWW8-71	04/03/06	983.59	980.90	35.56	36.07	0.51	948.03	947.52	947.94
RWW8-72	02/14/06	968.04	965.60	--	13.90	--	--	954.14	954.14
RWW8-72	04/03/06	968.04	965.60	--	14.38	--	--	953.66	953.66
RWW8-73	02/14/06	968.11	965.60	--	18.43	--	--	949.68	949.68
RWW8-73	04/03/06	968.11	965.60	--	18.25	--	--	949.86	949.86
RWW8-74	02/14/06	968.17	965.50	--	18.31	--	--	949.86	949.86
RWW8-74	04/03/06	968.17	965.50	--	17.64	--	--	950.53	950.53
RWW8-75	02/14/06	968.27	965.60	--	17.75	--	--	950.52	950.52
RWW8-75	04/03/06	968.27	965.60	--	17.21	--	--	951.06	951.06
RWW8-76	02/14/06	968.34	965.70	17.40	17.42	0.02	950.94	950.92	950.94
RWW8-76	04/03/06	968.34	965.70	--	16.39	--	--	951.95	951.95
RWW8-77	02/14/06	968.50	965.80	--	13.52	--	--	954.98	954.98
RWW8-77	04/03/06	968.50	965.80	--	13.14	--	--	955.36	955.36
RWW8-78	02/14/06	968.34	965.80	19.78	28.40	8.62	948.56	939.94	947.01
RWW8-78	04/03/06	968.34	965.80	18.90	27.88	8.98	949.44	940.46	947.82
RWW8-79	02/14/06	968.53	965.90	18.45	21.91	3.46	950.08	946.62	949.46
RWW8-79	04/03/06	968.53	965.90	15.39	18.72	3.33	953.14	949.81	952.54
RWW8-80	02/14/06	968.44	965.70	--	15.97	--	--	952.47	952.47
RWW8-80	04/03/06	968.44	965.70	--	15.00	--	--	953.44	953.44
RWW8-81	02/14/06	968.14	965.60	--	18.68	--	--	949.46	949.46
RWW8-81	04/03/06	968.14	965.60	--	18.02	--	--	950.12	950.12
RWW8-82	02/14/06	968.34	965.70	--	18.90	--	--	949.44	949.44
RWW8-82	04/03/06	968.34	965.70	--	18.55	--	--	949.79	949.79
RWW8-83	02/14/06	968.47	966.00	--	18.25	--	--	950.22	950.22
RWW8-83	04/03/06	968.47	966.00	--	18.40	--	--	950.07	950.07
RWW8-84	02/14/06	968.80	966.30	--	20.85	--	--	947.95	947.95
RWW8-84	04/03/06	968.80	966.30	--	20.30	--	--	948.50	948.50
RWW8-85	02/14/06	968.47	965.90	--	20.94	--	--	947.53	947.53
RWW8-85	04/03/06	968.47	965.90	--	20.46	--	--	948.01	948.01
RWW8-86	02/14/06	968.40	966.00	--	20.60	--	--	947.80	947.80
RWW8-86	04/03/06	968.40	966.00	19.59	19.63	0.04	948.81	948.77	948.80

APPENDIX D

POST-MPE WELL MEASUREMENTS
INTERIM MEASURES REPORT- AOI W-8, LNAPL AREA NO. 3
GM PONTIAC NORTH CAMPUS
PONTIAC, MICHIGAN

MW I.D.	Date	T.O.C. (feet)	Ground (feet)	DTP[1] (feet)	DTW[1] (feet)	LNAPL Thickness (feet)	LNAPL Elevations (feet)	Groundwater Elevations (feet)	Corrected Groundwater Elevations[3]
RWW8-87	02/14/06	968.50	966.00	20.34	21.08	0.74	948.16	947.42	948.03
RWW8-87	04/03/06	968.50	966.00	19.35	20.90	1.55	949.15	947.60	948.87
RWW8-88	02/14/06	968.70	966.10	--	22.49	--	--	946.21	946.21
RWW8-88	04/03/06	968.70	966.10	--	21.34	--	--	947.36	947.36
RWW8-89	02/14/06	968.44	965.90	13.10	13.51	0.41	955.34	954.93	955.27
RWW8-89	04/03/06	968.44	965.90	12.50	13.00	0.50	955.94	955.44	955.85

Appendix F

Well Boring Logs for LNAPL Area No. 3

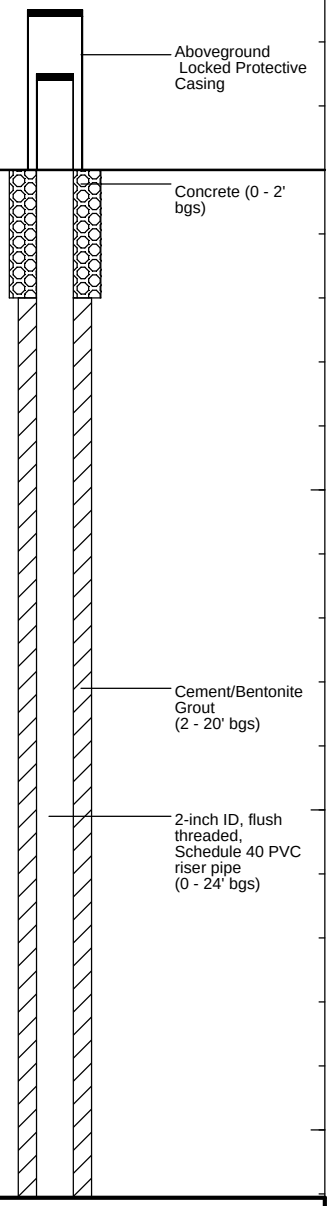
ENCORE
Environmental Corporate Remediation ©

Date Start/Finish: **Drilling Company:** Pennsylvania Drilling Co **Driller's Name:** Norm Hormel **Drilling Method:** 8" spun casing **Sampler Size:** 2", 2' Long **Auger Size:** 3.25" **Rig Type:** CME	**Northing:** 424168.30 **Easting:** 13413175.55 **Casing Elevation:** 970.46 **Borehole Depth:** 35 **Surface Elevation:** 968.03 **Descriptions By:** John McKenna	**Well/Boring ID:** MWW8-03 **Client:** GM **Location:** GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
970								
0	0-2 S-1	SS					Concrete	concrete
965	2-4 S-2	SS	7 9 12 9	21	1.5	BG	SW	brown fine to coarse SAND with fine Gravel, medium, dry (fill)
5	4-6 S-3	SS	5 6 6 4	12	1.2	3.2	SP	black foundry fine SAND, dry, petroleum odor (fill)
							SP	brown medium to coarse SAND, trace Silt, dry, petroleum odor (fill)
							CL	brown CLAY, trace Silt, dry, slight odor (fill)
960	6-8 S-4	SS	5 9 13 14	22	2.0	10	ML	gray with some iron staining SILT, trace Clay, very stiff, petroleum odor (fill)
	8-10 S-5	SS	7 9 14 15	23	2.0	8.0		
10							ML	gray SILT, trace fine Sand, petroleum odor
	10-12 S-6	SS	4 5 6 8	11	1.2		ML	brown SILT, trace fine Sand, stiff, plastic, moist, petroleum odor
955	12-14 S-7	SS	12 14 16 12	30	1.4	4.7	ML	brown SILT, trace fine Sand, very stiff, moist, slight petroleum odor
15	14-16 S-8	SS	3 5 5 6	10	2.0	BG	CL	brown CLAY with Silt, stiff, plastic, dry to moist

Hydrostratigraphy

Boring Construction



ENCORE

Remarks:

SS - Splitspoon

BG - Background

ppm - parts per million bgs - below ground surface

Client:
GM

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-03

Borehole Depth: 35

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
	16-18	SS	9 12 9 8	21	2.0	BG	CL	brown CLAY with Silt, trace fine to medium Gravel, plastic, dry to moist
	S-9							
950	18-20	SS	9 12 13 14	25	1.1	BG		
20	S-10							
	20-22	SS	3 4 4 9	8	2.0	BG	CL	brown CLAY, trace Silt, trace fine Gravel, medium stiff, plastic, moist
	S-11							
	22-24	SS	9 11 12 18	23	2.0	BG		gray/brown CLAY with Silt, trace fine gravel and fine sand, very stiff, plastic, moist, slight odor
945	S-12						CL	
	24-26	SS	2 7 9 10	16	1.9	BG		
25	S-13							
	26-28	SS	9 10 10 11	20	2.0	3.2	SP	brown fine SAND, trace Silt, medium, wet, slight odor
	S-14							
940	28-30	SS	3 4 7 11	11	2.0	8.0	CL	brown CLAY, trace Silt, trace fine Sand, plastic, moist
	S-15							
30	30-32	SS	3 4 10 11	14	1.8	3.2	SW	brown fine to medium SAND, wet, petroleum odor
	S-16						CL	black weathered organic-rich CLAY
							CL	brown CLAY with Silt, trace fine Sand, moist, slight petroleum odor
	32-34	SS	7 9 10 12	19	2.0	2.3	CL	brown CLAY, trace Silt, trace fine Gravel, very stiff, plastic, moist, petroleum odor
935	S-17							
35								

Hydrostratigraphy

Boring Construction

- Cement/Bentonite Grout (2 - 20' bgs)
- 2-inch ID, flush threaded, Schedule 40 PVC riser pipe (0 - 24' bgs)
- Hydrated Bentonite Seal (20 - 22' bgs)
- 2-inch ID, PVC wire-wrapped, 10-slot well screen (24 - 34' bgs)
- # 5 Sand Pack (22 - 34' bgs)

ENCORE

Remarks:
SS - Splitspoon
BG - Background
ppm - parts per million bgs - below ground surface

Date Start/Finish: 12/11/01
Drilling Company: Pennsylvania Drilling Co.
Driller's Name: Norm Hormel
Drilling Method: 3 1/4"
Sampler Size: 2" diameter, 2' long
Auger Size: 3 1/4"
Rig Type: NA

Northing: 424244.27
Easting: 13413161.76
Casing Elevation: 970.45

Borehole Depth: 32'
Surface Elevation: 968

Descriptions By: David Staccia

Well/Boring ID: MWW8-06

Client: General Motors

Location: GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
970 / 0		NA	NA	NA	NA	NA			CONCRETE.		Aboveground Locked Protective Casing
									No Samples Taken from 0 - 22' bgs.		Portland Cement/Bentonite Grout (0 - 8.0' bgs)
965 / 5											2-inch PVC Riser (2.4' ags - 22' bgs)
960 / 10											Natural Collapse (8.0' - 17' bgs)
955 / 15											

ENCORE

Remarks: ags = above ground surface; bgs = below ground surface; BG = Background; NA = Not Applicable.

Client:
General Motors

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-06

Borehole Depth: 32'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
		NA	NA	NA	NA	NA			No Samples Taken from 0 - 22' bgs.		Natural Collapse (8.0' - 17' bgs)
950											2-inch PVC Riser (2.4' ags - 22' bgs)
											Hydrated Pelletal Bentonite (17' - 19' bgs)
20	20-22 1	SS	3 5 9 14	14	0.0	NA					
	22-24 2	SS	2 5 6 8	11	0.9	BG	CL		Gray Silty CLAY, little fine to coarse Sand, stiff, dry.		
945							SM		Gray Silty very fine SAND, medium dense, wet, water table at 23.8' bgs.		#5 Sand Pack (19' - 32' bgs)
	24-26 3	SS	3 5 7 8	12	1.2	2.6	ML		Gray Clayey SILT, some very fine Sand, stiff, slightly moist.		
25							SM		Gray Silty very fine SAND, medium dense, dry.		
	26-28 4	SS	3 5 2 1	7	1.3	BG			Gray Silty CLAY, trace fine to coarse Sand, medium stiff, moist.		
940											2-inch PVC Screen (22' - 32' bgs)
	28-30 5	SS	1 2 1 1	3	1.0	BG	CL				
30									from 30' - 32' bgs, trace Gravel, stiff.		
	30-32 6	SS	3 4 5 7	9	2.0	BG					

ENCORE

Remarks: ags = above ground surface; bgs = below ground surface; BG = Background; NA = Not Applicable.

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-60

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.00						
0	SP-SANDS (FILL), with fine and coarse gravels, trace boulders, loose, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE	1RS		100		9.0
8	CI-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist	974.00	BENTONITE GROUT					12.8
10			4" PVC WELL CASING					
12				2RS		100		11.3
14	SC-CLAYEY SANDS, compact, poorly graded, fine grained, trace medium and coarse grained, trace fine and coarse gravels, brown, moist	968.00						
16								
18	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, brown	963.00	BENTONITE CHIPS					10.2
20								
22				3RS		100		11.8
24			8" BOREHOLE					
26	- dark brown at 25.0ft BGS - petroleum-like odor at 26.0ft BGS							
28								7.3
30			4" PVC WELL SCREEN					
32				4RS		100		
34								8.3

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-60

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
		944.00						
38	ML-SILTS, dense, poorly graded, fine grained, dark brown/gray, wet							
40								5.3
42			SAND PACK	5RS		100		
44								3.3
		936.00						
46	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, brown, no odor							
		934.00						
48	END OF HOLE @ 47.0ft BGS							
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
956.00 to 936.00ft bgs
25.00 to 45.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
958.00 to 934.00ft bgs
23.00 to 47.00ft BGS
Material: #5 SANDS

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

Date Start/Finish: 12/13/01-12/17/01
Drilling Company: Pennsylvania Drilling Co
Driller's Name: Norm Hormel
Drilling Method:
Sampler Size: 24"
Auger Size: 4 1/4"
Rig Type:

Northing: 424099.42
Easting: 13413178.04
Casing Elevation: 970.54

Borehole Depth: 40.0'
Surface Elevation: 967.78

Descriptions By: David Straccia

Well/Boring ID: MWW8-08

Client: GM

Location: GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
970											Aboveground Locked Protective Casing
0							Concrete		Concrete		Concrete (0 - 1' bgs)
965	2-4 S-1	SS	3 3 4 3	7	0.8	1.5	CL		olive gray Silty CLAY, trace fine to coarse Sand, medium stiff, dry		
5	4-6 S-2	SS	3 3 4 6	7	1.0	1.5			at 3.8' dark gray at 5.0' green-gray		Cement/Bentonite Grout (1 - 17.5' bgs)
	6-8 S-3	SS	15 17 19 15	36	2.0	0.5			at 7.0' red-brown		
960	8-10 S-4	SS	7 8 9 14	17	1.7	0.3			gray Silty fine SAND, dense, dry red-brown Silty CLAY, trace fine to coarse Sand, hard, dry at 8.0' color mixture of green-gray and red-brown		2-inch ID, flush threaded, Schedule 40 PVC riser pipe (0 - 24' bgs)
10	10-12 S-5	SS	5 7 9 11	16	1.7	1.2	CL				
955	12-14 S-6	SS	8 10 12 12	22	1.8	0.4					
15	14-16 S-7	SS	9 6 6 9	12	1.6	0.4			at 15.0' color changes completely to gray		

ENCORE

Remarks: water table at 25.7'
SS - Splitspoon
BG - Background
ppm - parts per million bgs - below ground surface

Client:
GM

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-08

Borehole Depth: 40.0'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
950	16-18 S-8	SS	6 8 9 11	17	1.7	0.2		
	18-20 S-9	SS	3 5 5 7	10	1.7	0.4		
20	20-22 S-10	SS	2 3 5 7	8	1.7	0.7	CL	
945	22-24 S-11	SS	3 4 5 5	9	1.9	0.7		
25	24-26 S-12	SS	2 3 4 6	7	1.7	1.1	ML	gray Clayey SILT, very stiff, moist
	26-28 S-13	SS	3 7 7 5	14	2.0	0.8	CL	gray Silty CLAY, trace fine to coarse Sand, hard, dry to moist
940	28-30 S-14	SS	3 3 2 4	5	1.7	9.2		
30	30-32 S-15	SS	4 5 6 7	11	2.0	3.7	SW	gray very fine to coarse SAND, some Silt, loose, very moist to wet
								gray Silty CLAY, trace fine to coarse Sand, medium stiff, moist
								dark gray fine to coarse SAND, some Silt, medium density, moist to wet
935	32-34 S-16	SS	2 6 7 11	13	1.6	5.9	CL	gray Silty CLAY, trace fine to coarse Sand, trace fine Gravel, medium stiff, dry to moist
35	34-36 S-17	SS	2 3 5 7	8	1.0	0.3		

Hydrostratigraphy

Boring Construction

- Cement/Bentonite Grout (1 - 17.5' bgs)
- Hydrated Bentonite Pellets (17.5 - 19.5' bgs)
- 2-inch ID, flush threaded, Schedule 40 PVC riser pipe (0 - 24' bgs)
- # 5 Sand Pack (19.5 - 35' bgs)
- 2-inch ID, PVC wire-wrapped, 10-slot well screen (24 - 34' bgs)
- Bentonite Chips (35 - 40' bgs)

ENCORE

Remarks: water table at 25.7'
SS - Splitspoon
BG - Background
ppm - parts per million bgs - below ground surface

Client:
GM

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-08

Borehole Depth: 40.0'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
930	36-38 S-18	SS	2 4 5 6	9	1.2	17.0	CL				Bentonite Chips (35 - 40' bgs)
	38-40 S-19	SS	6 9 37 50/4	87	0.2	2.0					
40											

ENCORE

Remarks: water table at 25.7'
SS - Splitspoon
BG - Background
ppm - parts per million bgs - below ground surface

Date Start/Finish: 01/28/02
Drilling Company: Pennsylvania Drilling Co.
Driller's Name: Earl Dye
Drilling Method: 8" Spun Casing
Sampler Size: 2" diameter, 2' long
Auger Size: 3 1/4"
Rig Type:

Northing: 424243.17
Easting: 13413324.95
Casing Elevation: 970.27

Borehole Depth: 38.0'
Surface Elevation: 967.93

Descriptions By: Bart Williams

Well/Boring ID: MWW8-09

Client: General Motors

Location: GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
970 / 0											Aboveground Locked Protective Casing
0	0-2 S-1	SS	NA NA 2 2	NA	0.6	9.4	Concrete		Concrete.		Concrete (0 - 2' bgs)
							SC		Brown to light brown Sandy CLAY, trace fine gravel, some coarse Sand, stiff, medium plasticity, moist. (Fill)		
965	2-4 S-2	SS	4 4 4 4	8	1.2	10			from 3.0 - 3.5' brown to black trace fine gravel, loose, moist.		Cement/Bentonite Grout (2 - 6' bgs)
5	4-6 S-3	SS	5 7 10 11	17	1.1	7.3			from 5.0 - 5.1' medium sand lense.		2-inch ID, flush threaded, Schedule 40 PVC riser pipe (0 - 10' bgs)
	6-8 S-4	SS	5 6 7 8	13	1.0	8.1			at 7.5' decrease in sands, increase in silts.		Hydrated Bentonite Pellets (6 - 8' bgs)
960	8-10 S-5	SS	4 6 8 8	14	1.4	BG	CL		Gray Silty CLAY, trace fine Gravel, some medium Sand, stiff, low to medium plasticity, dry to moist.		
10	10-12 S-6	SS	6 7 8 9	15	1.3	1.8					2-inch ID, PVC wire-wrapped, 10-slot well screen (10 - 20' bgs)
955	12-14 S-7	SS	10 6 10 1	16	1.1	BG					# 5 Sand Pack (8 - 20' bgs)
15	14-16 S-8	SS	3 4 5 7	9	1.2	BG					

ENCORE

Remarks:

bgs = below ground surface; ags = above ground surface;
NA = Not Applicable.

Client:
General Motors

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-09

Borehole Depth: 38.0'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
950	16-18 S-9	SS	7 9 11 8	20	13	3.3	CL		from 16.0 - 16.1' medium sand seam, moist to wet. Gray Silty CLAY, trace fine Gravel, some medium Sand, stiff, low to medium plasticity, dry to moist.		# 5 Sand Pack (8 - 20' bgs)
	18-20 S-10	SS	7 8 10 11	18	1.0	1.0					2-inch ID, PVC wire-wrapped, 10-slot well screen (10 - 20' bgs)
20	20-22 S-11	SS	14 18 15 15	33	15	BG			at 21.0' dense.		
945	22-24 S-12	SS	14 13 16 15	29	1.0	BG					
	24-26 S-13	SS	15 17 17 14	34	1.3	BG			at 24.0' dark gray.		Cement/Bentonite Grout (20 - 38' bgs)
25	26-28 S-14	SS	13 15 17 13	32	1.4	BG			at 27.0 dense.		
940	28-30 S-15	SS	3 4 8 5	12	1.3	BG					
30	30-32 S-16	SS	6 7 8 10		1.2	BG					
935	32-34 S-17	SS	12 11 12 9		1.1	BG					
35	34-36 S-18	SS	40 12 11 11		0.9	BG					

ENCORE

Remarks:

bgs = below ground surface; ags = above ground surface;
NA = Not Applicable.

Client:
General Motors

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-09

Borehole Depth: 38.0'

DEPTH ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
930	36-38 S-19	SS	12 13 13 14		1.0	BG	CL		Gray Silty CLAY, trace fine Gravel, some medium Sand, stiff, low to medium plasticity, dry to moist.		Cement/Bentonite Grout (20 - 38' bgs)

ENCORE

Remarks:

bgs = below ground surface; ags = above ground surface;
NA = Not Applicable.

Date Start/Finish: 10/11/03 **Drilling Company:** Prosonic Corporation **Driller's Name:** Mike Bond **Drilling Method:** Rotosonic **Sampler Size:** 10' corebarrel	**Northing:** 424135.08 **Easting:** 13413175.04 **Casing Elevation:** 970.23 **Borehole Depth:** 31.5' **Surface Elevation:** 967.71 **Descriptions By:** Wayne Patterson	**Well ID:** MWW8-14 **Client:** General Motors Corporation **Location:** GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
970								Stickup Protective Casing
0							Concrete.	Portland Cement (0 - 1.0' bgs)
					SP		Black fine SAND (SP), some angular gravel, loose, saturated, sheen on water, no odor, fill.	Sand Drain (1 - 3.0' bgs)
965							Grayish brown and light brown mottled SILTY CLAY (CL), few fine to coarse subangular sand, few fine to coarse subangular gravel, rare cobble, slightly plastic, stiff, no odor, dry, fill.	
	1	0-7'	100%	NA				2" ID PVC Riser Pipe (2.5' ags - 11.5' bgs)
5								Hydrated Bentonite Chips (3.0' - 9.5' bgs)
							Color change to dark gray, moderately plastic, moist to wet.	
960								
10								
955								
	2	7-17'	100%	NA				
15								

EEC
Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Client:
General Motors Corporation

Site Location:
GM Pontiac North Campus

Boring ID: MWW8-14

Borehole Depth: 31.5'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
950					CL			
20							Natural - no fill.	Sand Pack (9.5' - 31.5' bgs)
945	3	17-31.5	100%	NA				
25							Dark gray SILT (ML), saturated, no odor, few very fine sand.	2" ID 0.010" Wire Wrapped PVC Screen (11.5 - 31.5' bgs)
940								
30							Dark gray fine SAND (SP), few clay, loose, saturated, no odor.	

EEC
Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-61

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.00						
0	SP-SANDS (FILL), with fine and coarse gravels, loose to compact, poorly graded, fine grained, trace medium and coarse grained, brown, moist		CONCRETE					
2								
4				1RS		100		9.6
6								
8	CI-CLAYS, with sands and gravels, firm, low plasticity, brown, moist	974.00	BENTONITE GROUT					7.9
10			4" PVC WELL CASING					
12				2RS		100		
14								10.2
16								
18	SP-SANDS, trace silts, loose, poorl ygraded, fine and mediu mgrained, trace coarse grained, brown, very moist	964.00 963.00	BENTONITE CHIPS					
	CONCRETE							9.0
20	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, dark brown, moist	961.00						
22				3RS		100		
24	- very moist, with silts at 25.0ft BGS							3.5
26			8" BOREHOLE					
	- stiff to very stiff, moist at 26.9ft BGS	954.00						
28	ML-SILTS, compact, poorly graded, fine grained, dark brown, wet							7.2
30			4" PVC WELL SCREEN					
32				4RS		100		
34								9.3

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-61

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
38								
40								3.5
42			SAND PACK	5RS		100		
44	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, dark brown, moist	937.00						4.9
46								
	END OF HOLE @ 47.0ft BGS	934.00						
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
954.00 to 934.00ft bgs
27.00 to 47.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
956.00 to 934.00ft bgs
25.00 to 47.00ft BGS
Material: #5 SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-78

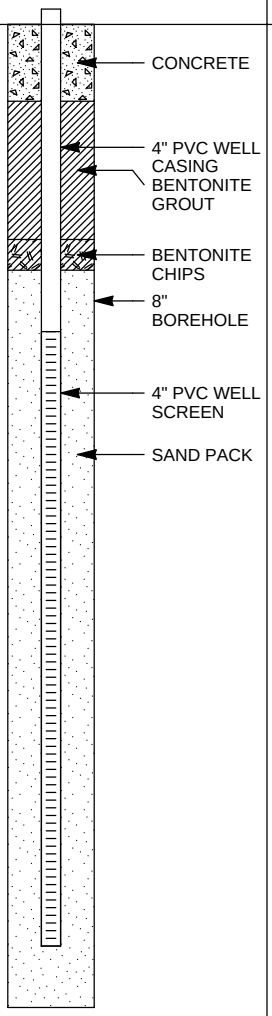
DATE COMPLETED: September 1, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), with fine to coarse gravels, poorly graded, fine to medium grained, loose to compact, brown to black, moist	
10	CONCRETE	10.00
15	CH-CLAYS, with sands, trace fine to coarse gravels, poorly graded, fine grained, soft, gray and green, saturated, petroleum-like odor	15.00
17	ML-SILTS, trace clays, poorly graded, slight plasticity, gray, firm, moist to very moist	17.00
22	- saturated at 22.0ft BGS	
25	CH-CLAYS, trace fine to coarse gravels, poorly graded, stiff, high plasticity, gray, moist	25.50
28	- soft to stiff at 28.0ft BGS	
30	- stiff at 30.0ft BGS	
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

Date Start/Finish: 12/15/03 **Drilling Company:** Prosonic Corporation **Driller's Name:** Mike Bond **Drilling Method:** Rotosonic **Sampler Size:** 10' corebarrel **Rig Type:** NA	**Northing:** 424252.15 **Easting:** 13413058.33 **Casing Elevation:** 971.02 **Borehole Depth:** 37.0' **Surface Elevation:** 967.93 **Descriptions By:** Wayne Patterson	**Well ID:** MWW8-19 **Client:** General Motors Corporation **Location:** Pontiac North Campus Pontiac, Michigan

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
0	0						
		1	0-7'	NA	BG		Concrete.
5	-5					CL	FILL - Brown and gray mottled CLAY (CL), some silt, little fine to coarse Sand, few fine Gravel, slightly plastic, dry to moist.
							Very dark gray in color.
10	-10	2	7-17'	NA	BG		Brownish gray and gray mottled in color.
15	-15						
20	-20	3	17-27'	NA	BG		Dark gray in color, native clay till.
25	-25					ML	Dark gray SILT (ML), wet, dense, native.
						CL	Dark gray CLAY (CL), some silt, little fine to coarse Sand, few fine Gravel, moderately plastic, wet, native.
30	-30	4	27-37'	NA	BG		
35	-35						

Well Construction

- Stickup Protective Casing
- Portland Cement (0 - 1.0' bgs)
- Sand Drain (1 - 3.0' bgs)
- 2" ID PVC Riser Pipe (2.5' ags - 20' bgs)
- Hydrated Bentonite Chips (3.0' - 18' bgs)
- Sand Pack (18' - 30' bgs)
- 2" ID 0.010" Wire Wrapped PVC Screen (20 - 30' bgs)
- Natural Collapse (30'-37' bgs)

Remarks: BG = background
NA = Not applicable/not available
bgs = below ground surface
ags = above ground surface

Date Start/Finish: 12/17/03
Drilling Company: Prosonic Corporation
Driller's Name: Mike Bond
Drilling Method: Rotosonic
Sampler Size: 10' corebarrel
Rig Type: NA

Northing: 424116.84
Easting: 13413239.63
Casing Elevation: 970.67

Borehole Depth: 37'
Surface Elevation: 967.75

Descriptions By: Wayne Patterson

Well ID: MWW8-24

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
0 / 0							
							Concrete.
	1	0-7'	NA	BG	ML		FILL - Black SILT (ML), some fine Sand, wet, strong odor, medium dense, wood and metal debrisl, sheen on water.
5 / -5					CL		FILL - Brown and gray mottled CLAY (CL) with Silt, few fine to coarse Sand, few fine Gravel, medium stiff, dry to moist. clay becomes soft, plastic
10 / -10							
	2	7-17'	NA	BG			clay is medium stiff, moderately plastic, gray, native.
15 / -15							
20 / -20							
	3	17-27'	NA	BG			
25 / -25							
30 / -30					SP		FILL - Gray fine to coarse SAND (SP), few Silt, wet with product, strong odor, loose.
					CL		FILL - Brown and gray mottled CLAY (CL) with Silt, few fine to coarse Sand, few fine Gravel, medium stiff, dry to moist.
	4	27-37'	NA	BG			
35 / -35							

Well Construction

- Stickup Protective Casing
- Portland Cement (0 - 1.0' bgs)
- Sand Drain (1 - 3.0' bgs)
- 2" ID PVC Riser Pipe (3' ags - 22.0' bgs)
- Hydrated Bentonite Chips (3.0' - 20.0' bgs)
- Sand Pack (20.0' - 32.0' bgs)
- 2" ID 0.010" Wire Wrapped PVC Screen (22.0 - 32.0' bgs)
- Natural Collapse (32' - 37' bgs)

Remarks: NA = Not applicable/not available
BG = background
bgs = below ground surface
ags = above ground surface

Date Start/Finish: 3/22/04
Drilling Company: Prosonic Corporation
Driller's Name: Mike Bond
Drilling Method: Rotosonic
Sampler Size: 10' corebarrel
Rig Type: NA

Northing: 424126
Easting: 13413371
Casing Elevation: 970.67

Borehole Depth: 37'
Surface Elevation: 967.7

Descriptions By: Wayne Patterson

Well ID: MWW8-26

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
0 / 0						Concrete.
					ML	FILL - Black SILT, little to some Clay, little fine Sand, w/little odor, wet. Sheen on surface of water.
5 / -5	1	0-7'	NA	BG		FILL - Brown to dark gray LEAN CLAY w/ SILT, few fine to coarse subangular to subrounded Sand, few fine subangular to subrounded Gravel, stiff, weakly plastic, no odor, dry to moist.
						Increased Silt content, soft, very plastic, weak odor, wet. Areas of black Silt throughout.
10 / -10					CL	
15 / -15	2	7-17'	NA	BG		Dark gray LEAN CLAY w/ SILT, few fine to coarse subangular to subrounded Sand, few fine subangular to subrounded Gravel, stiff, weakly plastic, no odor, dry to moist. Native clay till.
20 / -20						
25 / -25	3	17-27'	NA	BG	CL	
30 / -30						
35 / -35	4	27-37'	NA	BG		Some fine to medium Sand.

Well Construction

- Stickup Protective Casing
- Portland Cement (0 - 1.0' bgs)
- Hydrated Bentonite Chips (1.0' - 3.0' bgs)
- 2" ID PVC Riser Pipe (2.5' ags - 5.0' bgs)
- # 5 Sand Pack (3.0' - 15.0' bgs)
- 2" ID 0.010" Wire Wrapped PVC Screen (5.0 - 15.0' bgs)
- Natural Collapse (15' - 37' bgs)

Remarks: NA = Not applicable/not available
BG = background
bgs = below ground surface
ags = above ground surface

Date Start/Finish: 3/22/04
Drilling Company: Prosonic Corporation
Driller's Name: Mike Bond
Drilling Method: Rotosonic
Sampler Size: 10' corebarrel
Rig Type: NA

Northing: 424203
Easting: 13413298
Casing Elevation: 970.77

Borehole Depth: 37'
Surface Elevation: 967.8

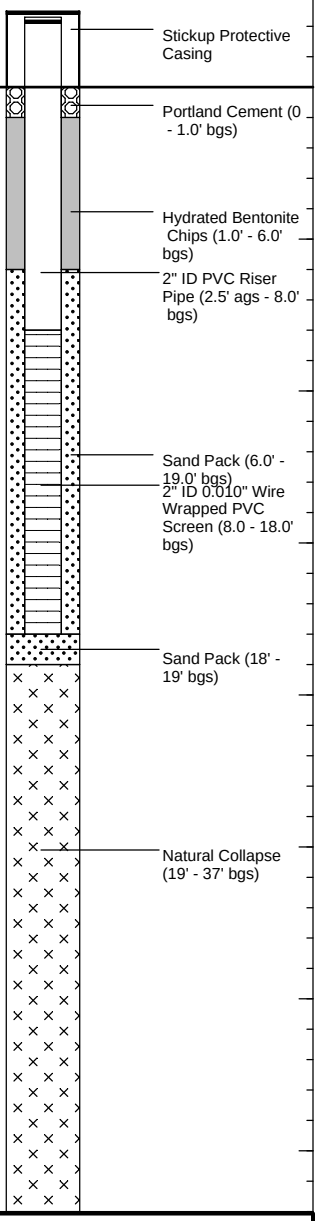
Descriptions By: Wayne Patterson

Well ID: MWW8-27

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
0 / 0						Concrete.
	1	0-7'	NA	BG	CL	FILL - Gray brown LEAN CLAY with SILT (CL), some fine to coarse subangular to subrounded Sand, few fine subangular to subrounded Gravel, stiff, slightly plastic saturated. 1-2' bgs - Strong odor, NAPL present, increased Silt content.
5 / -5						7-10'bgs - Moist, wet Silt and Sand stringers throughout.
10 / -10	2	7-17'	NA	BG	CL	Dark gray LEAN CLAY with SILT (CL), few fine to coarse subangular to subrounded Sand, little fine subrounded Gravel, stiff, weakly plastic, stringers of moisture throughout, weak odor,dry to moist. Native.
15 / -15						
20 / -20	3	17-27'	NA	BG	CL	No stringers, moist.
25 / -25						2" lense of brown gray fine Sand.
30 / -30	4	27-37'	NA	BG		
35 / -35						



Remarks: NA = Not applicable/not available
BG = background
bgs = below ground surface
ags = above ground surface

Project: 64411.120
Data File:MWW8-27.dat

Template:I:\rockware\logplot\logfiles\Templates\Geoprobe2003EEC.ldf
Date: 3/25/04

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-79

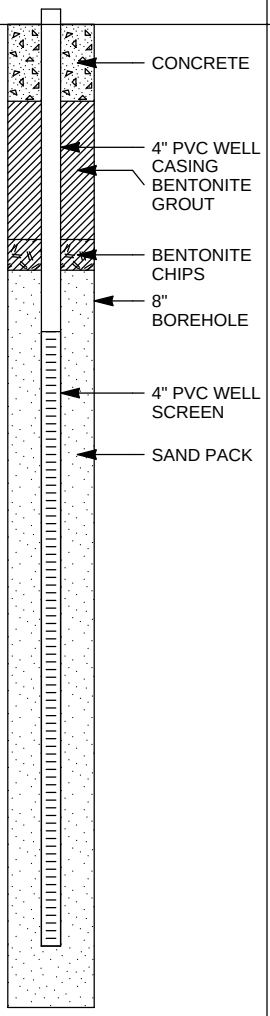
DATE COMPLETED: August 25, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist	
4	- concrete debris at 5.0ft BGS	
6	- no concrete debris at 5.8ft BGS	
10	- concrete debris at 10.0ft BGS	
11.00	CH-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, high plasticity, stiff, brown, mottled, moist	
12	- soft to stiff, gray at 13.5ft BGS	
14	- green and gray at 14.0ft BGS	
16	- stiff to very stiff at 15.5ft BGS	
18.50	ML-SILTS, trace clays, poorly graded, slight plasticity, gray and green, moist to very moist, slight petroleum-like odor	
22	- 4" thick sand lense, fine grained, petroleum-like odor at 22.5ft BGS	
25.50	CH-CLAYS, trace silts and fine to coarse gravels, poorly graded, high plasticity, stiff, gray, moist	
29	- soft, very high plasticity at 29.0ft BGS	
32.00	END OF HOLE @ 32.0ft BGS	

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				1.6
1RS		100		2.1
				2.5
				2.3
2RS		100		2.5
				2.7
				2.7
				3.4
3RS		100		3.0
				3.4
				3.0
4RS		100		3.4
				3.0

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

Date Start/Finish: 1/12/05
Drilling Company: Prosonic
Driller's Name: Mike Bond
Drilling Method: Sonic Drill Rig
Sampler Size: 8' and 10'
Rig Type: Sonic

Northing: 424206.79
Easting: 13413090.5
Casing Elevation: 971.56

Borehole Depth: 36.0'
Surface Elevation: 968.16

Descriptions By: Randy Brown

Well ID: MWW8-47

Client: General Motors

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
970 / 0						Concrete
					CL	FILL - Gray CLAY with Silt, some Gravel, medium stiff, no staining.
965 / 5	1	0-8'	8.0'	0.0		Concrete
960 / 10	2	8-16'	8.0'	0.0	CL	Gray-olive gray CLAY with Silt, few Gravel, trace Sand, stiff, no staining.
955 / 15						
950 / 20	3	16-26'	10.0'	0.0		22' bgs- Increasing Silt content and wetness.
945 / 25					ML	Gray SILT, some fine Sand, wet, no staining.
940 / 30	4	26-36'	10.0'	0.0	CL	Gray-tan mottled CLAY with Silt, few Gravel, trace Sand, no staining.
935 / 35						

Well Construction:
- Protective cover
- Concrete
- #5 Sand pack (0.5-2' bgs)
- Bentonite chip (2-15' bgs)
- 4" PVC casing (2' ags-17' bgs)
- #5 Sand pack (15-33' bgs)
- 4" 0.010 slot wire wrapped PVC screen (17-32' bgs)
- Bentonite chip (33-36' bgs)

Remarks:
NA= Not available/not applicable
bgs= below ground surface
ags= above ground surface

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-87

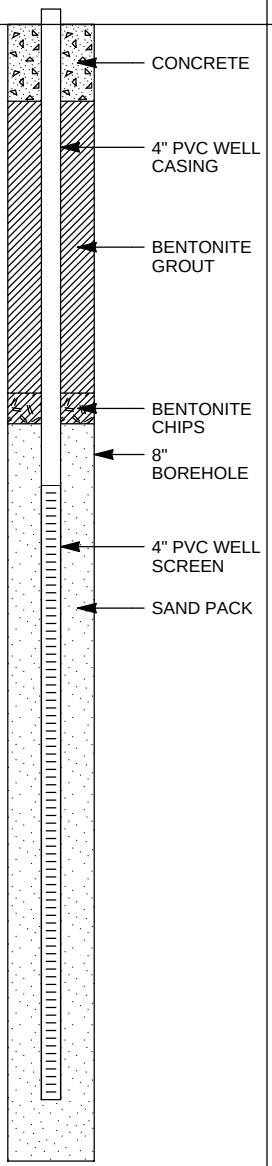
DATE COMPLETED: September 1, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
	SC-CLAYEY SANDS (FILL), with fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist	
	CL-CLAYS, with silts, trace fine to coarse gravels and fine sands, poorly graded, low plasticity, soft, black, moist - slight petroleum-like odor at 15.0ft BGS	13.00
	CH-CLAYS, trace fine to coarse gravels, poorly graded, stiff to very stiff, brown, moist	17.00
	ML-SILTS, trace clays, poorly graded, slight plasticity, firm gray, very moist - saturated at 25.0ft BGS	24.00
	CH-CLAYS, trace fine to coarse gravels, poorly graded, soft to very stiff, gray, moist to very moist	33.00
	END OF HOLE @ 37.0ft BGS	37.00

MONITORING WELL



WELL DETAILS
Screened interval:
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
13.00 to 37.00ft BGS
Material: SANDS

SAMPLE			
NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

Date Start/Finish: 7/30/03
Drilling Company: Prosonic Corporation
Driller's Name: Mike Bond
Drilling Method: Rotosonic
Sampler Size: 10 feet

Northing: 424162.75
Easting: 13413147.59
Casing Elevation: 970.33

Borehole Depth: 37' below grade
Surface Elevation: 967.86

Descriptions By: Wayne Patterson

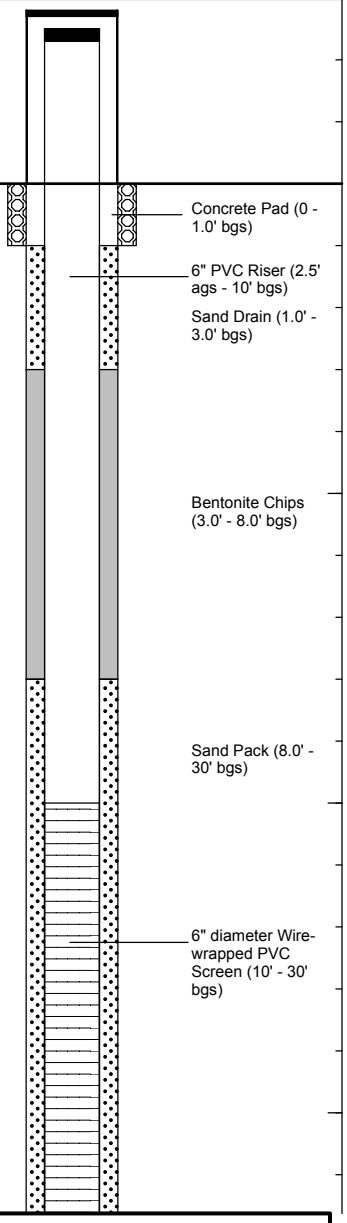
Well ID: RWW8-01

Client: GM

Location: GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
970 / 0							
0					SM		Brown Silty fine SAND, trace coarse Sand, trace fine Gravel, very dense, dry.
965 / 5	1	0-7	NA	NA	SP		Brown very fine to fine SAND, little medium to coarse Sand, little Clay, trace Silt, loose, dry.
5					CL		Dark gray-brown Silty CLAY, few fine to coarse Sand, few fine Gravel, some mottling with gray color, slightly plastic, stiff, damp to moist.
960 / 10	2	7-17	NA	NA			
955 / 15							
	2	7-17	NA	NA			Dark gray Silty CLAY, few fine to coarse Sand, few fine Gravel, some mottling with gray color, slightly plastic, stiff, damp to moist.

Well Construction



EEC Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Client:
GM

Site Location:
GM Pontiac North Campus

Boring ID: RWW8-01

Borehole Depth: 37' below grade

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
950 / 20	3	17-27	NA	NA	CL		Medium stiff, moderately plastic at 22' bgs. Rare Cobble at 23' bgs.	Sand Pack (8.0' - 30' bgs); 6" diameter Wire-wrapped PVC Screen (10' - 30' bgs)
945 / 25					ML		Dark gray SILT, product (LNAPL) on water, saturated.	
940 / 30	4	27-37	NA	NA	CL		Dark gray Silty CLAY, few fine to coarse Sand, few fine Gravel, some mottling with gray color, slightly plastic, stiff, damp to moist.	Bentonite (30' - 37' bgs)
935 / 35	4	27-37	NA	NA	CL		Dark gray Silty CLAY, few fine to coarse Sand, few fine Gravel, some mottling with gray color, slightly plastic, stiff, damp to moist.	Bentonite (30' - 37' bgs)

EEC Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Date Start/Finish: 11/2/01
Drilling Company: Pennsylvania Drilling Co.
Driller's Name: Norm Hormel
Drilling Method: 8" spun casing
Sampler Size: 2" diameter, 2' long
Auger Size: 3 1/4"
Rig Type: NA

Northing: 424159.32
Easting: 13413119.87
Casing Elevation: 970.23

Borehole Depth: 32.5'
Surface Elevation: 967.71

Descriptions By: David Straccia

Well/Boring ID: MWW8-07

Client: General Motors

Location: GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
970											Aboveground Locked Protective Casing
0	0-2 1	SS	18 50/0.0 - -	>100	0.4	BG	SM		Brown Silty fine SAND (SM), trace coarse Sand, trace fine Gravel, very dense, dry.		Concrete (0 -1.0' bgs)
965	2-4 2	SS	3 3 5 5	8	1.8	BG	SP		Brown very fine to fine SAND, little medium to coarse Sand, little Clay, trace Silt, loose, dry.		Portland Cement/Bentonite Grout (1.0' - 4.0' bgs)
5	4-6 3	SS	6 7 9 8	16	1.0	BG	SM		Brown (SM) Silty very fine to fine SAND, some Clay, medium dense, dry.		
	6-8 4	SS	3 3 4 3	7	0.3	BG					2-inch PVC Riser (2.3' ags - 22.5' bgs)
960	8-10	NA	NA	NA	0.0	NA	Fill		COBBLE. Black foundry very fine to fine SAND, loose, moist. (Fill) CONCRETE. No Sample.		
10	10-12 5	SS	4 5 5 7	10	0.8	2.3	CL		Gray-brown Silty CLAY, some fine to coarse Sand, trace Gravel, stiff, dry.		Natural Collapse (4.0' - 18' bgs)
955	12-14 6	SS	4 5 5 9	10	0.8	54					
15	14-16 7	SS	5 7 9 9	16	1.6	67			at 15.2' bgs, gray color.		

ENCORE

Remarks: ags = above ground surface; bgs = below ground surface;
BG = Background; NA = Not Applicable.
SS = Splitspoon

Client:
General Motors

Site Location:
GM Pontiac North Campus

Well/Boring ID: MWW8-07

Borehole Depth: 32.5'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows / 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Hydrostratigraphy	Boring Construction
950	16-18	SS	3 11 17 21	28	0.2	29.4			Gray-brown Silty CLAY, some fine to coarse Sand, trace Gravel, stiff, dry.		Natural Collapse (4.0' - 18' bgs)
	8										
	18-20	SS	11 12 16 16	28	0.2	1000+					2-inch PVC Riser (2.3' ags - 22.5' bgs)
	9										Pelletal Bentonite (18' - 20' bgs)
20									at 19.8' bgs, yellow liquid.		
	20-22	SS	9 10 12 15	22	1.0	49.4					
	10										
945	22-24	SS	3 3 1 1	4	0.1	136					
	11										
	24-26	SS	2 3 4 6	7	1.7	20.7	CL		at 24' bgs, gray-brown color.		#5 Sand Pack (20' - 32.5' bgs)
25	12								from 25' - 28' bgs, gray-brown Silty CLAY (CL), very stiff, moist, wet.		
	26-28	SS	9 11 15 19	26	1.9	20.1					
940	13										
	28-30	SS	3 5 7 9	12	1.8	28.3			from 28' - 32' bgs, gray-brown Silty CLAY (CL), very stiff, little fine to coarse Sand, trace Gravel, dry to 31' bgs, moist to 32' bgs.		2-inch PVC Screen (22.5 - 32.5' bgs)
30	14										
	30-32.5	SS	2 2 3 4	5	0.8	50.4					
	15										

ENCORE

Remarks: ags = above ground surface; bgs = below ground surface;
BG = Background; NA = Not Applicable.
SS = Splitspoon

Date Start/Finish: 5/18/2004
Drilling Company: Prosonic
Driller's Name: Don Bond
Drilling Method: Hollow stem auger
Sampler Size: NA
Rig Type: NA

Northing: 424138
Easting: 13413237
Casing Elevation: 971.15

Borehole Depth: 40.0'
Surface Elevation: 967.6

Descriptions By: Bart Williams

Well ID: RWW8-03

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
0 / 970							No soil samples taken, no stratigraphic description available.	Stickup Protective Casing
5 / 965								
10 / 960								Cement/bentonite grout (0-13' bgs); 4" ID PVC Riser (3.5' ags -20' bgs)
15 / 955								Bentonite Seal (13'-17' bgs)
20 / 950	NA	NA	NA	NA	NA			Sand Pack (17'-40' bgs)
25 / 945								
30 / 940								4" ID 0.1010" Wire Wrapped PVC Screen (20'-40' bgs)
35 / 935								
40								

Remarks: NA= not available\not applicable
bgs= below ground surface

EEC
Encore Environmental Consortium, LLC

Project: 64411.120
Data File:RWW8-03.dat

Template:I:\rockware\logplot\logfiles\Template\Geoprobe2003EEC.ldf
Date: 7/12/2004

Date Start/Finish: 5/15/2004
Drilling Company: Prosonic
Driller's Name: Don Bond
Drilling Method: Hollow stem auger
Sampler Size: NA
Rig Type: NA

Northing: 424137
Easting: 13413277
Casing Elevation: 971.30

Borehole Depth: 42.0'
Surface Elevation: 967.8

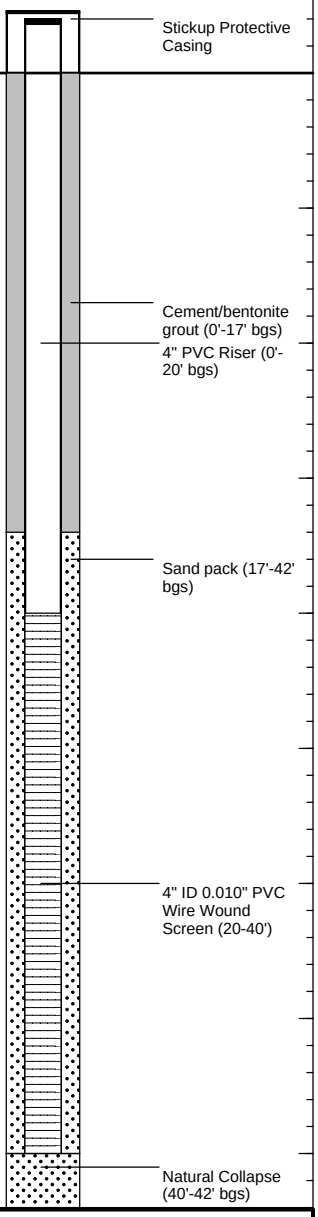
Descriptions By: Bart Williams

Well ID: RWW8-04

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
0 / 970							Concrete
5 / 965							Clay with Silt.
10 / 960							
15 / 955							
20 / 950	NA	NA	NA	NA	CL		
25 / 945							27'-35' bgs odors
30 / 940							30'-33' bgs olive green LNAPL staining
35 / 935							
40 / 930							



Remarks: NA= not available\not applicable
bgs= below ground surface
ags = above ground surface
LNAPL = light non-aqueous phase liquid

EEC
Encore Environmental Consortium, LLC

Date Start/Finish: 5/18/2004
Drilling Company: Prosonic
Driller's Name: Don Bond
Drilling Method: Hollow stem auger
Sampler Size: NA
Rig Type: NA

Northing: 424111
Easting: 13413279
Casing Elevation: 971.36

Borehole Depth: 40.0'
Surface Elevation: 967.8

Descriptions By: Bart Williams

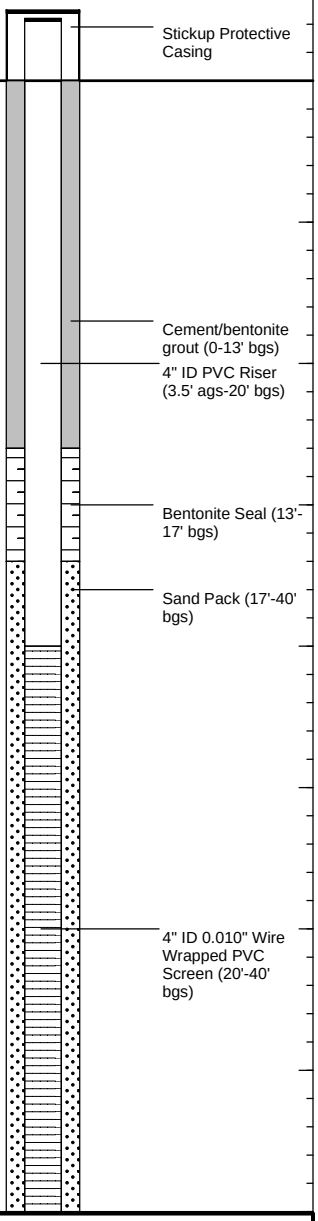
Well ID: RWW8-05

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
0 / 970							No soil samples taken, no stratigraphic description available.
5 / 965							
10 / 960							
15 / 955							
20 / 950	NA	NA	NA	NA	NA		
25 / 945							
30 / 940							
35 / 935							
40							

Well Construction



Remarks: NA= not available\not applicable
bgs= below ground surface
ags = above ground surface

EEC
Encore Environmental Consortium, LLC

Date Start/Finish: 5/15/2004
Drilling Company: Prosonic
Driller's Name: Don Bond
Drilling Method: Hollow stem auger
Sampler Size: NA
Rig Type: NA

Northing: 424233
Easting: 13413128
Casing Elevation: 970.92

Borehole Depth: 40.0'
Surface Elevation: 968.0

Descriptions By: Bart Williams

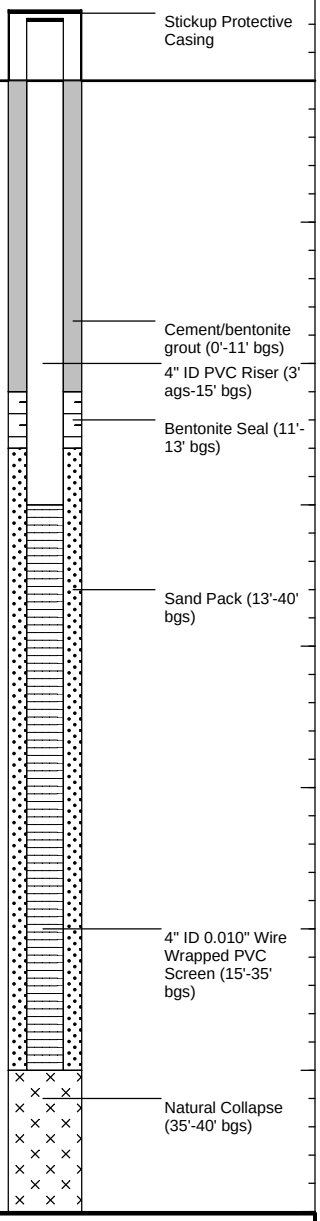
Well ID: RWW8-06

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
0 / 970							No soil samples taken, no stratigraphic description available.
5 / 965							
10 / 960							
15 / 955							
20 / 950	NA	NA	NA	NA	NA		
25 / 945							
30 / 940							
35 / 935							
40							

Well Construction



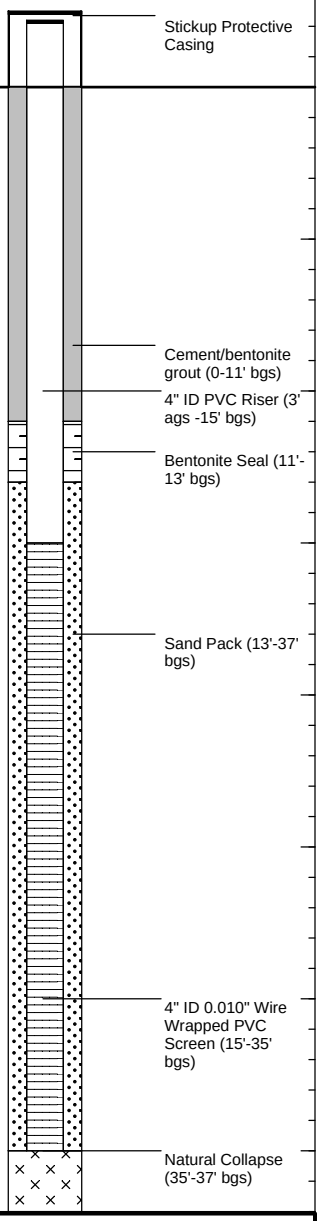
Remarks: NA= not available\not applicable
bgs= below ground surface
ags = above ground surface

EEC
Encore Environmental Consortium, LLC

Date Start/Finish: 5/15/2004 **Drilling Company:** Prosonic **Driller's Name:** Don Bond **Drilling Method:** Hollow stem auger **Sampler Size:** NA **Rig Type:** NA	**Northing:** 424189 **Easting:** 13413139 **Casing Elevation:** 971.07 **Borehole Depth:** 37.0' **Surface Elevation:** 968.2 **Descriptions By:** Bart Williams	**Well ID:** RWW8-07 **Client:** General Motors Corporation **Location:** Pontiac North Campus Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
0 / 970	NA	NA	NA	NA	NA		No soil samples taken, no stratigraphic description available.
5 / 965							
10 / 960							
15 / 955							
20 / 950							
25 / 945							
30 / 940							
35 / 935							

Well Construction



Remarks: NA= not available\not applicable
bgs= below ground surface
ags = above ground surface

Date Start/Finish: 10/11/03 **Drilling Company:** Prosonic Corporation **Driller's Name:** Mike Bond **Drilling Method:** Rotosonic **Sampler Size:** 10' corebarrel	**Northing:** 424164.60 **Easting:** 13413225.53 **Casing Elevation:** 970.24 **Borehole Depth:** 31.5' **Surface Elevation:** 967.71 **Descriptions By:** Wayne Patterson	**Well ID:** MWW8-15 **Client:** General Motors Corporation **Location:** GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
970								Stickup Protective Casing
0							Concrete.	Portland Cement (0 - 1.0' bgs)
							Black fine SAND (SP), few silt, few angular gravel, loose, dry-damp, no odor, fill.	Sand Drain (1 - 3.0' bgs)
965	1	0-7'	100%	NA	SP			2" ID PVC Riser Pipe (2.5' ags - 11.5' bgs)
5								Hydrated Bentonite Chips (3.0' - 9.5' bgs)
							Subsurface concrete.	
960								
							Grayish brown, little mottling with light brown SILTY CLAY (CL), few fine to coarse subangular sand, few fine to coarse subangular gravel, rare cobble, moderately plastic, soft - medium stiff, no odor, moist, fill.	
10								
955	2	7-17'	100%	NA	CL			
15								

EEC
Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Client:
General Motors Corporation

Site Location:
GM Pontiac North Campus

Boring ID: MWW8-15

Borehole Depth: 31.5'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
950								
20							Grayish brown SILT (ML), saturated, no odor.	Sand Pack (9.5' - 31.5' bgs)
945							Dark gray SILT (ML), saturated, slight odor.	
	3	17-31.5	100%	NA				
25					ML			2" ID 0.010" Wire Wrapped PVC Screen (11.5 - 31.5' bgs)
940								
30					CL		Dark gray SILTY CLAY (CL), few fine to coarse subangular sand, few fine to coarse subangular gravel, rare cobble, moderately plastic, soft - medium stiff, no odor, moist, natural.	

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-09

DATE COMPLETED: February 1, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.09					
0	CONCRETE	967.09	CEMENT				
2	CH-CLAYS, trace fine sands, silts and fine to coarse gravels, poorly graded, high plasticity, gray, mottled, moist to very moist, odor			1RS		100	
4			BENTONITE GROUT				
6							
8			BENTONITE CHIPS				
10	- not mottled at 9.0ft BGS						
12			4" PVC WELL CASING	2RS		80	
14			8" BOREHOLE				
16	- trace sand lenses at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20	- decrease in sands at 20.0ft BGS						
22			SAND PACK	3RS		100	
24	- moist to very moist, slight odor at 24.0ft BGS						
26	- very moist at 25.0ft BGS - increase in silts at 26.0ft BGS						
28							
30							
32				4RS		100	
34							
36	END OF HOLE @ 36.0ft BGS	932.09					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.09 to 933.09ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.09 to 932.09ft bgs
9.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

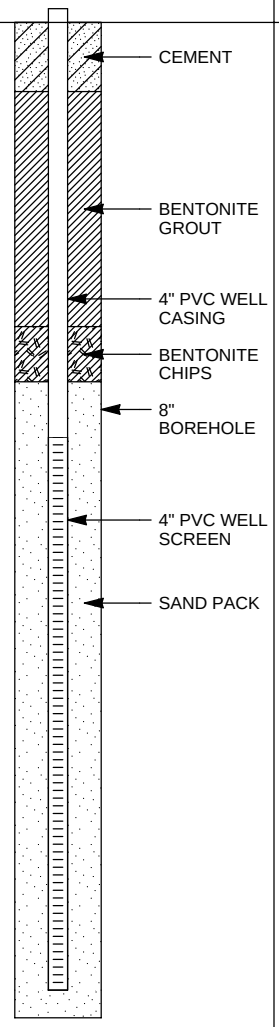
HOLE DESIGNATION: RWW8-10

DATE COMPLETED: February 2, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.00
0	CONCRETE	
2		966.00
	SP-SANDS, fine and medium grained, trace coarse grained and fine gravels, poorly graded, loose, saturated, gray, slight odor	965.00
4		
	CH-CLAYS, with fine sands, trace silts and fine gravels, poorly graded, high plasticity, gray, soft to firm, gray, very moist	962.00
6		961.50
	SP-SANDS, fine and medium grained, trace coarse grained and fine gravels, poorly graded, loose, saturated, gray, slight odor	
8		958.50
	CH-SANDY CLAYS, trace silts and fine gravels, fine and medium grained, poorly graded, high plasticity, gray, soft to firm, saturated, slight odor	
10		
12		
	CH-CLAYS, with fine sands, trace silts and fine gravels, poorly graded, high plasticity, gray, soft to firm, gray, moist to very moist	
14		
	- moist, no odor at 11.0ft BGS	
16		
18		
20		
	- very moist at 22.0ft BGS	
22		
	ML-SILTS, with clays, trace fine sands, poorly graded, low plasticity, firm, gray, very moist	944.50
24		
26		
	CH-CLAYS, with fine sands, trace silts and fine gravels, poorly graded, high plasticity, gray, stiff, gray, moist	940.00
28		
30		
32		
34		
	END OF HOLE @ 36.0ft BGS	932.00
36		
38		
40		
42		
44		
46		
48		



WELL DETAILS
Screened interval:
953.00 to 933.00ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.00 to 932.00ft bgs
13.00 to 36.00ft BGS
Material: SANDS

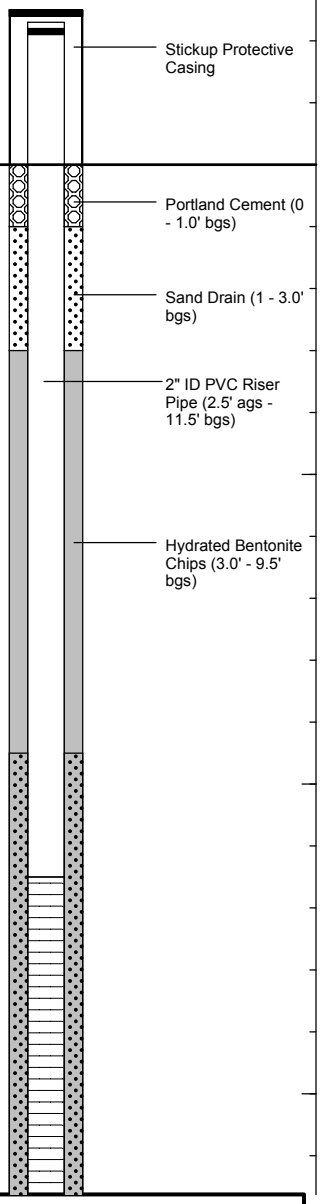
SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

Date Start/Finish: 10/11/03 **Drilling Company:** Prosonic Corporation **Driller's Name:** Mike Bond **Drilling Method:** Rotosonic **Sampler Size:** 10' corebarrel	**Northing:** 424200.69 **Easting:** 13413210.82 **Casing Elevation:** 970.46 **Borehole Depth:** 31.5' **Surface Elevation:** 968.00 **Descriptions By:** Wayne Patterson	**Well ID:** MWW8-16 **Client:** General Motors Corporation **Location:** GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
970							
0							Concrete.
					CL		Black SILTY CLAY (CL), some gravel aggregate, wet, no odor, fill.
965							Subsurface concrete.
	1	0-7'	100%	NA			
5							
							Dark gray SILTY CLAY (CL), few fine to coarse subangular sand, few fine to coarse subangular gravel, rare wood fragments, moderately plastic, soft to medium stiff, wet with NAPL, slight odor, fill.
960							
10							
955							
	2	7-17'	100%	NA	CL		
15							



Well Construction

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Encore Environmental Consortium, LLC

Project: 64411.120
Data File:MWW8-16.dat

Template:I:\rockware\logplot\logfiles\Templates\Geoprobe2003EEC.ldf
Date: 10/14/03

Client:
General Motors Corporation

Site Location:
GM Pontiac North Campus

Boring ID: MWW8-16

Borehole Depth: 31.5'

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
950 / 20							Increased silt content.	Sand Pack (9.5' - 31.5' bgs)
945	3	17-31.5	100%	NA			Dark gray SILT (ML), saturated, with NAPL, moderate odor.	
25					ML			2" ID 0.010" Wire Wrapped PVC Screen (11.5 - 31.5' bgs)
940					SP		Dark gray fine SAND (SP), loose, moist with NAPL, slight odor.	
30					CL		Dark gray SILTY CLAY (CL), few fine to coarse subangular sand, few fine to coarse subangular gravel, rare wood fragments, moderately plastic, soft to medium stiff, wet with NAPL, slight odor.	

EEC
Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Date Start/Finish: 12/9/2004
Drilling Company: Prosonic
Driller's Name: Joe Tidwell
Drilling Method: Geoprobe
Sampler Size: 5' x 2"
Rig Type: NA

Northing: 424151.76
Easting: 13412196.99
Casing Elevation: 966.55

Borehole Depth: 25' bgs
Surface Elevation: 964.33

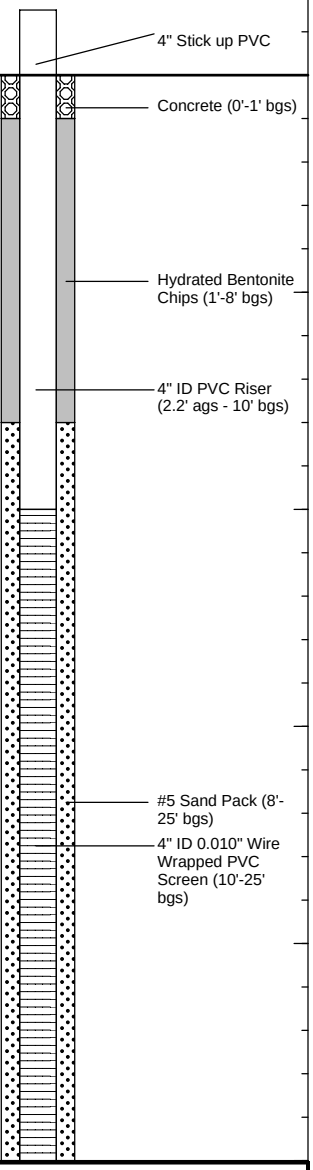
Descriptions By: Marie Mathe

Well ID: MWW8-34

Client: General Motors

Location: GM Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
0 / 0						Concrete.
	1	0-5'	60%	BG	SP	Fill - Black, fine SAND, poorly graded, trace Silt, compact, moist.
5 / -5					CL	Fill - Gray to brown SANDY CLAY, trace Silt, firm, low plasticity, moist. 5' - Becomes soft, color changes to gray. 5.7' - Becomes firm, color changes to brown to gray. 6.8' - Becomes stiff, trace fine, rounded Gravel.
	2	5'-10'	60%	BG		
10 / -10					SP	Light brown, fine SAND, trace Silt, compact, moist. 13.1' - 2.5 inch Silty Sand lens. 13.5' - medium grained. 13.8' - Moist to wet. 14' - Color changes to black. Faint petroleum type odor present. 15' - Color becomes gray.
	3	10'-15'	70%	8.2		
15 / -15						17' - 2 inch Sandy Silt lens, moist to wet. 17.3' - Color changes to brown, wet.
	4	15'-20'	100%	BG		
20 / -20						
		20'-25'	NA	NA		
25 / -25						



Remarks: bgs - below ground surface, NA- not available, BG - background
ags - above ground surface
Shake test performed at 17-18' was negative .
Stratigraphic description from BW8-41 located aproximately 1.5 ft Southeast.

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-13

DATE COMPLETED: February 4, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.10					
0	CONCRETE		CEMENT				
2	SP-SANDS (FILL), fine and medium grained, trace coarse grained and fine gravels, poorly graded, loose, gray, very moist, odor	967.10		1RS		95	
4							
6		961.60	BENTONITE GROUT				
8	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, brown, moist, slight odor						
10			4" PVC WELL CASING	2RS		100	
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16							
18			4" PVC WELL SCREEN				
20	- trace sand lens at 20.0ft BGS						
22	ML-SILTS, with clays and sands, fine grained, poorly graded, slight plasticity, soft to firm, gray, saturated, odor, slight staining (black)	946.10					
24							
26				3RS		100	
28	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist, slight odor	940.60					
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	932.10					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.10 to 933.10ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.10 to 932.10ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-14

DATE COMPLETED: February 4, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.30					
0	CONCRETE		CEMENT				
2				1RS		100	
4							
6	CH-CLAYS, with silts, trace fine sands and fine gravles, poorly graded, high plasticity, brown, very stiff, moist, odor	962.30	BENTONITE GROUT				
8							
10			4" PVC WELL CASING				
12			BENTONITE CHIPS	2RS		100	
14			8" BOREHOLE				
16	- gray at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, firm, gray, moist to very moist, odor	948.30	SAND PACK				
22							
24	CH-CLAYS, with silts, trace fine sands and fine & coarse gravels, poorly graded, high plasticity, very stiff, gray, moist, odor	945.30					
26				3RS		100	
28							
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	932.30					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.30 to 933.30ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.30 to 932.30ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-15

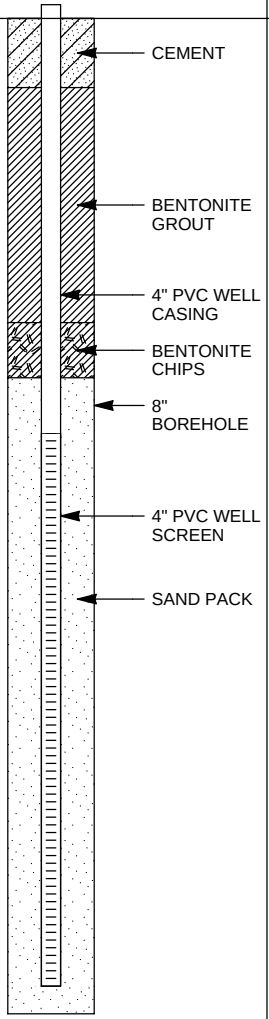
DATE COMPLETED: February 3, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.20
0	CONCRETE	967.20
2	NO RECOVERY	
4	CONCRETE	964.20
6	SP-SANDS, medium and coarse grained, trace fine grained and fine gravels, poorly graded, loose, black, very moist, odor	962.20
8		
10	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist, odor	959.20
12		
14		
16		
18		
20		
22	ML-SILTS, with clays and sands, fine grained, poorly graded, low plasticity, soft to firm, gray to brown, very moist to saturated, odor	947.20
24		
26		
28		
30	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray, moist	939.20
32		
34	- increase in plasticity at 34.0ft BGS	
36	END OF HOLE @ 36.0ft BGS	932.20
38		
40		
42		
44		
46		
48		

MONITORING WELL



WELL DETAILS
Screened interval:
953.20 to 933.20ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.20 to 932.20ft bgs
13.00 to 36.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		50	
2RS		100	
3RS		100	

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

Date Start/Finish: 1/12/05
Drilling Company: Prosonic
Driller's Name: Mike Bond
Drilling Method: Sonic Drill Rig
Sampler Size: 6' and 10'
Rig Type: Sonic

Northing: 424265.57
Easting: 13412400.12
Casing Elevation: 971.25

Borehole Depth: 36.0'
Surface Elevation: 967.95

Descriptions By: Randy Brown

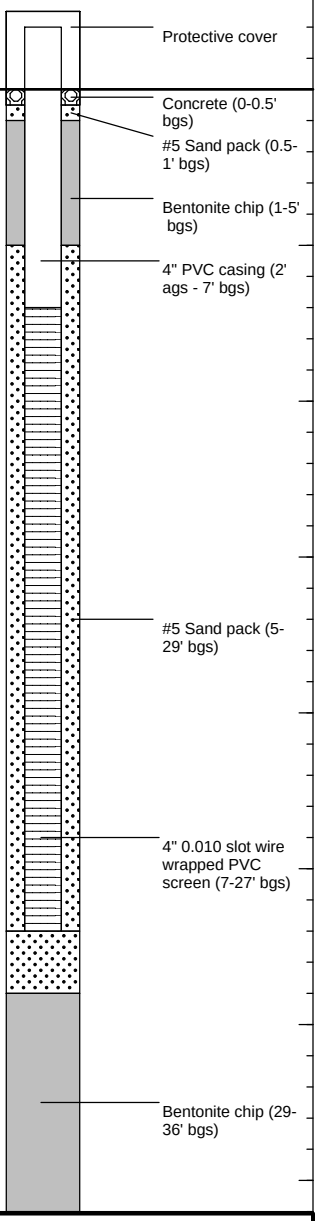
Well ID: MWW8-48

Client: General Motors

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Stratigraphic Description
970 / 0						Concrete
965 / 5	1	0-6'	6.0'	0.0	SP	FILL - Gray-black fine to medium SAND, few Gravel, few concrete debris, foundry sand.
					CL	Gray-tan mottled CLAY with Silt, trace Gravel, trace Sand, medium stiff, no staining.
960 / 10	2	6-16'	10.0'	0.0	CL	Gray SANDY CLAY, trace Gravel, trace organic material, soft, plastic, wet, no staining.
955 / 15					CL	Gray-olive gray mottled CLAY with Silt, trace Gravel, stiff, no staining. 14' bgs- Color gradually changes to gray-tan, mottled.
950 / 20	3	16-26'	10.0'	0.0	GP	GRAVEL seams, wet, no staining.
				12.0	CL	Gray-tan mottled CLAY with Silt, trace Gravel. 19' bgs- Thin Gravel seam (0.1'), wet.
945 / 25				6.0	ML	Gray SILT, some fine Sand, wet, no staining.
				0.0	SP	Gray tan fine SAND, trace medium Sand, poorly sorted, wet, no staining.
940 / 30	4	26-36'	10.0'	0.0	ML	Gray SILT, wet, no staining. 30' bgs- Sand seam 30-30.2'
935 / 35					CL	Gray CLAY with Silt, trace Gravel, medium stiff, no staining. 33' bgs- Increasing stiffness with depth 33-36'

Well Construction



Remarks: NA= Not available/not applicable
bgs= below ground surface
ags= above ground surface

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-16

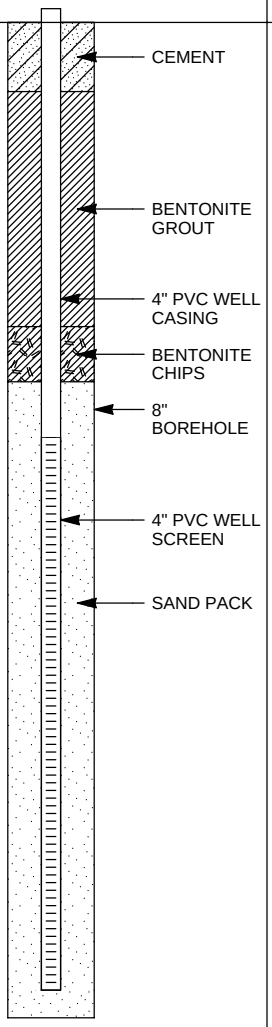
DATE COMPLETED: February 10, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.30
0	CONCRETE	
6	CL-CLAYS, trace fine sands, silts and fine and coarse gravels, poorly graded, low plasticity, stiff, brown and gray, mottled, very moist to saturated, odor	962.30
10	- trace sand lenses, ~2-4" thick, saturated, odor at 6.5ft BGS	958.30
12	- no lenses at 9.0ft BGS	
	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, gray, moist, slight odor	
20	ML-CLAYEY SILTS, trace fine sands, poorly graded, low to medium plasticity, firm, gray, saturated, odor, sheen on core	948.30
26	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, gray, moist, no odor	941.30
36	END OF HOLE @ 36.0ft BGS	932.30

MONITORING WELL



WELL DETAILS
Screened interval:
953.30 to 933.30ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.30 to 932.30ft bgs
13.00 to 36.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-17

DATE COMPLETED: February 10, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.10					
0	CONCRETE		CEMENT	1RS		100	
6	CI-CLAYS, trace fine sands, silts, and fine and coarse gravels, poorly graded, medium to low plasticity, very stiff, brown, mottled, moist, odor	961.10	BENTONITE GROUT				
10			4" PVC WELL CASING	2RS		100	
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, firm to stiff, moist, gray, slight odor	952.10					
18			4" PVC WELL SCREEN				
20							
22	ML-CLAYEY SILTS, trace fine sands, poorly graded, medium plasticity, soft to firm, gray, very moist, odor	947.10	SAND PACK				
24	SC-CLAYEY SANDS, fine and medium grained, poorly graded, loose to compact, gray, very moist, odor	944.10					
26	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, firm to stiff, moist, gray, slight odor	942.10		3RS		100	
36	END OF HOLE @ 36.0ft BGS	932.10					

WELL DETAILS
Screened interval:
953.10 to 933.10ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.10 to 932.10ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-18

DATE COMPLETED: February 11, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.80					
0	CONCRETE/GRAVEL DEBRIS		CEMENT				
2		964.80					
4	CONCRETE						
6			BENTONITE GROUT				
8		958.80		1RS		100	
10	CI-CLAYS, trace fine sands, silts, and fine gravels, poorly graded, low plasticity, very stiff, brown, moist	956.80	4" PVC WELL CASING				
12	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, brown to gray, moist		BENTONITE CHIPS				
14	- gray at 13.0ft BGS		8" BOREHOLE				
16							
18			4" PVC WELL SCREEN				
20							
22			SAND PACK				
24	ML-CLAYEY SILTS, trace fine sands, poorly graded, low plasticity, firm to stiff, gray, very moist to saturated, odor, visible sheen on core	944.80					
26	CH-CLAYS, with silts, trace fine sands and fine & coarse gravels, poorly graded, high plasticity, very stiff, brown to gray, moist	942.30		2RS		100	
28							
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	931.80					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.80 to 932.80ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.80 to 931.80ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-19

DATE COMPLETED: February 10, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.20					
0	CONCRETE	967.20	CEMENT				
2	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, brown, mottled, very moist, slight odor						
4	- trace sand lenses, saturated, slight odor at 3.5ft BGS						
6	- no lenses, moist at 5.5ft BGS		BENTONITE GROUT				
8	- not mottled, brown and gray at 8.0ft BGS			1RS		100	
10			4" PVC WELL CASING				
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16	- gray at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20							
22			SAND PACK				
24							
26				2RS		100	
28							
30							
32	- increase in silts at 32.0ft BGS						
34							
36	END OF HOLE @ 36.0ft BGS	932.20					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.20 to 933.20ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.20 to 932.20ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-20

DATE COMPLETED: February 4, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

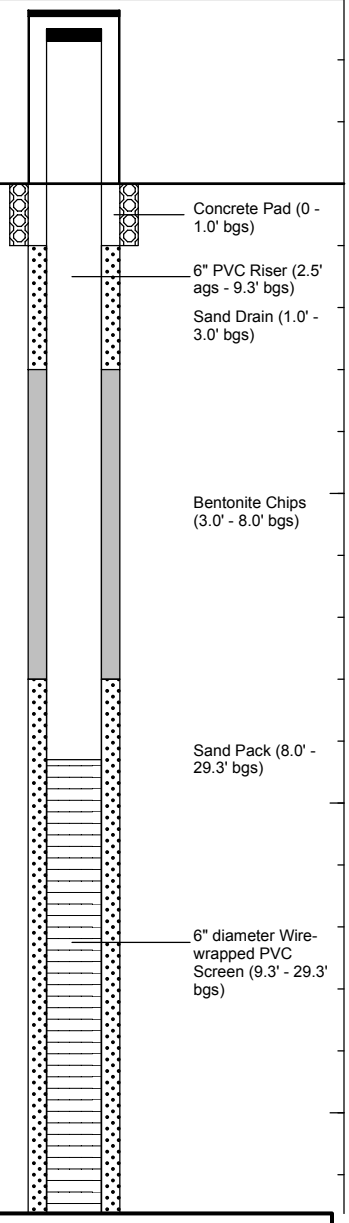
DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.00					
0	CONCRETE DEBRIS		CEMENT				
2	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray, moist, odor	966.50					
4	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, soft to firm, gray, saturated, odor	964.50					
6	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray, moist, odor	963.50	BENTONITE GROUT	1RS		80	
8							
10			4" PVC WELL CASING				
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16							
18			4" PVC WELL SCREEN				
20			SAND PACK				
22							
24							
26				2RS		50	
28							
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	932.00					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.00 to 933.00ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.00 to 932.00ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

Date Start/Finish: 7/30/03 **Drilling Company:** Prosonic Corporation **Driller's Name:** Mike Bond **Drilling Method:** Rotosonic **Sampler Size:** 10 feet	**Northing:** 424205.24 **Easting:** 13413260.37 **Casing Elevation:** 970.75 **Borehole Depth:** 32' below grade **Surface Elevation:** 967.94 **Descriptions By:** Wayne Patterson	**Well ID:** RWW8-02 **Client:** GM **Location:** GM Pontiac North Campus

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
970							
0							CONCRETE.
							Light brown Sandy CLAY, some coarse Sand, trace fine Gravel, medium plasticity, moist. [FILL]
965	1	0-7		NA			
5							
					CL		Dark gray Silty CLAY, few fine to coarse Sand, few fine Gravel, slight odor, medium stiff, medium plastic, moist.
960							
10							
	2	7-17		NA			
955							
15							
	2	7-17		NA			Dark gray Silty CLAY, few fine to coarse Sand, few fine Gravel, slight odor, medium stiff, medium plastic, moist.



EEC
Encore Environmental Consortium, LLC

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

Client:
GM

Site Location:
GM Pontiac North Campus

Boring ID: RWW8-02

Borehole Depth: 32' below grade

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
950 / 20	3	17-27		NA	CL		Saturated with LNAPL at 17' bgs. Increased Silt content at 21.5' bgs.	Sand Pack (8.0' - 29.3' bgs) 6" diameter Wire-wrapped PVC Screen (9.3' - 29.3' bgs)
945 / 25					ML		Dark gray SILT, strong odor, saturated with LNAPL.	
940 / 30	4	27-32		NA	CL		Dark gray Silty CLAY, few fine to coarse Sand, few fine Gravel, slight odor, medium stiff, medium plastic, moist. Becoming stiff, slightly plastic, no odor, damp at 27' bgs.	Bentonite (29.3' - 32' bgs)

Remarks:

BG = background
ppm = parts per million
bgs = below ground surface

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-22

DATE COMPLETED: February 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
2	CONCRETE		CEMENT				
4	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, odor	964.90					
6	ML-SILTS, trace fine sands and clays, trace sand lenses ~1" thick, poorly graded, slight plasticity, soft to firm, gray, very moist, odor	963.40					
8	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, brown to gray, moist	960.90	BENTONITE GROUT	1RS		100	
10			4" PVC WELL CASING				
12	- trace sand lenses ~2" thick at 12.0ft BGS		BENTONITE CHIPS				
14			8" BOREHOLE				
16	- no lenses at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20	- visible sheen on soil, odor at 20.0ft BGS		SAND PACK				
22	SM-SILTY SANDS, fine grained, trace clays, poorly graded, low plasticity, gray, loose to compact, very moist, odor	945.90					
24	- increase in sands, saturated, strong odor at 23.0ft BGS	942.90		2RS		100	
26	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist, odor						
28							
30							
32	- no odor at 33.0ft BGS						
34							
36	END OF HOLE @ 36.0ft BGS	931.90					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-23

DATE COMPLETED: February 11, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
0	CONCRETE	967.15	CEMENT				
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, odor	964.65					
4	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, brown and gray, moist, slight odor		BENTONITE GROUT				
6							
8				1RS		100	
10	- gray at 9.0ft BGS		4" PVC WELL CASING				
12	- brown at 12.0ft BGS		BENTONITE CHIPS				
14			8" BOREHOLE				
16	- gray, odor, product visible on core at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20							
22			SAND PACK				
24	SC-CLAYEY SANDS, fine grained, trace silts and fine gravels, poorly graded, low plasticity, firm, gray, saturated, strong odor, product visible on core	944.90					
26				2RS		100	
28	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray, moist, odor	939.90					
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	931.90					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-24

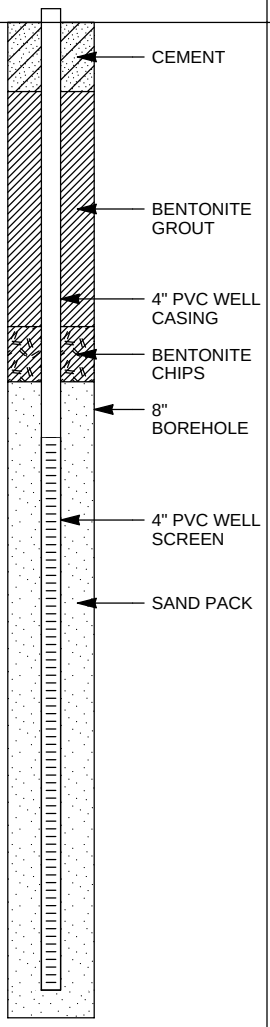
DATE COMPLETED: February 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	967.90
0	CONCRETE	967.15
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, moist to very moist, odor	
4		
6	CONCRETE	961.90
	NO RECOVERY	960.90
8		
10		
12		
14		
16	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, brown and gray, moist	951.90
18		
20		
22		
24	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, firm, gray, saturated, odor	943.90
26	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, brown and gray, moist, slight odor	941.90
28		
30	- trace sand lenses, 4-6" thick, odor at 30.0ft BGS	
32		
34	- no lenses, no odor at 34.0ft BGS	
36	END OF HOLE @ 36.0ft BGS	931.90
38		
40		
42		
44		
46		
48		

MONITORING WELL



WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

Date Start/Finish: 5/18/2004
Drilling Company: Prosonic
Driller's Name: Don Bond
Drilling Method: Hollow stem auger
Sampler Size: NA
Rig Type: NA

Northing: 424205
Easting: 13413178
Casing Elevation: 970.98

Borehole Depth: 37.0'
Surface Elevation: 968.1

Descriptions By: Bart Williams

Well ID: RWW8-08

Client: General Motors Corporation

Location: Pontiac North Campus
Pontiac, Michigan

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well Construction
0 / 970	NA	NA	NA	NA	NA		No soil samples taken, no stratigraphic description available.	Stickup Protective Casing; Concrete (0-1' bgs); Cement/bentonite grout (1'-11' bgs); 4" ID PVC Riser (3' ags-15' bgs); Bentonite Seal (11'-13' bgs); Sand Pack (13'-37' bgs); 4" ID 0.010" PVC Wire Wrapped Screen (15'-35' bgs); Natural Collapse (35'-37' bgs)
5 / 965								
10 / 960								
15 / 955								
20 / 950								
25 / 945								
30 / 940								
35 / 935								

Remarks: NA= not available\not applicable
bgs= below ground surface
ags = above ground surface

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-26

DATE COMPLETED: February 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.00					
0	CONCRETE		CEMENT				
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, odor	966.00					
4	CL-CLAYS, trace fine sands, silts, and fine and coarse gravels, poorly graded, low plasticity, very stiff, brown and gray, mottled, moist, odor	965.00					
6							
8	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, gray, firm, very moist, slight odor	961.00 960.00	BENTONITE GROUT	1RS		100	
10	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, gray and brown, moist, odor		4" PVC WELL CASING				
12	- gray, no odor at 12.0ft BGS		BENTONITE CHIPS				
14			8" BOREHOLE				
16							
18			4" PVC WELL SCREEN				
20							
22			SAND PACK				
24	- increase in silts at 23.0ft BGS						
26	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, gray, firm, very moist to saturated, slight odor	943.00 941.00		2RS		100	
28	SP-SANDS, fine and medium grained, trace coarse grained and fine gravels, poorly graded, loose, black, saturated, strong odor	939.00					
30	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist, no odor						
32							
34							
36	END OF HOLE @ 36.0ft BGS	932.00					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.00 to 933.00ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.00 to 932.00ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-11

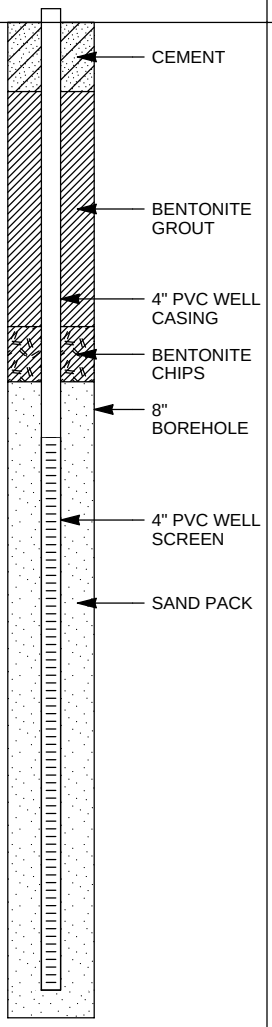
DATE COMPLETED: February 3, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.19
	CONCRETE	967.19
2	SP-SANDS (FILL), fine and medium grained, trace coarse grained and fine gravels, poorly graded, loose, black, very moist, odor	966.19
4	CL-CLAYS, with sands, trace silts and fine gravels, fine grained, poorly graded, low plasticity, stiff to very stiff, brown and gray, very moist, slight odor	963.19
6		
8	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray, moist	
10		
12		
14		
16		
18		
20	- very moist at 20.0ft BGS	
22	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, firm, gray, very moist to saturated	946.19
24	- saturated at 25.0ft BGS	
26		
28		
30	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, decrease in sands, very stiff, gray, moist to very moist	938.69
32		
34		
36	END OF HOLE @ 36.0ft BGS	932.19
38		
40		
42		
44		
46		
48		

MONITORING WELL



WELL DETAILS
Screened interval:
953.19 to 933.19ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.19 to 932.19ft bgs
13.00 to 36.00ft BGS
Material: SANDS

SAMPLE				
NUMBER	INTERVAL	REC (%)	'N' VALUE	
1RS		100		
2RS		100		
3RS		100		

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-28

DATE COMPLETED: February 9, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.10					
0	CONCRETE	967.35	CEMENT				
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, slight odor	965.10		1RS		100	
4	CONCRETE	963.10					
6	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, slight odor	961.10	BENTONITE GROUT				
8	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, soft, brown to gray, very moist						
10	- very high plasticity at 10.0ft BGS		4" PVC WELL CASING	2RS		100	
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16	- odor at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20							
22	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, soft to firm, gray, saturated, odor	946.10	SAND PACK				
24							
26				3RS		100	
28	SP-SANDS, fine and medium grained, trace clays, coarse sands and coarse gravels, poorly graded, loose, gray to black, saturated, odor	940.10					
30		938.10					
32	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, firm to stiff, gray, very moist, odor						
34							
36	END OF HOLE @ 36.0ft BGS	932.10					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.10 to 933.10ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.10 to 932.10ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-12

DATE COMPLETED: February 3, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.20					
0	CONCRETE	967.20	CEMENT				
2	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray to brown, very moist, odor			1RS		100	
4							
6	- gray, moist, no odor at 6.0ft BGS		BENTONITE GROUT				
8		959.70					
10	CL-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, low plasticity, very stiff, brown, moist		4" PVC WELL CASING	2RS		100	
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16	- gray, very moist, odor at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20							
22			SAND PACK				
24	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, firm, gray, saturated, odor	945.20					
26				3RS		100	
28	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, gray, moist, odor	940.70					
30	- sand lens at 29.0ft BGS						
32	- no lenses, slight odor at 29.5ft BGS						
34							
36	END OF HOLE @ 36.0ft BGS	932.20					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.20 to 933.20ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.20 to 932.20ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-16

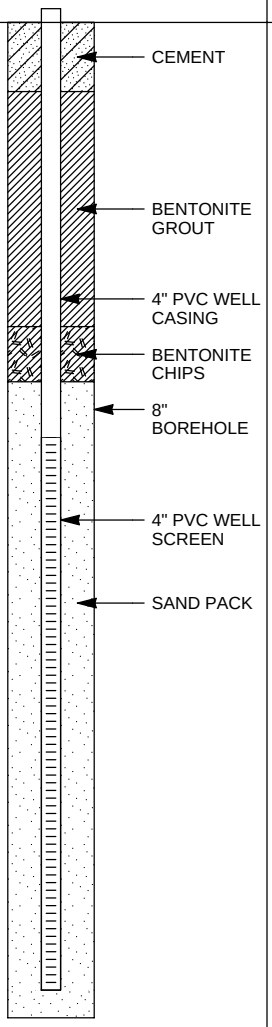
DATE COMPLETED: February 10, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.30
0	CONCRETE	
6	CL-CLAYS, trace fine sands, silts and fine and coarse gravels, poorly graded, low plasticity, stiff, brown and gray, mottled, very moist to saturated, odor	962.30
10	- trace sand lenses, ~2-4" thick, saturated, odor at 6.5ft BGS	958.30
12	- no lenses at 9.0ft BGS	
	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, gray, moist, slight odor	
20	ML-CLAYEY SILTS, trace fine sands, poorly graded, low to medium plasticity, firm, gray, saturated, odor, sheen on core	948.30
26	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, gray, moist, no odor	941.30
36	END OF HOLE @ 36.0ft BGS	932.30

MONITORING WELL



WELL DETAILS
Screened interval:
953.30 to 933.30ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.30 to 932.30ft bgs
13.00 to 36.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-21

DATE COMPLETED: February 11, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
0	GRAVEL DEBRIS		CEMENT				
2		965.40					
4	CONCRETE	963.90					
6	MH-SANDY SILTS, trace fine gravels, fine grained, poorly graded, low plasticity, soft, gray, saturated	961.90					
8	SP-SANDS, fine and medium grained, trace silts and fine gravels, poorly graded, loose, gray, saturated	960.90	BENTONITE GROUT	1RS		100	
10	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist		4" PVC WELL CASING				
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16							
18	- very high plasticity, odor at 18.0ft BGS		4" PVC WELL SCREEN				
20							
22			SAND PACK				
24	SP-SANDS, fine and medium grained, trace coarse grained, silts and clays, poorly graded, loose, gray, very moist to saturated, odor	943.90					
26		941.40		2RS		100	
28	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, very stiff, gray, moist, slight odor						
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	931.90					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-32

DATE COMPLETED: February 9, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	968.00					
0	CONCRETE	967.25	CEMENT				
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, odor						
6	CI-CLAYS, trace fine sands, silts, fine and coarse gravels, poorly graded, medium to low plasticity, very stiff, gray and brown, moist, odor	962.00	BENTONITE GROUT	1RS		100	
10			4" PVC WELL CASING				
12	CONCRETE DEBRIS	956.00	BENTONITE CHIPS				
14	CI-CLAYS, trace fine sands, silts, fine and coarse gravels, poorly graded, medium to low plasticity, very stiff, gray and brown, moist, odor - gray, no odor at 16.0ft BGS	954.00	8" BOREHOLE				
18			4" PVC WELL SCREEN				
20			SAND PACK				
24	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, firm, gray, saturated	944.00		2RS		100	
30	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, gray, stiff to very stiff, moist - trace sand lenses ~2-4" thick, no odor at 33.0ft BGS	938.00					
36	END OF HOLE @ 36.0ft BGS	932.00					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
953.00 to 933.00ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.00 to 932.00ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-33

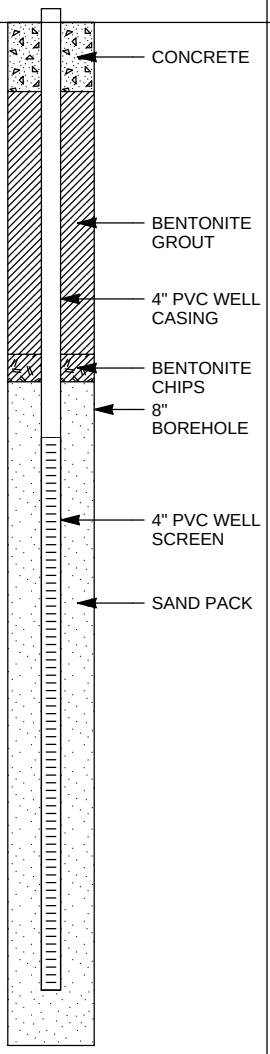
DATE COMPLETED: July 5, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.10
0	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine to medium grained, poorly graded, loose to compact, brown, moist to very moist	
12	CONCRETE	957.10
12	CI-CLAYS, with sands, fine grained, poorly graded, low plasticity, stiff to very stiff, gray, moist, mottled	955.10
20	CH-CLAYS, trace silts and fine gravels, poorly graded, stiff, high plasticity, gray, moist	947.60
26	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, saturated	941.60
30	CH-CLAYS, trace silts and fine gravels, poorly graded, stiff, high plasticity, gray, moist	938.10
36	CI-CLAYS, with sands, fine grained, poorly graded, low plasticity, stiff to very stiff, gray, moist, mottled	933.10
37		931.10
38	END OF HOLE @ 37.0ft BGS	

MONITORING WELL



WELL DETAILS
Screened interval:
953.10 to 933.10ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.10 to 931.10ft bgs
13.00 to 37.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1RS		100		7.6
				8.5
				3.0
				7.5
2RS		100		6.3
				12.8
				13.0
				11.2
3RS		100		5.0
				6.7
				9.0
				5.2
4RS		100		2.5
				4.4
				5.4

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-34

DATE COMPLETED: July 6, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	968.30						
2	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine to medium grained, poorly graded, loose to compact, brown, moist to very moist		CONCRETE					2.2
4				1RS		95		4.2
6								4.2
8			BENTONITE GROUT					
10	- dense to very dense at 9.5ft BGS		4" PVC WELL CASING					2.2
12	CONCRETE	956.80	BENTONITE CHIPS	2RS		100		2.9
14			8" BOREHOLE					2.8
16	CL-CLAYS, with sands, trace fine and coarse gravels, low plasticity, poorly graded, fine grained, stiff to very stiff, gray, moist, mottled	952.80						3.0
18	- brown at 17.0ft BGS		4" PVC WELL SCREEN					3.1
20	- gray, moist, mottled at 19.0ft BGS							
22			SAND PACK	3RS		100		3.9
24	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist	944.30						3.8
26	- saturated at 26.0ft BGS							2.3
28	CH-CLAYS, trace silts, high plasticity, fine grained, poorly graded, gray, firm, very moist	940.30						3.5
30								
32				4RS		100		1.5
34	- trace sands at 34.0ft BGS							1.1
36	- no sands, stiff to very stiff at 35.0ft BGS							2.2
38	END OF HOLE @ 37.0ft BGS	931.30						
40								
42								
44								
46								
48								

WELL DETAILS
Screened interval:
953.30 to 933.30ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.30 to 931.30ft bgs
13.00 to 37.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

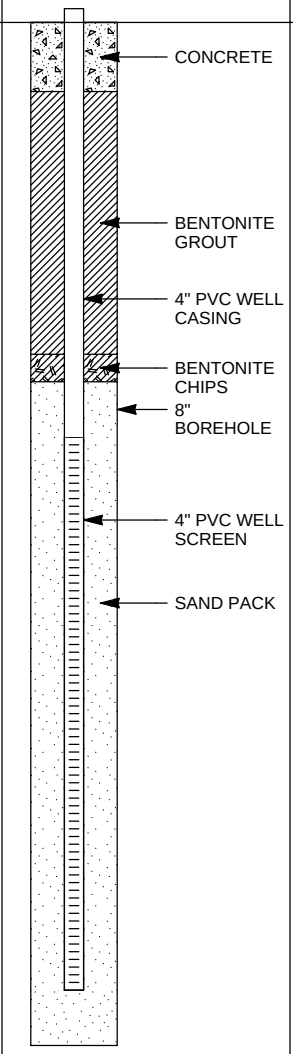
HOLE DESIGNATION: RWW8-35

DATE COMPLETED: July 6, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.30
2	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine to medium grained, poorly graded, compact, brown, moist to very moist	
4		
6		
8		
10	- compact to dense at 10.0ft BGS	
12		
	CONCRETE	955.30
14		
		952.80
16	CL-CLAYS, with sands, trace fine and coarse grained, poorly graded, low plasticity, fine and medium grained, very stiff, brown, moist, mottled	
18		
20		
22		
24		943.55
	SP-SANDS, fine and mediu mgrained, poorly graded, loose, gray, saturated, odor	943.05
26	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, saturated, odor	
28		939.30
	SP-SANDS, fine and mediu mgrained, poorly graded, loose, gray, saturated, odor	938.80
30	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, saturated, slight odor	
32		936.30
	CH-CLAYS, trace silts, fine sands, fine gravels, poorly graded, high plasticity, firm to stiff, gray, moist to very moist	
34	- moist at 34.0ft BGS	
36		931.30
	END OF HOLE @ 37.0ft BGS	
38		
40		
42		
44		
46		
48		



WELL DETAILS
Screened interval:
953.30 to 933.30ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.30 to 931.30ft bgs
13.00 to 37.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				9.8
1RS		95		8.8
				6.5
				7.6
				2.8
2RS		100		--
				1.4
				4.2
				10.2
3RS		100		13.4
				11.0
				8.3
				5.5
4RS		100		3.6
				7.4

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-36

DATE COMPLETED: July 6, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	968.60						
2	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, compact, brown, moist to very moist		CONCRETE					1.7
4				1RS		100		3.5
6								3.8
8			BENTONITE GROUT					2.4
10			4" PVC WELL CASING					2.6
12			BENTONITE CHIPS	2RS		100		
14	CONCRETE	955.60	8" BOREHOLE					--
16	CL-CLAYS, with sands, trace fine and coarse gravels, poorly graded, fine grained, low plasticity, stiff to very stiff, gray, moist	954.60						1.8
18			4" PVC WELL SCREEN					
20								2.4
22			SAND PACK	3RS		100		1.6
24	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist to saturated	944.60						2.4
26								2.2
28								2.7
30								
32	CH-CLAYS, trace silts, fine sands and fine gravels, poorly graded, high plasticity, stiff to firm, gray, moist to very moist	937.10		4RS		100		0.6
34	- firm to stiff at 35.5ft BGS							1.9
36								1.6
38	END OF HOLE @ 37.0ft BGS	931.60						
40								
42								
44								
46								
48								

WELL DETAILS
Screened interval:
953.60 to 933.60ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.60 to 931.60ft bgs
13.00 to 37.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-37

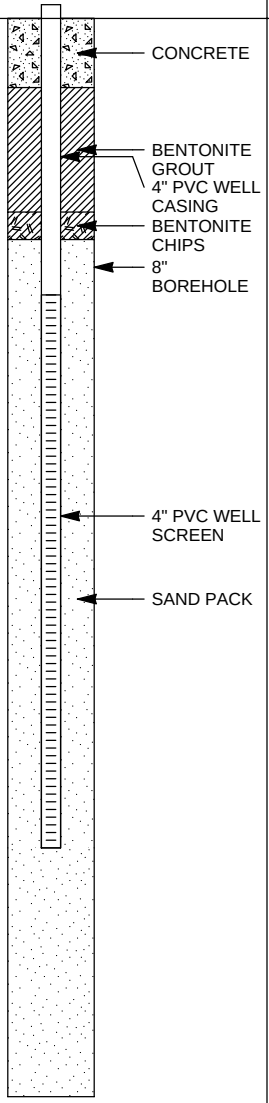
DATE COMPLETED: July 7, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.50
0	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, compact, brown, moist	968.00
2	CH-CLAYS, trace fine sands, and fine and coarse gravels, poorly graded, high plasticity, stiff, brown, moist	967.00
4	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, compact, brown, moist	
6		
8		
10		
12		
14	CONCRETE	955.00
	SP-SANDS, fine and medium grained, poorly graded, very moist	954.00
16	- saturated, slight odor at 15.5ft BGS	
18	- strong odor at 17.0ft BGS	
	- trace clays at 18.0ft BGS	
20	- trace coarse sands at 19.5ft BGS	
	CI-CLAYS, trace fine sands, silts and fine and coarse gravels, poorly graded, moderate plasticity, very stiff, gray, moist	948.00
22		
24		
26	ML-SILTS, trace clays, poorly graded, slight plasticity, firm to stiff, gray, very moist	942.50
28	CH-CLAYS, trace silts, fine and coarse gravels, poorly graded, high to moderate plasticity, stiff, gray, moist	940.50
30	- stiff to very stiff at 30.0ft BGS	
32		
34		
36		
38		
	END OF HOLE @ 39.0ft BGS	929.50
40		
42		
44		
46		
48		

MONITORING WELL



WELL DETAILS
Screened interval:
958.50 to 938.50ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
960.50 to 929.50ft bgs
8.00 to 39.00ft BGS
Material: SANDS

SAMPLE				
NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				0.7
1RS		100		0.5
				1.1
				1.2
2RS		100		1.7
				1.0
				1.2
				4.1
3RS		100		2.9
				2.5
				1.3
				2.3
4RS		100		1.0
				1.4
				0.7

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

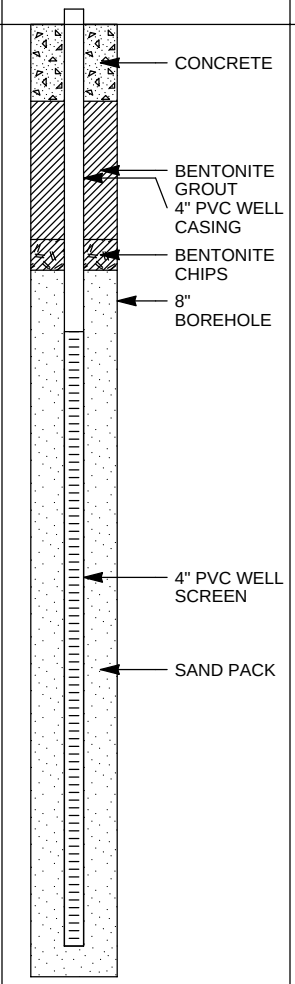
HOLE DESIGNATION: RWW8-38

DATE COMPLETED: July 7, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.40
2	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, stiff, brown, moist to very moist	
4		964.40
6	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist to very moist	962.40
8	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, stiff, brown, moist to very moist	
10		
12	- strong odor at 16.0ft BGS	
14		
16		952.90
18	ML-SILTS, trace clays and fine sands, poorly graded, slight plasticity, firm, gray, saturated	
20	- increase in clays at 17.0ft BGS - decrease in clays, increase in sands, black at 19.0ft BGS	
22	- trace clays and fine sands, poorly graded, slight plasticity, firm, gray, saturated at 20.5ft BGS	
24	CH-CLAYS, trace fine sands and silts, and fine and coarse gravels, poorly graded, high plasticity, firm to stiff, gray, moist	945.90
26		
28	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist to saturated	941.40
30		938.40
32	CH-CLAYS, trace fine sands and silts, and fine and coarse gravels, poorly graded, high plasticity, firm to stiff, gray, moist	937.40
34	END OF HOLE @ 31.0ft BGS	
36		
38		
40		
42		
44		



WELL DETAILS
Screened interval:
958.40 to 938.40ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
960.40 to 937.40ft bgs
8.00 to 31.00ft BGS
Material: SANDS

SAMPLE				
NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				1.7
1RS		100		2.1
				2.1
				6.8
2RS		100		6.8
				9.8
				14.2
3RS		100		18.5
				7.6
				6.1
4RS		100		5.1

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

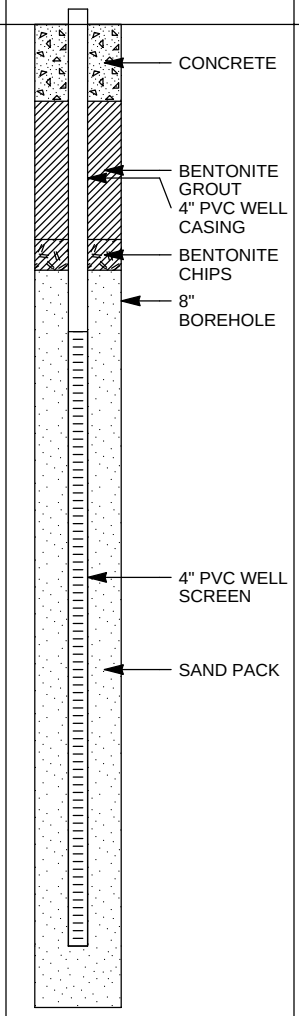
HOLE DESIGNATION: RWW8-39

DATE COMPLETED: July 7, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	967.90
0	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist	966.90
2	CL-CLAYS (FILL), with sands, and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, brown, stiff, moist	965.40
4	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist	960.90
6	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, brown, stiff, moist - stiff to very stiff, gray, mottled at 7.5ft BGS - brown, not mottled at 8.5ft BGS	
8	CONCRETE	952.65
10	ML-SILTS, trace clays and fine sands, poorly graded, slight plasticity, soft to firm, brown, moist - saturated, slight odor at 17.0ft BGS	951.90
12	SM-SILTY SANDS, trace clays and fine gravels, fine to coarse grained, poorly graded, loose, gray, saturated, slight odor	947.40
14	CH-CLAYS, trace fine sands, silts, fine and coarse gravels, poorly graded, high plasticity, firm to stiff, gray, moist	945.90
16	ML-SILTS, trace clays, poorly graded, slight plasticity, stiff, gray, moist to very moist	941.40
18	END OF HOLE @ 32.0ft BGS	935.90
20		
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		



WELL DETAILS
Screened interval:
957.90 to 937.90ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.90 to 935.90ft bgs
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	SAMPLE INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				3.1
1RS		100		8.5
				1.5
				7.6
2RS		100		7.5
				5.3
				3.0
				18.2
3RS		100		16.2
				5.2
				5.2
4RS		100		3.9

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-40

DATE COMPLETED: July 7, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	968.30						
0	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist	967.80	CONCRETE					2.2
2	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, stiff to very stiff, brown, moist	964.80	BENTONITE GROUT 4" PVC WELL CASING	1RS		100		1.9
4	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist	961.30	BENTONITE CHIPS					5.3
6	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, stiff to very stiff, brown, moist - gray at 10.0ft BGS		8" BOREHOLE					4.1
8								4.1
10				2RS		100		5.6
12	CONCRETE	954.80						5.1
14	ML-SILTS, trace clays, poorly graded, firm, brown, moist to very moist - brown to black, very moist to saturated at 16.0ft BGS	954.30 951.30						7.5
16	SP-SANDS, trace silts, poorly graded, fine and medium grained, loose, brown, saturated		4" PVC WELL SCREEN					4.2
18								3.2
20	CI-CLAYS, trace silts, fine and coarse gravels, poorly graded, moderate plasticity, brown, moist - gray at 22.5ft BGS	948.30	SAND PACK	3RS		100		1.8
22								1.6
24	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist to saturated	943.80						
26				4RS		100		
28	CH-CLAYS, trace fine sands, silts, and fine and coarse gravels, poorly graded, high plasticity, stiff, gray, moist	938.30						
30	END OF HOLE @ 32.0ft BGS	936.30						
32								
34								
36								
38								
40								
42								
44								

WELL DETAILS
Screened interval:
958.30 to 938.30ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
960.30 to 936.30ft bgs
8.00 to 32.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-41

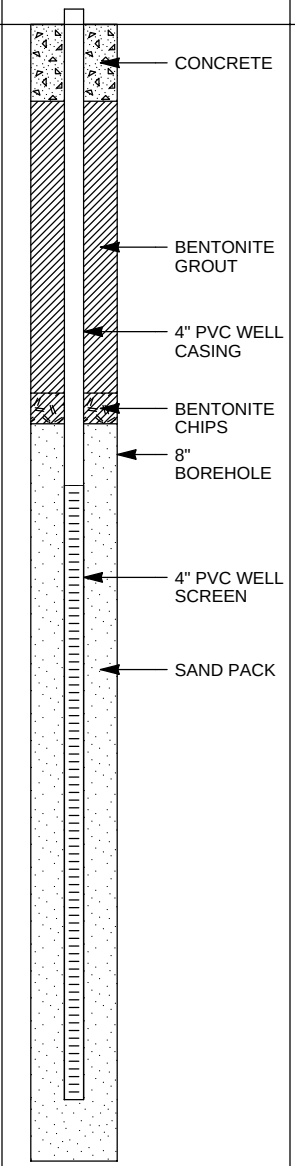
DATE COMPLETED: July 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.00
0	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist	967.50
2	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, stiff to very stiff, brown, moist	964.50
4	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, loose to compact, brown, moist	963.00
6	CL-CLAYS (FILL), with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, stiff to very stiff, brown, moist	
8		
10		
12		
14	CONCRETE	955.00
	CL-CLAYS, with silts, trace fine and medium grained sands, poorly graded, high plasticity, brown, soft, moist to very moist	954.00
16		
18	- gray, slightly mottled at 18.5ft BGS	
20	CI-SILTY CLAYS, poorly graded, moderately high plasticity, firm, gray, very moist, faint odor	948.00
22		
24		
26	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist to saturated	942.00
28	- very moist at 27.5ft BGS	
30	CH-CLAYS, trace fine sands, silts and fine and coarse gravels, poorly graded, very high plasticity, gray, soft to firm, moist	938.50
32		
34	- firm to stiff at 35.0ft BGS	
36		
38	END OF HOLE @ 37.0ft BGS	931.00
40		
42		
44		

MONITORING WELL



WELL DETAILS
Screened interval:
953.00 to 933.00ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.00 to 931.00ft bgs

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				2.3
1RS		100		2.0
				1.8
				2.6
2RS		100		3.0
				2.8
				2.5
				3.6
3RS		100		2.5
				3.0
				2.0
				6.1
4RS		100		3.8
				2.2
				3.1

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-41

DATE COMPLETED: July 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-42

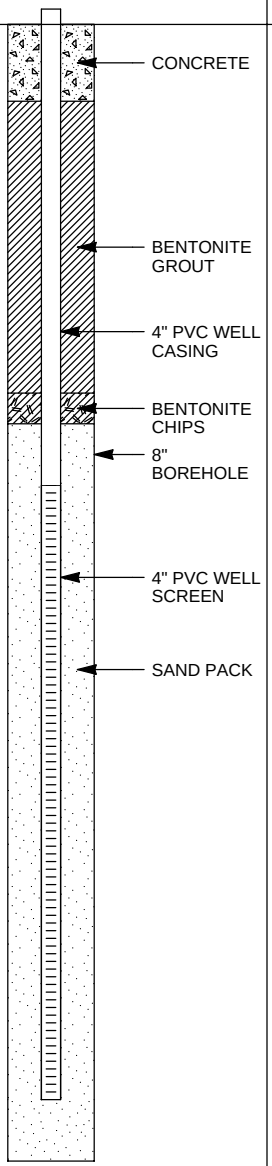
DATE COMPLETED: July 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.10
2	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, compact to dense, brown, moist	
4	- loose to compact at 3.0ft BGS - compact to dense at 4.0ft BGS	
6		
8	- dense at 7.0ft BGS	
10		
12	CONCRETE	957.10 956.60
	CL-CLAYS, with sands and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, brown, stiff to very stiff, moist	955.10
14	CONCRETE	952.60
16	CH-CLAYS, trace fine sands and fine and coarse gravels, poorly graded, moderate to high plasticity, stiff, brown, moist, mottled	
18	- decrease in plasticity at 18.0ft BGS	
20		
22	- brown and gray, slightly mottled at 22.0ft BGS	
24		
26	SP-SANDS, fine and medium grained, poorly graded, loose, gray, very moist	943.10
28		939.60
30	CH-CLAYS, trace fine sands, silts, and fine and coarse gravels, poorly graded, very high plasticity, soft to firm, gray, moist to very moist	
32		
34	- stiff at 34.0ft BGS	
36		
38	END OF HOLE @ 37.0ft BGS	931.10
40		
42		
44		

MONITORING WELL



WELL DETAILS
Screened interval:
953.10 to 933.10ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.10 to 931.10ft bgs

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				2.5
1RS		100		3.9
				4.3
				2.3
				5.0
2RS		100		3.3
				2.0
				2.8
				4.1
3RS		100		3.9
				2.8
				1.0
				2.2
4RS		100		1.8
				1.2

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-42

DATE COMPLETED: July 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-43

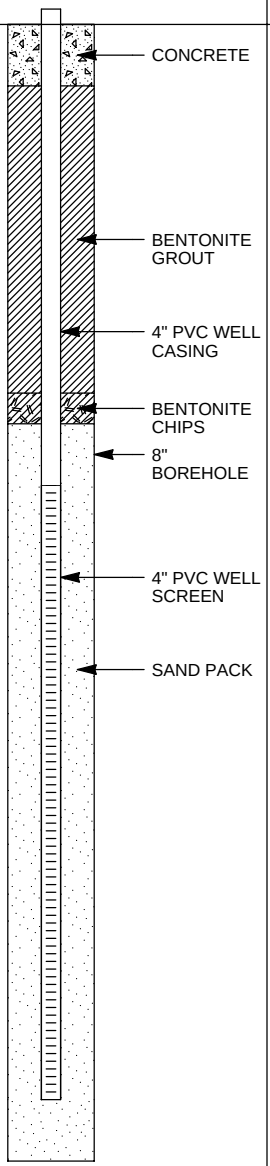
DATE COMPLETED: July 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE/C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	968.00
2	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine and medium grained, poorly graded, compact, brown, moist to very moist	967.00
		965.00
4	CI-CLAYS, with sands, and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, brown, stiff to very stiff, moist	964.00
6	SC-CLAYEY SANDS (FILL), with fine and coarse gravels, fine to coarse grained, poorly graded, compact, black, moist to very moist	
8	CH-CLAYS, with sands, and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, brown, stiff to very stiff, moist	959.00
10		958.00
	CONCRETE	
12	CH-CLAYS, with sands, and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, brown, stiff to very stiff, moist	956.00
		955.00
14	CONCRETE	
16	CH-CLAYS, with sands, and fine and coarse gravels, fine and medium grained, poorly graded, low plasticity, dark brown, stiff to very stiff, moist	
18		950.00
20	SP-SANDS, trace silts, compact, poorly graded, fine grained, light brown, moist	
22		
24		944.00
	SC-CLAYEY SANDS, compact, poorly graded, fine grained, slight plasticity, brown, very moist	943.50
26		942.50
	SP-SANDS, trace silts, compact, poorly graded, fine grained, brown, moist	941.00
28	SW-SANDS, comapct, well gradeded, fine, medium and coarse grained, brown, moist	
30	SP-SANDS, trace silts, compact, poorly graded, fine grained, trace medium and coarse grained, brown, very moist	938.00
32	CH-CLAYS, trace fine subrounded gravels, stiff, high plasticity, brown, moist	
34		934.00
	SC-CLAYEY SANDS, compact, poorly graded, fine grained, brown, wet	933.00
36	CH-CLAYS, trace fine subrounded gravels, stiff, high plasticity, brown, moist	
		931.00
38	END OF HOLE @ 37.0ft BGS	
40		
42		
44		

MONITORING WELL



WELL DETAILS
Screened interval:
953.00 to 933.00ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
955.00 to 931.00ft bgs

SAMPLE				
NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				1.8
1RS		100		2.6
				1.8
				4.1
				5.8
2RS		90		7.0
				6.4
				9.9
				7.4
3RS		90		2.0
				4.0
				9.0
				8.8
4RS		100		7.0
				7.9

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-43

DATE COMPLETED: July 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE/C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-44

DATE COMPLETED: July 12, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.70						
2	CI-SANDY CLAYS, trace fine and coarse subrounded gravels, firm, low plasticity, brown, moist		CONCRETE					12
4		963.70		1RS		100		14.3
6	SC-CLAYEY SANDS, trace fine and coarse subrounded gravels, compact, poorly graded, fine grained, with medium and coarse grained, dark brown, moist		BENTONITE GROUT					16.7
8								2.3
10		958.70	4" PVC WELL CASING					
12	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, brown, moist		BENTONITE CHIPS	2RS		100		1.9
14			8" BOREHOLE					0.6
16								1.4
18	- very stiff at 17.0ft BGS		4" PVC WELL SCREEN					1.8
20								
22			SAND PACK	3RS		100		4.6
24								4.5
26	- dark gray, very moist to wet, stiff at 25.0ft BGS							2.0
28	- moist, very stiff at 27.0ft BGS							1.3
30								
32				4RS		100		3.9
34								1.5
36		930.70						1.5
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								

WELL DETAILS
Screened interval:
952.70 to 932.70ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.70 to 930.70ft bgs

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-44

DATE COMPLETED: July 12, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-25

DATE COMPLETED: February 9, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
0	CONCRETE	967.15	CEMENT				
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, saturated						
	CONCRETE	965.15		1RS		100	
4							
6	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, soft to firm, brown, very moist, odor	962.40	BENTONITE GROUT				
8							
10			4" PVC WELL CASING				
12			BENTONITE CHIPS	2RS		100	
14			8" BOREHOLE				
16	- increase in plasticity at 16.0ft BGS						
18			4" PVC WELL SCREEN				
20							
22	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, soft to firm, gray, saturated, odor	945.90	SAND PACK				
24							
26				3RS		100	
28							
	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, soft to firm, brown, moist to very moist, odor	938.90					
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	931.90					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-27

DATE COMPLETED: February 15, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
0	CONCRETE		CEMENT				
2		965.40					
4	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist to saturated, odor	964.40					
6	CH-CLAYS, with silts, trace fine sands and fine and coarse gravels, poorly graded, high to medium plasticity, gray and brown, mottled, moist		BENTONITE GROUT				
8	- very high plasticity at 8.0ft BGS			1RS		100	
10			4" PVC WELL CASING				
12	- high plasticity, not mottled, gray at 11.0ft BGS		BENTONITE CHIPS				
14			8" BOREHOLE				
16							
18			4" PVC WELL SCREEN				
20	- increase in silts, very high plasticity, moist to very moist at 20.0ft BGS		SAND PACK				
22							
24	- high plasticity at 25.0ft BGS						
26				2RS		100	
28							
30							
32							
34							
36	END OF HOLE @ 36.0ft BGS	931.90					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-47

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.50						
0	SC-CLAYEY SANDS, trace fine and coarse gravels, firm to compact, poorly graded, fine grained, with medium grained, trace coarse grained, brown, moist		CONCRETE					4.0
2								
4				1RS		100		8.3
6			BENTONITE GROUT					14.1
8								16.9
10			4" PVC WELL CASING					
12		955.50	BENTONITE CHIPS	2RS		90		19.2
14	CONCRETE		8" BOREHOLE					16.8
16								14.5
18		950.50	4" PVC WELL SCREEN					10.7
20	CH-CLAYS, trace gravels, stiff, high plasticity, brown, moist							
22		945.50	SAND PACK	3RS		100		11.1
24	ML-SILTS, compact, poorly graded, fine grained, dark gray, wet, petroleum-like odor, slight sheen							3.5
26								6.7
28		939.50						2.2
30	CH-CLAYS, trace gravels, stiff, high plasticity, brown, moist							
32				4RS		100		13.1
34								1.8
36								2.0
38		930.50						
40	END OF HOLE @ 37.0ft BGS							
42								
44								

WELL DETAILS
Screened interval:
952.50 to 930.50ft bgs
15.00 to 37.00ft BGS
Length: 22ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.50 to 930.50ft bgs

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-47

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-48

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.50						
0	SC-CLAYEY SANDS, trace fine and coarse gravels, compact, poorly graded, fine grained, trace medium and coarse grained, brown, moist		CONCRETE	1RS		100		6.0
2								
4								
6			BENTONITE GROUT					
8								
10			4" PVC WELL CASING					4.3
12			BENTONITE CHIPS	2RS		80		
14	CONCRETE	954.50	8" BOREHOLE					7.2
16	CH-CLAYS, trace gravels, firm, high plasticity, brown, very moist	951.50						
18			4" PVC WELL SCREEN					
20								5.4
22			SAND PACK	3RS		100		
24								5.4
26								
28								
30								8.0
32				4RS		100		
34	ML-SILTS, compact, poorly graded, fine grained, brown/gray, wet, oily	933.50 / 932.50						9.1
36	CH-CLAYS, trace gravels, firm, high plasticity, brown, moist	930.50						
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								

WELL DETAILS
Screened interval:
952.50 to 932.50ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.50 to 930.50ft bgs

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-48

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-49

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.80						
0	SC-CLAYEY SANDS, compact, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
2								
4				1RS		100		5.5
6			BENTONITE GROUT					
8								
10			4" PVC WELL CASING					4.3
12	CONCRETE	955.80	BENTONITE CHIPS	2RS		100		
14	ML-SILTS, compact, poorly graded, fine grained, slight plasticity, brown, moist	953.80	8" BOREHOLE					6.9
16								
18	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, dark brown, moist	950.80	4" PVC WELL SCREEN					
20								7.2
22			SAND PACK	3RS		100		
24								6.8
26	- 2" silty wet seam at 26.0ft BGS							
28								
30								5.6
32				4RS		100		
34								3.2
36								
38	END OF HOLE @ 37.0ft BGS	930.80						
40								
42								
44								

WELL DETAILS
Screened interval:
952.80 to 932.80ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.80 to 930.80ft bgs

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-49

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-50

DATE COMPLETED: July 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.60						
0	SC-CLAYEY SANDS, trace fine and coarse gravels, firm to compact, poorly graded, fine grained, trace medium and coarse grained, brown, moist		CONCRETE	1RS		100		49.1
2								
4			BENTONITE GROUT					
6			4" PVC WELL CASING					
8			BENTONITE CHIPS					
10			8" BOREHOLE					41.9
12	CONCRETE	956.60		2RS		70		
14								42.8
16								
18	SM-SILTY SANDS, loose, poorly graded, fine grained, with medium grained, trace coarse grained, brown, wet	950.60	4" PVC WELL SCREEN					
20								24.6
22	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, dark brown, moist	945.60	SAND PACK	3RS		100		
24								28.8
26								
28								
30				4RS		100		24.0
32	END OF HOLE @ 32.0ft BGS	935.60						
34								
36								
38								
40								
42								
44								

WELL DETAILS
Screened interval:
957.60 to 937.60ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.60 to 935.60ft bgs
8.00 to 32.00ft BGS
Material: #5 SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-51

DATE COMPLETED: July 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.70						
0	SC-CLAYEY SANDS, compact, poorly graded, fine grained, with medium grained, brown, moist		CONCRETE	1RS		100		1.1
8	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, brown, moist	960.70	BENTONITE GROUT					
10			4" PVC WELL CASING					4.5
12			BENTONITE CHIPS	2RS		100		
14			8" BOREHOLE					1.4
18			4" PVC WELL SCREEN					
20								1.7
22			SAND PACK	3RS		100		
24		942.70						0.1
26	ML-SILTS, dense, poorly graded, fine grained, gray, wet	942.20						
28	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, brown, moist							1.2
32				4RS		100		
34								1.9
36		930.70						
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								

WELL DETAILS
Screened interval:
952.70 to 932.70ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.70 to 930.70ft bgs

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-51

DATE COMPLETED: July 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-52

DATE COMPLETED: July 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.60						
0	SC-CLAYEY SANDS, compact, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
4	CH-CLAYS, trace fine and coarse gravels, firm to stiff, high plasticity, brown, moist	963.60	BENTONITE GROUT; 4" PVC WELL CASING; BENTONITE CHIPS	1RS		100		14.0
10								13.1
12				2RS		50		
14			8" BOREHOLE					12.9
18			4" PVC WELL SCREEN					
20	SP/SM-SANDS AND SILTY SANDS, compact, poorly graded, fine grained, with medium and coarse grained, brown, wet	947.60	SAND PACK					10.4
22				3RS		100		
24	CH-CLAYS, trace fine and coarse gravels, firm to stiff, high plasticity, brown, moist	943.60						14.7
30				4RS		100		11.1
32	END OF HOLE @ 32.0ft BGS	935.60						

WELL DETAILS
Screened interval:
957.60 to 937.60ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.60 to 935.60ft bgs
8.00 to 32.00ft BGS
Material: #5 SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-53

DATE COMPLETED: July 14, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.40						
0	SC-CLAYEY SANDS, trace gravels, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
2								
4				1RS		100		15.2
6			BENTONITE GROUT 4" PVC WELL CASING					
8			BENTONITE CHIPS					
10		957.40	8" BOREHOLE					10.4
12	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist			2RS		100		
14								5.8
16								
18		949.40	4" PVC WELL SCREEN					
20	ML-SILTS, compact, poorly graded, fine grained, brown/gray, wet							5.6
22		945.40	SAND PACK	3RS		100		
24	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist							6.6
26								
28								
30				4RS		100		10.2
32	END OF HOLE @ 32.0ft BGS	935.40						
34								
36								
38								
40								
42								
44								

WELL DETAILS
Screened interval:
957.40 to 937.40ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.40 to 935.40ft bgs
8.00 to 32.00ft BGS
Material: #5 SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-54

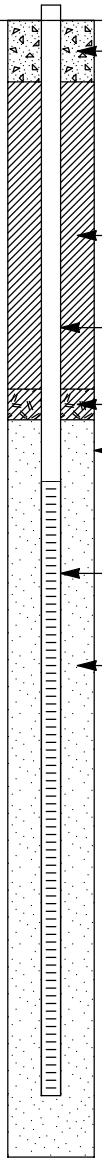
DATE COMPLETED: July 15, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	967.80
0	SC/CL-SANDY CLAYS/CLAYEY SANDS, compact to firm, poorly graded, low plasticity, brown, moist	
10	CONCRETE	957.80
18	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, dark brown, moist	949.80
28	SM/SP-SILTY SANDS TO SANDS, compact, poorly graded, fine grained, trace medium and coarse grained, brown/gray, wet, petroleum-like odor	939.80
30		937.80
32	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, dark brown, moist	
36	END OF HOLE @ 37.0ft BGS	930.80

MONITORING WELL



WELL DETAILS
Screened interval:
952.80 to 932.80ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.80 to 930.80ft bgs

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1RS		100		3.2
				6.6
2RS		100		
				11.2
				14.4
3RS		100		
				12.2
				11.9
4RS		100		
				9.2

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-54

DATE COMPLETED: July 15, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-55

DATE COMPLETED: July 15, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	968.10						
0	CI-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist		CONCRETE					
4	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist	964.10	BENTONITE GROUT; 4" PVC WELL CASING; BENTONITE CHIPS; 8" BOREHOLE	1RS		100		10.8
10								11.9
12				2RS		100		
14								9.7
18			4" PVC WELL SCREEN					
20								8.3
22			SAND PACK	3RS		100		
24	ML-SILTS, comapct, poorly graded, fine grained, brown/gray, wet	944.10						8.4
26	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist	942.10						
30				4RS		100		10.4
32	END OF HOLE @ 32.0ft BGS	936.10						

WELL DETAILS
Screened interval:
958.10 to 938.10ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
960.10 to 936.10ft bgs
8.00 to 32.00ft BGS
Material: #5 SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-29

DATE COMPLETED: February 9, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
0	CONCRETE	967.15	CEMENT				
2	SP-SANDS (FILL), fine and medium grained, poorly graded, loose, black, very moist, slight odor			1RS		100	
4							
6			BENTONITE GROUT				
8							
10	CI-CLAYS, trace fine sands, silts, and fine and coarse gravels, poorly graded, medium plasticity, very stiff, brown, moist, slight odor	957.90	4" PVC WELL CASING	2RS		100	
12			BENTONITE CHIPS				
14			8" BOREHOLE				
16	CH-CLAYS, with silts, trace fine sands and gravels, poorly graded, high plasticity, firm to stiff, gray, moist to very moist, odor	951.90					
18			4" PVC WELL SCREEN				
20							
22	- slight increase in sands, decrease in gravels, very moist to saturated, stronger odor at 22.0ft BGS		SAND PACK				
24							
26				3RS		100	
28	- with silts, trace fine sands and gravels, poorly graded, high plasticity, firm to stiff, gray, moist to very moist, odor at 27.0ft BGS						
30							
32	- very stiff, moist, no odor at 33.0ft BGS						
34							
36	END OF HOLE @ 36.0ft BGS	931.90					
38							
40							
42							
44							
46							
48							

WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 931.90ft bgs
13.00 to 36.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-57

DATE COMPLETED: July 20, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.10						
0	SP-SANDS (FILL), loose, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
4	SC-CLAYEY SANDS (FILL), compact, poorly graded, fine grained, with medium and coarse grained, brown, moist	978.10		1RS		100		2.4
8			BENTONITE GROUT					
10			4" PVC WELL CASING					2.9
12			BENTONITE CHIPS	2RS		70		
14	- boulder (~6" diameter) at 14.0ft BGS		8" BOREHOLE					1.7
16								
18	CH-CLAYS, with sands, trace fine and fine subrounded gravels, stiff, high plasticity, dark brown, moist	964.10	4" PVC WELL SCREEN					7.8
20								
22			SAND PACK	3RS		100		
24								8.0
26								
28	SC-CLAYEY SANDS, comapct, poorly graded, fine grained, with meduim and coarse grained, brown/gray, wet, petroleum-like odor	954.10						9.0
30								
32				4RS		100		
34	CH-CLAYS, trace fine subrounded gravels,	947.10						7.7

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-57

DATE COMPLETED: July 20, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36	stiff, high plasticity, gray/brown, moist							
	END OF HOLE @ 37.0ft BGS	944.10	WELL DETAILS Screened interval: 966.10 to 946.10ft bgs 15.00 to 35.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 968.10 to 944.10ft bgs 13.00 to 37.00ft BGS Material: #5 SANDS					
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-58

DATE COMPLETED: July 20, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.50						
0	SP/SC-SANDS intermixed WITH CLAYEY SANDS (FILL), loose to compact, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE	1RS		100		3.5
8	CI-CLAYS, trace fine and medium grained sands, trace fine and coarse subrounded gravels, firm, high plasticity, dark brown, moist	974.50	BENTONITE GROUT					8.8
10			4" PVC WELL CASING					
12				2RS		100		3.2
18	CH-CLAYS, trace fine, medium and coarse grained sands, trace fine and coarse subrounded gravels, firm, high plasticity, dark brown, moist	963.50	BENTONITE CHIPS					7.5
22				3RS		100		17.3
26	- very moist at 26.0ft BGS		8" BOREHOLE					
28		952.50						9.0
30	SC-CLAYEY SANDS, compact, poorly graded ,fine grained, with medium and coarse grained, dark brown, wet, petroleum-like odor		4" PVC WELL SCREEN					
32				4RS		100		
34	CH-CLAYS, trace fine, medium and coarse	947.50						10.6

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-58

DATE COMPLETED: July 20, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36	grained sands, trace fine and coarse subrounded gravels, firm, high plasticity, dark brown, moist	944.50	SAND PACK WELL DETAILS Screened interval: 954.50 to 934.50ft bgs 27.00 to 47.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 956.50 to 934.50ft bgs 25.00 to 47.00ft BGS Material: #5 SANDS					
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

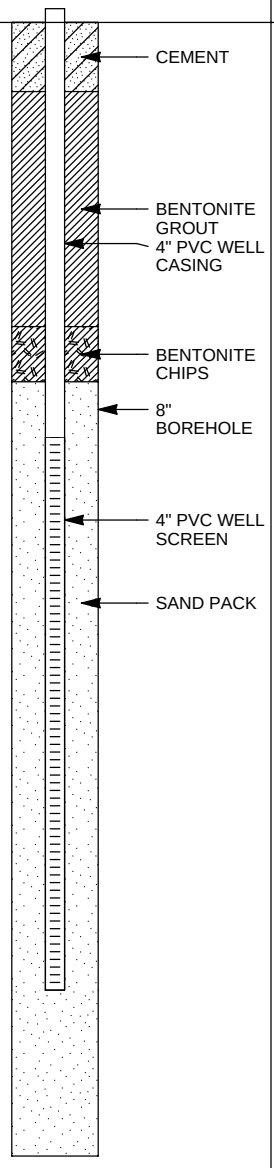
HOLE DESIGNATION: RWW8-30

DATE COMPLETED: February 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	967.90
0	CONCRETE	966.90
2	SP-SANDS (FILL), fine grained, trace medium grained, poorly graded, loose, black, very moist	965.90
		965.40
4	CONCRETE	
6	CL-CLAYS, with sands, fine grained, trace silts and fine gravels, poorly graded, low plasticity, brown, moist	961.90
8	SP-SANDS, fine grained, poorly graded, loose to compact, gray, very moist, odor	960.90
10	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, brown to gray, moist, odor	
12	- gray, decrease in sands at 9.0ft BGS	
14		
16		
18		
20		
22		
24	ML-SILTS, with clays, trace fine sands, poorly graded, slight plasticity, firm, gray, saturated, slight odor	944.90
26	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high plasticity, stiff, brown to gray, moist, slight odor	942.40
28	SP-SANDS, fine grained, poorly graded, loose to compact, gray, very moist, odor	939.90
30	CH-CLAYS, with silts, trace fine sands and fine gravels, poorly graded, high to very high plasticity, stiff, brown to gray, moist, faint odor	937.90
32		
34		
36		
38		
40		
42	END OF HOLE @ 41.0ft BGS	926.90
44		
46		
48		



WELL DETAILS
Screened interval:
952.90 to 932.90ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.90 to 926.90ft bgs

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-30

DATE COMPLETED: February 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	
52			13.00 to 41.00ft BGS Material: SANDS					
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								
90								
92								
94								
96								
98								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-31

DATE COMPLETED: February 8, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	GROUND SURFACE	967.90					
	SP-SANDS (FILL), fine grained, trace medium grained and clays, poorly graded, loose, brown, moist		CEMENT	1RS		90	
5	CONCRETE	963.40 962.90					
	CH-CLAYS, with silts, trace fine sands, poorly graded, high plasticity, very stiff, brown, moist, slight odor		BENTONITE GROUT 4" PVC WELL CASING	2RS		100	
10							
	- gray at 12.5ft BGS						
15			BENTONITE CHIPS				
			8" BOREHOLE				
20	- decrease in sands at 20.0ft BGS			3RS		100	
	- moist to very moist at 24.0ft BGS		4" PVC WELL SCREEN				
25							
			SAND PACK				
30	- sand lenses, stronger odor than clays, saturated at 30.0ft BGS			4RS		100	
	- no lenses, moist to very moist, no odor at 32.0ft BGS						
35							
				5RS		100	
40	END OF HOLE @ 40.0ft BGS	927.90					
45							
50							

WELL DETAILS
Screened interval:
947.90 to 927.90ft bgs
20.00 to 40.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
949.90 to 927.90ft bgs
18.00 to 40.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-45

DATE COMPLETED: July 12, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.20						
0	SC-CLAYEY SANDS, trace fine and coarse subrounded gravels, compact, poorly graded, fine grained with medium grained, trace coarse grained, brown, moist, slight petroleum-like odor		CONCRETE	1RS		100		1.7
2								2.0
4			BENTONITE GROUT					
6			4" PVC WELL CASING					2.4
8		959.20	BENTONITE CHIPS					2.2
10	CI-CLAYS, trace fine sands, trace fine and coarse subrounded gravels, firm, low plasticity, brown		8" BOREHOLE					
12		955.70		2RS		50		1.0
14	NO RECOVERY, sand washed out, according to driller							--
16								--
18		950.20	4" PVC WELL SCREEN					1.1
20	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, brown, moist							
22			SAND PACK	3RS		100		8.1
24								12.9
26								2.6
28								1.1
30								
32				4RS		100		3.1
34								1.7
36		930.20						2.2
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								

WELL DETAILS
Screened interval:
957.20 to 937.20ft bgs
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.20 to 935.20ft bgs
8.00 to 32.00ft BGS
Material: #5 SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-62

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	980.80						
0	SP-SANDS (FILL), with gravels and boulders, loose, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
2								
4				1RS		100		5.3
5.5		975.80						
6	CI-CLAYS, trace fine and coarse gravels, firm, low plasticity, dark brown, moist							
8			BENTONITE GROUT					
9.5		971.80						10.5
10	CH-CLAYS, trace fine and coarse gravels, firm, highp lasticity, moist, dark brown		4" PVC WELL CASING					
12				2RS		100		
14								7.7
16								
18			BENTONITE CHIPS					
19.5		961.80						6.2
20	GP-GRAVELS, loose, poorly graded, coarse, beige/brown, wet							
22				3RS		100		
24			8" BOREHOLE					3
26								
27.5		953.80						
28	CONCRETE							
30			4" PVC WELL SCREEN					5.2
32		948.80		4RS		100		
32	CH-CLAYS, trace red brick, trace fine and coarse gravels, firm, highp lasticity, moist, dark brown							
34								5.1

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-62

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
		943.80						
38	ML-SILTS, compact, poorly graded, fine grained, gray, wet							
40								7.1
42		938.80	SAND PACK	5RS		100		
	CH-CLAYS, trace fine and coarse gravels, firm, highp lasticity, moist, dark brown							
44								2.2
46								
		933.80						
48	END OF HOLE @ 47.0ft BGS							
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
955.80 to 935.80ft bgs
25.00 to 45.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
957.80 to 933.80ft bgs
23.00 to 47.00ft BGS
Material: #5 SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-63

DATE COMPLETED: July 22, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.50						
0	SC-CLAYEY SANDS, trace gravels, compact, poorly graded, fine grained, trace medium and coarse grained, brown, moist		CONCRETE					
2								
4				1RS		100		3.0
5		976.50						
6	SP-SANDS, trace silts and gravels, loose, poorly graded, fine grained, trace medium and coarse grained, brown, moist							
7		974.50	BENTONITE GROUT					
8	CI-CLAYS, trace gravels, firm, low plasticity, brown, moist							
10			4" PVC WELL CASING					11.4
11		970.50						
12	CONCRETE			2RS		100		
13		968.50						
14	CI-CLAYS, trace gravels, firm, low plasticity, brown, moist							9.6
16								
17		964.50	BENTONITE CHIPS					
18	SP-SANDS, trace silts and gravels, loose, poorly graded, fine grained, trace medium and coarse grained, brown, moist							
19		961.50						9.5
20	CONCRETE							
21		960.50						
22	CH-CLAYS, trace gravels, firm to stiff, high plasticity, dark brown, moist			3RS		100		
24			8" BOREHOLE					9.5
26								
28								
29								11.9
30			4" PVC WELL SCREEN					
32				4RS		100		
34								10.6

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-63

DATE COMPLETED: July 22, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
		944.50						
38	ML-SILTS, compact to dense, poorly graded, fine grained, dark gray, very moist							
40								11.2
42			SAND PACK	5RS		100		
		938.50						
44	CH-CLAYS, trace gravels, firm to stiff, high plasticity, gray, very moist							11.5
46								
		934.50						
48	END OF HOLE @ 47.0ft BGS							
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
956.50 to 936.50ft bgs
25.00 to 45.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
958.50 to 934.50ft bgs
23.00 to 47.00ft BGS
Material: #5 SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-64

DATE COMPLETED: July 22, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.40						
0	SP-SANDS (FILL), _____, loose, poorly graded, with medium and coarse grained, brown, moist		CONCRETE					
2	CI-CLAYS (FILL), trace gravels, firm, low plasticity, brown, moist	979.40		1RS		100		3.1
4	CONCRETE	977.40						
		976.40						
6	SP-SANDS (FILL), _____, loose, poorly graded, with medium and coarse grained, brown, moist		BENTONITE GROUT					
8	CI-CLAYS (FILL), trace gravels, firm, low plasticity, brown, moist	973.40						6.1
10			4" PVC WELL CASING					
12				2RS		100		8.5
14								
16								
18	- black, petroleum-like odor at 18.0ft BGS		BENTONITE CHIPS					7.9
20	CH-CLAYS, trace gravels, firm, high plasticity, dark brown, moist	961.40						
22				3RS		100		
24			8" BOREHOLE					8.2
26								
28								
30			4" PVC WELL SCREEN					8.1
32				4RS				
34	- 2" layer silts at 34.0ft BGS							3.0

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-64

DATE COMPLETED: July 22, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36	SP-SANDS, with silts, compact, poorly graded, fine grained, with medium grained, trace coarse grained, gray/brown, wet, slight petroleum-like odor	945.40						
38								
40								6.9
42			SAND PACK	5RS				
44								3.8
46	CH-CLAYS, trace gravels, firm, high plasticity, dark brown, moist	935.40						
	END OF HOLE @ 47.0ft BGS	934.40						
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
956.40 to 936.40ft bgs
25.00 to 45.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
958.40 to 934.40ft bgs
23.00 to 47.00ft BGS
Material: #5 SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-65

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.40						
0	CI-CLAYS, trace gravels, firm, low plasticity, brown, moist		CONCRETE					
2								
4				1RS		100		10.4
6		975.40						
	SM-SILTY SANDS, loose, poorly graded, fine grained, brown, moist	974.40	BENTONITE GROUT					
8	CI-CLAYS, trace gravels, firm, low plasticity, brown, moist							9.4
10			4" PVC WELL CASING					
12				2RS		100		
14								6.3
16								
18			BENTONITE CHIPS					
20								8.8
22		959.40		3RS		100		
	CH-CLAYS, trace gravels, stiff, high plasticity, dark brown, moist		8" BOREHOLE					8.8
24								
26								
28								
30			4" PVC WELL SCREEN					12.0
32				4RS		100		
34								4.5

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-65

DATE COMPLETED: July 21, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
38	ML-SILTS, dense, poorly graded, fine grained, dark brown, wet	944.40						10.1
40								
42	CH-CLAYS, trace gravels, stiff, high plasticity, dark brown, moist	939.40	SAND PACK	5RS		100		
44								5.5
46								
48	END OF HOLE @ 47.0ft BGS	934.40						
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
956.40 to 936.40ft bgs
25.00 to 45.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
958.40 to 934.40ft bgs
23.00 to 47.00ft BGS
Material: #5 SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-66

DATE COMPLETED: July 26, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.30						
0	FILL-SANDS, loose, poorly graded, fine grained, trace medium and coarse grained, trace fine gravels, brown, moist		CONCRETE	1RS		100		14.6
8	CI-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist	974.30	BENTONITE GROUT					11.5
10			4" PVC WELL CASING					
12			BENTONITE CHIPS	2RS		100		
14			8" BOREHOLE					13.9
16	SP-SANDS, trace gravels, compact, poorly graded, medium grained, brown, moist	966.30						
18	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, brown, moist	964.30	4" PVC WELL SCREEN					
20								14.3
22			SAND PACK	3RS		100		
24								11.2
26								
28	SP-SANDS, trace gravels, compact, poorly graded, medium grained, brown, wet	954.30						
30	ML-SILTS, compact-dense, poorly graded, fine grained, dark bronw/dark gray, wet - petroleum-like odor at 30.0ft BGS	952.30						8.1
32	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, brown, moist	949.30		4RS		100		
34								12.2

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-66

DATE COMPLETED: July 26, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
38	END OF HOLE @ 37.0ft BGS	944.30	WELL DETAILS Screened interval: 966.30 to 946.30ft bgs 15.00 to 35.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 968.30 to 944.30ft bgs 13.00 to 37.00ft BGS Material: #5 SANDS					
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-67

DATE COMPLETED: July 26, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.20						
0	FILL-SANDS, loose, poorly graded, medium grained, brown, moist		CONCRETE					
2								
4	CI-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist	978.20		1RS		100		4.8
6								
8	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist	974.20	BENTONITE GROUT					
10	SP-SANDS, trace fine and coarse gravels, trace glass shards, loose, poorly graded, medium grained, brown, moist	972.20	4" PVC WELL CASING					5.8
12			BENTONITE CHIPS	2RS		100		
14			8" BOREHOLE					6.6
16								
18			4" PVC WELL SCREEN					
20	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist	962.20						9
22	- dark brown/dark gray at 22.0ft BGS		SAND PACK	3RS		100		
24								7.4
26								
28	SP-SANDS, trace fine and coarse gravels, trace glass shards, loose, poorly graded, medium grained, brown, wet	954.20						
30								10.1
32				4RS				
34	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist	948.20						11.0

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-67

DATE COMPLETED: July 26, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36		944.20	WELL DETAILS Screened interval: 966.20 to 946.20ft bgs 15.00 to 35.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 968.20 to 944.20ft bgs 13.00 to 37.00ft BGS Material: #5 SANDS					
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-68

DATE COMPLETED: July 26, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.10						
0	FILL-SANDS AND CLAYS, compact, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
2								
4				1RS		100		10.5
6								
8	CI-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist	974.10	BENTONITE GROUT					6.5
10			4" PVC WELL CASING					
12			BENTONITE CHIPS	2RS		100		
14			8" BOREHOLE					4.9
16								
18	CH-CLAYS, trace fine and coasre gravels, firm, high plasticity, brown, moist	964.10	4" PVC WELL SCREEN					11.1
20								
22			SAND PACK	3RS		70		
24								10.9
26	SP-SANDS, loose to compacdt, poorly graded, medium grained ,trace fine and coarse grained, brown, wet	955.10						
28								
30								8.1
32				4RS		100		
34	CH-CLAYS, trace fine and coasre gravels, firm, high plasticity, brown, moist	948.10						6.4

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-68

DATE COMPLETED: July 26, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36		944.10	WELL DETAILS Screened interval: 966.10 to 946.10ft bgs 15.00 to 35.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 968.10 to 944.10ft bgs 13.00 to 37.00ft BGS Material: #5 SANDS					
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-69

DATE COMPLETED: July 27, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.70						
0	FILL-CLAYS, trace fine and coasre graels, firm, low plasticity, brown, moist		CONCRETE					
2								
4				1RS		100		4.6
		976.70						
6	SP-SANDS, loose, poorly graded, fine grained, brown, moist							
		974.70	BENTONITE GROUT					
8	CI-CLAYS, trace fien and coarse gravels, firm, low plasticity, brown, moist							3.2
10			4" PVC WELL CASING					
12			BENTONITE CHIPS	2RS		100		
14			8" BOREHOLE					4.6
16								
18			4" PVC WELL SCREEN					
20								7.4
		961.70						
22	SM/SP-SILTY SANDS/SANDS, loose to compact, poorly graded, fine grained, trace mediu mgrained, black, moist		SAND PACK	3RS		100		
24	- brown at 23.5ft BGS							5.1
26	- wet at 26.0ft BGS							
28								
		952.70						
30	SC-CLAYEY SANDS, trace fine and coarse gravels, compact, poorly graded, fine grained, with medium and coarse grained, dark brown, wet, slight plasticity							6.8
32				4RS		100		
34								7.4

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-69

DATE COMPLETED: July 27, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36	CH-CLAYS, trace fine and coasre gravels, firm to stiff, high plasticity, brown, moist	946.70						
38	END OF HOLE @ 37.0ft BGS	944.70	WELL DETAILS Screened interval: 966.70 to 946.70ft bgs 15.00 to 35.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 968.70 to 944.70ft bgs 13.00 to 37.00ft BGS Material: #5 SANDS					
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-70

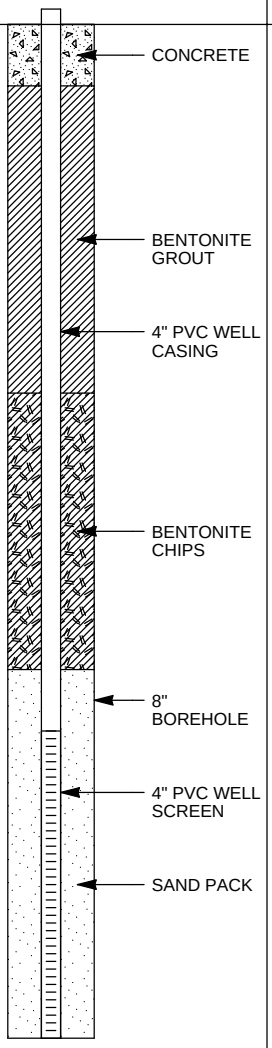
DATE COMPLETED: July 27, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs
	GROUND SURFACE	980.70
0	FILL-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist	
8	SP-SANDS, with fine and coarse gravels, loose, poorly graded, fine grained, with medium grained, brown, moist	973.70
10	CI-CLAYS, with fine and coarse gravels, firm, low plasticity, brown, moist	971.70
16	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown, moist	963.70
32	SC-CLAYEY SANDS, compact, poorl ygraded, fine grained, with medium grained, dark brown, wet	948.70
34	END OF HOLE @ 33.0ft BGS	947.70

MONITORING WELL



WELL DETAILS
Screened interval:
957.70 to 947.70ft bgs
23.00 to 33.00ft BGS
Length: 10ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
959.70 to 947.70ft bgs
21.00 to 33.00ft BGS
Material: #5 SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1RS		100		7.5
				3.2
2RS		100		
				9.8
				15.6
3RS		100		
				11.6
				12.8
4RS		100		
				7.7

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-71

DATE COMPLETED: July 28, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	980.90						
0	FILL-CLAYS, trace fine and coarse gravels, firm, low plasticity, brown, moist		CONCRETE					
2								
4				1RS		100		2.7
6			BENTONITE GROUT					
8								
10			4" PVC WELL CASING					4.9
12				2RS		100		
14								5.5
16	SC-CLAYEY SANDS, trace fine and coarse gravels, compact, poorly graded, fine grained, with medium and caorse grained, dark brown, moist	965.90	BENTONITE CHIPS					
18	CH-CLAYS, trace fine and coarse gravels, firm, high plasticity, brown/gray mottled, moist	963.40						
20			8" BOREHOLE					5.3
22	- wet at 21.0ft BGS			3RS		100		
24			4" PVC WELL SCREEN					14.2
26								
28			SAND PACK					
30								21.9
32				4RS		100		
34								12.5

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-71

DATE COMPLETED: July 28, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
38	CH-CLAYS, trace fine and coarse gravels, stiff, high plasticity, dark brown, moist	943.90						
40				5RS		100		3.6
42	END OF HOLE @ 42.0ft BGS	938.90	WELL DETAILS Screened interval: 960.90 to 940.90ft bgs 20.00 to 40.00ft BGS Length: 20ft Diameter: 4in Slot Size: 0.010 Material: PVC Sand Pack: 962.90 to 938.90ft bgs 18.00 to 42.00ft BGS Material: #5 SANDS					
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-72

DATE COMPLETED: August 31, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SP-SANDS (FILL), with fine to coarse gravels, trace clays, fine and medium grained, medium graded, loose, brown, moist	
1.50	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine and medium grained, compact, brown to black, moist	
11.50	CH-CLAYS, trace fine to coarse gravels, poorly graded, high to moderate plasticity, soft, brown, moist	
14.00	CONCRETE	
17.00	SP-SANDS, trace fine to coarse gravels and clays, fine to coarse grained, poorly graded, loose, brown, saturated	
20.50	ML-SILTS, trace clays, poorly graded, firm, slight plasticity, gray, saturated	
25.00	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist	
27.00	NO RECOVERY	
32.00	END OF HOLE @ 32.0ft BGS	

MONITORING WELL: CONCRETE; 4" PVC WELL CASING; BENTONITE GROUT; BENTONITE CHIPS; 8" BOREHOLE; 4" PVC WELL SCREEN; SAND PACK

WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				--
1RS		85		--
				--
				1.8
				2.8
2RS		90		2.8
				--
				2.3
				3.2
3RS		100		2.8
				3.7
				--
4RS		0		--

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

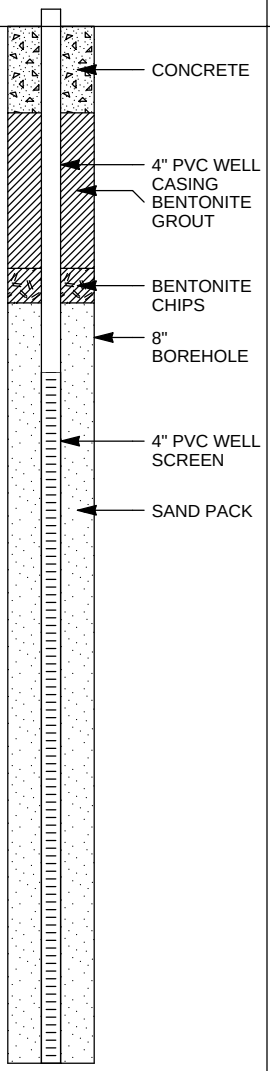
HOLE DESIGNATION: RWW8-73

DATE COMPLETED: August 24, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose, black, moist	
2	- compact, black and gray at 2.5ft BGS	
4		
6	- trace boulders, loose, brown at 5.0ft BGS	
8		
10		10.00
12	CH-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, high plasticity, soft to stiff, brown, moist	
14		
16		16.50
18	SP-SANDS, fine and medium grained, poorly graded, loose, brown, moist to very moist	17.00
20	CL-CLAYS, trace fine sands and fine and coarse gravels, poorly graded, low plasticity, stiff to very stiff, gray, moist	18.50
22	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist - saturated at 19.5ft BGS	
24	CL-CLAYS, trace fine sands and fine and coarse gravels, poorly graded, low plasticity, stiff to very stiff, gray, moist	23.00
26		
28		
30	END OF HOLE @ 30.0ft BGS	30.00
32		
34		
36		
38		



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 30.00ft BGS
Material: SANDS

SAMPLE NUMBER	SAMPLE INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1RS		100		3.0
				3.2
				3.6
				2.5
2RS		100		2.5
				2.7
				2.1
				2.5
3RS		100		3.0
				2.7
				1.6

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-74

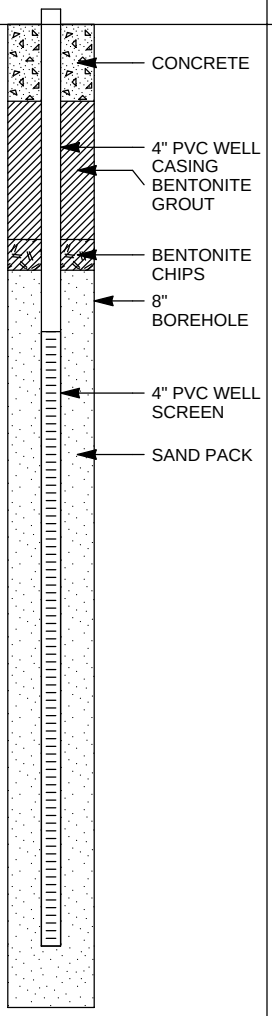
DATE COMPLETED: August 25, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose, brown, moist	
	- compact at 3.0ft BGS	
	- trace boulders, loose at 7.0ft BGS	
12	CL-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, moderate plasticity, stiff, brown, moist	12.00
17	CH-CLAYS, trace silts and fine sands, poorly graded, high plasticity, soft, brown, moist	17.00
18.5	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, moist	18.50
	- saturated at 20.5ft BGS	
24	CH-CLAYS, trace silts, fine sands, and fine to coarse gravels, poorly graded, high plasticity, soft, gray, very moist	24.00
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				1.6
1RS		100		2.7
				2.5
				3.0
				2.3
2RS		100		1.8
				1.6
				3.0
				1.6
3RS		100		1.1
				2.1
				1.6
4RS		100		1.6

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-75

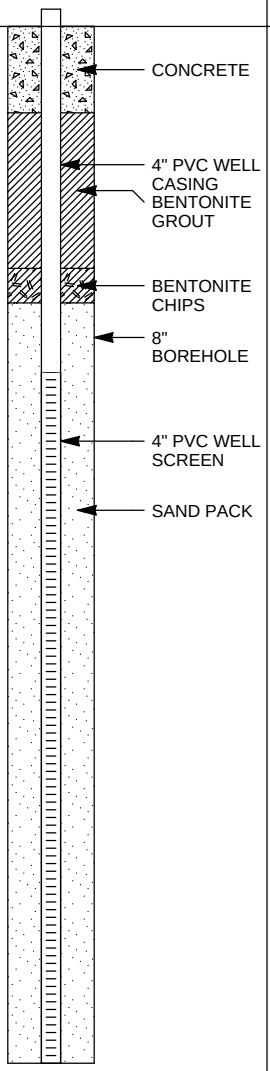
DATE COMPLETED: August 25, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose, brown, moist	
6	CL-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, firm to stiff, brown and gray, moist	6.00
10	- 1" thick piece of steel and concrete debris at 10.0ft BGS - decrease in sands at 10.5ft BGS - increase in silts, mottled at 11.5ft BGS	
14	SP-SANDS, trace clays, trace fine and medium gravels, fine to medium grained, poorly graded, loose, brown, very moist	14.00
16	CL-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, firm to stiff, brown and gray, moist	16.00
17.5	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, moist to very moist	17.50
20	- very moist at 20.0ft BGS	
27	CL-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, low plasticity, stiff to very stiff, gray, moist	27.00
30	END OF HOLE @ 30.0ft BGS	30.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 30.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				4.3
1RS				100
				2.1
				3.6
				2.7
				3.2
2RS				100
				3.0
				3.0
				3.2
				2.5
3RS				100
				3.0
				2.3
4RS				100
				2.5

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

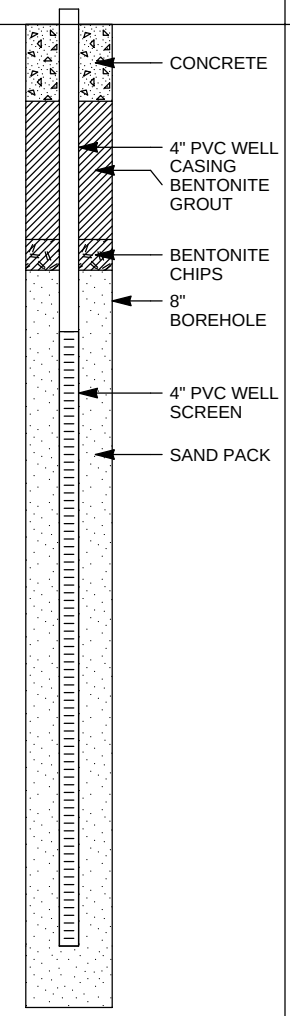
HOLE DESIGNATION: RWW8-76

DATE COMPLETED: August 25, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist	
2	- compact at 3.0ft BGS	
4		
6		
8	- concrete debris at 7.5ft BGS - no concrete debris at 8.5ft BGS	
10	CL-CLAYS, with sands, trace fine to coarse gravels, fine to medium grained, poorly graded, low plasticity, stiff to very stiff, brown, mottled, moist	9.50
12	CH-CLAYS, with silts, trace clays, fine sands and fine to coarse gravels, poorly graded, high plasticity, soft to stiff, olive green and gray, mottled, moist	12.50
14	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, olive green and gray, very moist, petroleum-like odor	14.50
16		
18		
20		
22	- 2" thick sand lense, fine to medium grained, petroleum-like odor at 22.0ft BGS	
24	- trace fine to medium gravels, gray, moist at 23.0ft BGS	
26	CH-CLAYS, trace silts, fine sands and fine to coarse gravels, poorly graded, high plasticity, stiff, gray, moist	25.00
28		
30		
32	END OF HOLE @ 32.0ft BGS	32.00
34		
36		
38		
40		
42		
44		



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				0.9
1RS		100		2.1
				1.6
				2.3
				2.3
2RS		100		2.7
				3.0
				2.3
				3.2
3RS		100		2.3
				2.5
				2.3
4RS		100		2.1

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-77

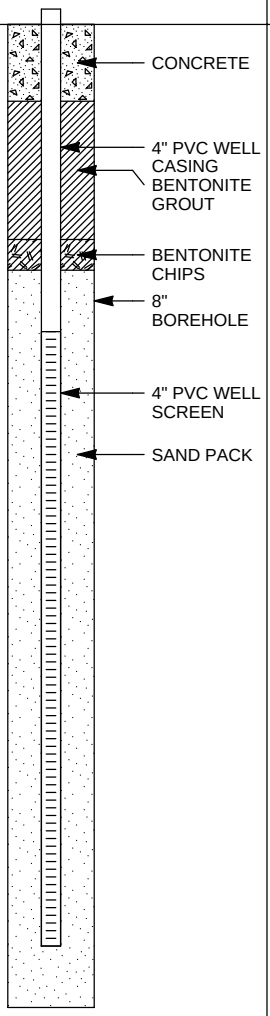
DATE COMPLETED: September 1, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), with fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist	
6	- compact at 5.5ft BGS	
7.5	CONCRETE/CONCRETE DEBRIS	7.50
8	CH-CLAYS, trace fine to coarse gravels and fine sands, poorly graded, high plasticity, stiff, brown, moist	8.00
13	- black at 13.0ft BGS	
14	- increase in fine to medium sands, brown and green, mottled, very moist, petroleum-like odor at 14.5ft BGS	
17.5	- trace fine to coarse gravels, poorly graded, high plasticity, very stiff, brown, moist at 17.5ft BGS	
22	ML-SILTS, trace clays, poorly graded, firm, gray, moist to very moist	22.00
26	CH-CLAYS, trace fine and coarse gravels, poorly graded, high plasticity, stiff, gray, moist	26.00
28	- soft to stiff at 28.0ft BGS	
30	- stiff at 30.0ft BGS	
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-46

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.70						
2	SC-CLAYEY SANDS, trace fine and coarse subrounded gravels, compact, poorly graded, fine grained, trace medium and coarse grained, brown, moist		CONCRETE					18.8
4	- gray/brown at 2.0ft BGS			1RS		100		20.2
6	- very moist at 6.5ft BGS							17.9
		960.70	BENTONITE GROUT					
8	SP-SANDS, trace fine and coarse subrounded gravels, loose, poorly graded, fine grained, with medium and coarse grained, brown, very moist to wet	960.20						16.9
10	CH-CLAYS, trace sands and fine and coarse gravels, firm, high plasticity, brown, moist		4" PVC WELL CASING					20.5
12	CONCRETE	955.70	BENTONITE CHIPS	2RS		90		
14			8" BOREHOLE					20.6
16								19.5
		950.70						
18	CH-CLAYS, trace sands and fine and coarse gravels, very stiff, high plasticity, brown, moist		4" PVC WELL SCREEN					9.6
20								
22			SAND PACK	3RS		100		6.4
24								8.1
		942.70						
26	ML-SILTS, compact to dense, poorly graded, fine grained, brown/gray, wet							3.2
28								14.3
		938.70						
30	CH-CLAYS, trace sands and fine and coarse gravels, firm, high plasticity, brown, moist							10.4
32				4RS		90		
34								6.0
36								7.6
		930.70						
38	END OF HOLE @ 37.0ft BGS							
40								
42								
44								

WELL DETAILS
Screened interval:
952.70 to 932.70ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.70 to 930.70ft bgs

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-46

DATE COMPLETED: July 13, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-56

DATE COMPLETED: July 19, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	967.60						
2	CI-CLAYS, trace fine and coarse subrounded gravels, firm, low plasticity, brown, moist to very moist	965.60	CONCRETE					
4	SC-CLAYEY SANDS, trace fine and coarse subrounded gravels, compact, poorly graded, fine grained, trace medium and coarse grained, brown, moist			1RS		100		3.4
6								
8	CONCRETE	959.60	BENTONITE GROUT					
10	CH-CLAYS, trace fine and coarse subrounded gravels, soft to firm, medium to high plasticity, brown, moist	958.60	4" PVC WELL CASING					4.8
12			BENTONITE CHIPS	2RS		100		
14			8" BOREHOLE					6.9
16								
18	- firm to stiff at 18.0ft BGS		4" PVC WELL SCREEN					
20								2.3
22			SAND PACK	3RS		100		
24	- increased silt content, dark gray at 24.0ft BGS							5.7
26								
28								
30								8.6
32	- 2" wet sand seam at 31.0ft BGS			4RS		100		
34								2.4
36								
38	END OF HOLE @ 37.0ft BGS	930.60						
40								
42								
44								

WELL DETAILS
Screened interval:
952.60 to 932.60ft bgs
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
954.60 to 930.60ft bgs

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-56

DATE COMPLETED: July 19, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
46			13.00 to 37.00ft BGS Material: #5 SANDS					
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82								
84								
86								
88								

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-80

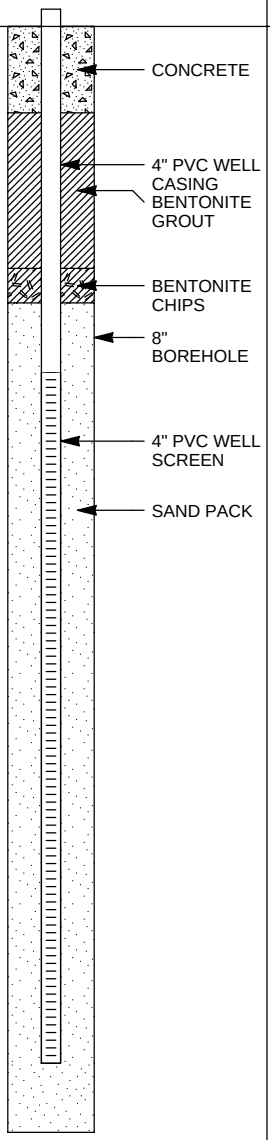
DATE COMPLETED: August 30, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist	
12	CONCRETE	11.50
12	CH-CLAYS, with sands, trace fine to coarse gravels, fine to medium grained, poorly graded, high plasticity, soft, brown, moist to very moist	12.50
16	- black at 15.5ft BGS	
18	ML-SILTS, trace clays, poorly graded, slight plasticity, green and gray, firm, saturated, petroleum-like odor, stained	17.50
20	- gray at 19.3ft BGS	
26	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, stiff, gray, moist	25.50
28	NO RECOVERY	27.00
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				1.9
1RS		100		2.4
				1.9
				1.9
				2.4
2RS		100		3.4
				2.9
				0.0
				0.0
3RS		90		0.5
				0.5
				--
4RS		0		--

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

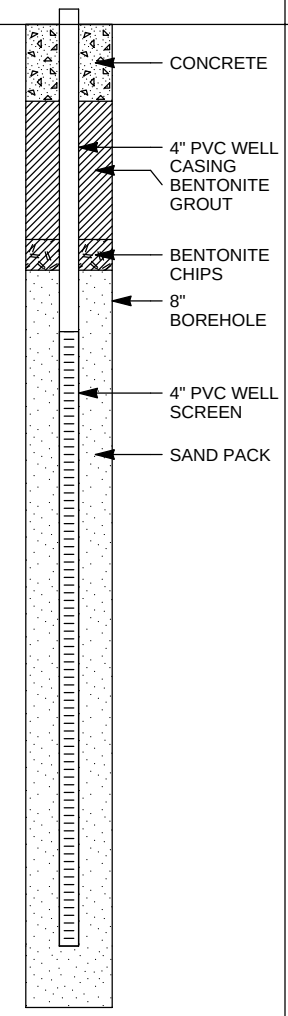
HOLE DESIGNATION: RWW8-81

DATE COMPLETED: August 30, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SP-SANDS (FILL), trace clays, fine and medium grained with fine to coarse gravels, medium graded, loose, brown, moist	1.50
4	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose to compact, brown to black, moist	4.50
6	SP-SANDS (FILL), trace clays, fine and medium grained with fine to coarse gravels, medium graded, loose, brown, moist	6.50
8	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose to compact, black, moist	8.00
10	CONCRETE/CONCRETE DEBRIS	9.00
12	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine to medium grained, loose to compact, black, moist	11.00
14	CONCRETE/CONCRETE DEBRIS	12.00
16	CH-CLAYS, with silts, trace fine sands and fine to coarse gravels, poorly graded, stiff, high plasticity, brown, mottled, stained, moist - trace sand lense, fine to medium grained, green to gray, very moist to saturated, staining, petroleum-like odor at 15.5ft BGS	17.50
18	SP-SANDS, trace clays, fine to medium grained, trace coarse grained, fine to medium gravels, poorly graded, loose, gray, saturated, petroleum-like odor	18.50
22	CH-CLAYS, with silts, trace fine sands and fine to coarse gravels, poorly graded, stiff to very stiff, high plasticity, brown and gray, moist	23.00
24	ML-SILTS, trace clays, poorly graded, firm, gray, very moist to saturated	26.00
26	CH-CLAYS, with silts, trace fine sands and fine to coarse gravels, poorly graded, stiff to very stiff, high plasticity, gray, moist	27.00
28	NO RECOVERY	
32	END OF HOLE @ 32.0ft BGS	32.00
34		
36		
38		
40		
42		
44		



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				0.0
1RS		100		0.0
				0.0
				0.0
2RS		100		0.5
				0.5
				1.5
				0.0
3RS		100		0.0
				3.4
				0.5
4RS		0		--
				--

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

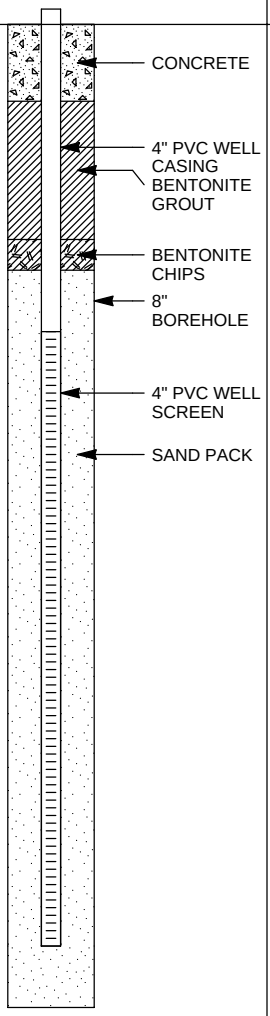
HOLE DESIGNATION: RWW8-82

DATE COMPLETED: August 30, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SP-SANDS (FILL), with fine to coarse gravels, trace clays, fine and medium grained, moderately graded, loose, brown, moist	
2		1.50
	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, poorly graded, fine and medium grained, compact, brown to black, moist	
4		5.00
6	SP-SANDS (FILL), with fine to coarse gravels, trace clays, trace pieces of red brick, fine and medium grained, moderately graded, loose, brown, moist	
8	- concrete debris at 8.5ft BGS	
		9.00
10	CH-CLAYS, with silts, trace sand and fine to coarse gravels, fine grained, poorly graded, high plasticity, stiff to very stiff, brown, mottled, moist	
12		
14	- decrease in gravels, stiff, gray to black, not mottled at 14.5ft BGS	
16		
18	- with silts, trace sand and fine to coarse gravels, fine grained, poorly graded, high plasticity, stiff to very stiff, brown, mottled, moist at 17.0ft BGS	
20		
		21.00
22	ML-SILTS, trace clays, poorly graded, firm, slight plasticity, gray, saturated	
24		
26	- moist to very moist at 25.8ft BGS	
		27.00
28	CH-CLAYS, trace fine to medium gravels, poorly graded, high plasticity, soft to stiff, gray, moist	
30		
32	END OF HOLE @ 32.0ft BGS	32.00
34		
36		
38		
40		
42		
44		



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE				
NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				1.0
1RS		100		1.5
				1.9
				1.9
2RS		100		2.4
				2.9
				1.9
				3.4
3RS		100		1.9
				1.9
				2.4
4RS		100		2.4
				1.9

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-83

DATE COMPLETED: August 31, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SP-SANDS (FILL), with fine to coarse gravels, trace clays, fine and medium grained, medium graded, loose, brown, moist	
1.50	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, fine and medium grained, poorly graded, compact, brown to black, moist	
11.00	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, soft, brown, moist	
14.00	CONCRETE	
17.00	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, soft, black, moist	
19.00	SP-SANDS, trace fine to coarse gravels and clays, fine to coarse grained, poorly graded, loose, black, saturated, slight petroleum-like odor	
21.00	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, stiff, brown, moist to very moist	
24.00	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, saturated	
26.00	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, stiff to very stiff, gray, moist	
27.00	NO RECOVERY	
32.00	END OF HOLE @ 32.0ft BGS	

MONITORING WELL

CONCRETE

4" PVC WELL CASING

BENTONITE GROUT

BENTONITE CHIPS

8" BOREHOLE

4" PVC WELL SCREEN

SAND PACK

WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
				2.8
1RS		100		2.8
				3.7
				4.1
				3.7
2RS		100		2.3
				3.2
				2.8
				3.2
3RS		100		2.3
				3.2
				--
4RS		0		--

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-84

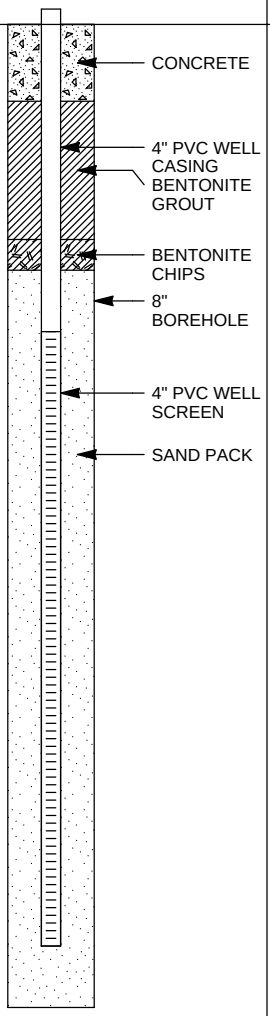
DATE COMPLETED: August 31, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SP-SANDS (FILL), with fine to coarse gravels, moderately graded, loose, brown, moist	
6	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, fine and medium grained, poorly graded, compact, black, moist	6.00
9	SP-SANDS, fine to medium grained, poorly graded, loose, brown, moist	9.00 10.00
10	CL-CLAYS, trace fine to coarse gravels and fine sands, poorly graded, stiff, brown, mottled, moist	
16	- trace wood debris, black at 16.0ft BGS	
17	CH-CLAYS, with sands, trace fine to coarse gravels, fine to medium grained, poorly graded, high plasticity, soft, gray, saturated	17.00
22	- increased sands at 23.0ft BGS	
24	ML-SILTS, trace clays, poorly graded, firm, gray, moist	24.00
30	CH-CLAYS, trace fine to coarse grained, poorly graded, stiff to very stiff, high plasticity, gray, moist	30.00
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1RS		100		1.4
				1.8
				2.8
				3.2
2RS		100		3.2
				2.8
				2.8
				4.1
3RS		100		3.7
				3.5
				3.5
4RS		100		3.2
				2.8

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-85

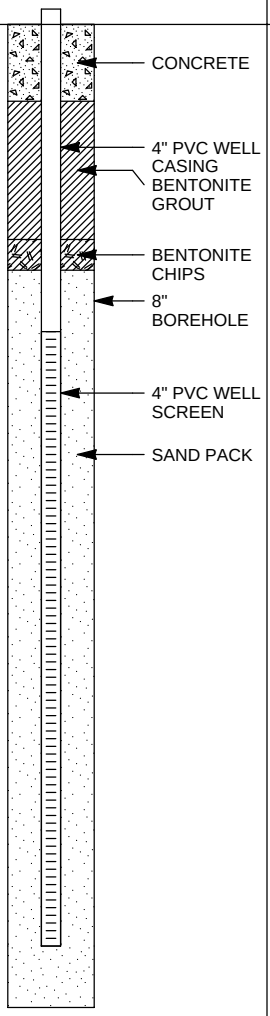
DATE COMPLETED: August 31, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, fine and medium grained, poorly graded, loose, brown to black, moist	
12	- brown at 11.0ft BGS	
	CL-CLAYS, trace fine to coarse gravels and fine sands, poorly graded, stiff, brown, moist	12.00
16	- black at 15.5ft BGS	
18	- stiff to very stiff at 18.0ft BGS	
	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, moist	20.50
22	- saturated at 22.0ft BGS	
	CH-CLAYS, trace fine to medium gravels, poorly graded, stiff to very stiff, gray, moist	26.50
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-86

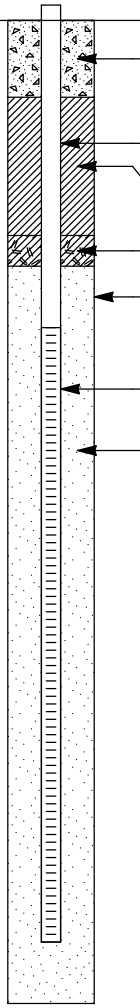
DATE COMPLETED: September 1, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, fine to medium grained, poorly graded, loose, brown to black, moist	
4	CONCRETE	4.00
5	SC-CLAYEY SANDS (FILL), trace fine to coarse gravels, fine to medium grained, poorly graded, losoe, brown to black, moist	5.00
13	CONCRETE	13.00
13.5	CL-CLAYS, with sands, trace fine to coarse gravels, fine and medium grained, poorly graded, soft, low palsticity, brown to black, moist to very moist - slight petroleum-like odor, moist to very moist, staining at 15.5ft BGS - black at 16.5ft BGS - petroleum-like odor at 17.0ft BGS - fine grained, stiff to very stiff, brown, moist at 20.0ft BGS	13.50
24	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, saturated	24.00
27	NO RECOVERY	27.00
32	END OF HOLE @ 32.0ft BGS	32.00

MONITORING WELL



WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 32.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		0	

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-59

DATE COMPLETED: July 20, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	981.00						
0	SC-CLAYEY SANDS (FILL), compact, poorly graded, fine grained, with medium and coarse grained, brown, moist		CONCRETE					
4				1RS		100		5.9
5		976.00						
6	SP-SANDS, loose, poorly graded, fine grained, with medium and coarse grained, brown, moist	975.00						
8	SC-CLAYEY SANDS (FILL), compact, poorly graded, fine grained, with medium and coarse grained, brown, moist		BENTONITE GROUT					
9		972.00						
10	CI-CLAYS, trace fine and coarse gravels, trace sands, dense, low to medium plasticity, dark brown, moist		4" PVC WELL CASING					8.2
12				2RS		100		
14								8.5
16								
17		964.00						
18	SP-SANDS, trace silts, fine subrounded gravels, loose, poorly graded, fine grained, with medium and coarse grained, brown, moist		BENTONITE CHIPS					
19		962.00						9.4
20	CH-CLAYS, trace fine and coarse subrounded gravels, stiff, high plasticity, dark brown, moist							
22				3RS		100		
24								9.3
26			8" BOREHOLE					
28								
30			4" PVC WELL SCREEN					7.6
32	- gray/dark brown at 33.0ft BGS			4RS		100		
34								7.5

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-59

DATE COMPLETED: July 20, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: M. MATHE CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft bgs	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36								
38	ML-SILTS, comapct, poorly graded, fine grained, brown/gray, wet, petroleum-like odor	943.00						5.9
40								
42			SAND PACK	5RS		100		
44								10.8
46		935.00						
48	END OF HOLE @ 47.0ft BGS	934.00						
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
954.00 to 934.00ft bgs
27.00 to 47.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
956.00 to 934.00ft bgs
25.00 to 47.00ft BGS
Material: #5 SANDS

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-88

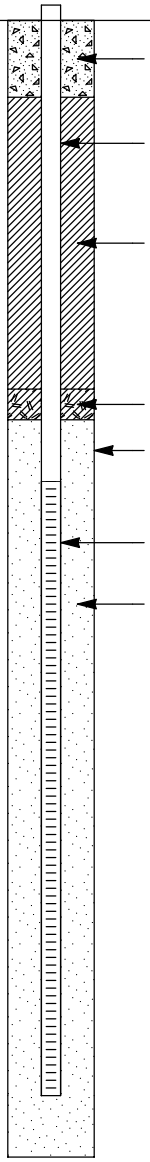
DATE COMPLETED: September 1, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS
0	SC-CLAYEY SANDS (FILL), with fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist	
10	CH-CLAYS, with sands, trace fine to coarse gravels, poorly graded, fine grained, medium to high plasticity, soft, brown, moist - high plasticity at 13.5ft BGS - black and brown, slight odor at 15.5ft BGS - brown, stiff to very stiff, trace fine sands at 17.5ft BGS	10.00
23	ML-SILTS, trace clays, poorly graded, slight plasticity, firm, gray, very moist - saturated at 23.5ft BGS	23.00
27.5	CH-CLAYS, trace fine to coarse gravels, poorly graded, high plasticity, stiff, gray, moist	27.50
37	END OF HOLE @ 37.0ft BGS	37.00

MONITORING WELL



WELL DETAILS
Screened interval:
15.00 to 35.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
13.00 to 37.00ft BGS
Material: SANDS

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE
1RS		100	
2RS		100	
3RS		100	
4RS		100	

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

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: PONTIAC NORTH CAMPUS

PROJECT NUMBER: 17487

CLIENT: ENCORE

LOCATION: PONTIAC, MICHIGAN

HOLE DESIGNATION: RWW8-89

DATE COMPLETED: September 2, 2005

DRILLING METHOD: ROTOSONIC

FIELD PERSONNEL: C. BONDY CRA

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
0	SC-CLAYEY SANDS (FILL), with fine to coarse gravels, poorly graded, fine to medium grained, loose, brown to black, moist		CONCRETE				
2							
4			4" PVC WELL CASING	1RS		100	
6			BENTONITE GROUT				
8			BENTONITE CHIPS				
8.50	CH-CLAYS, trace fine to coarse gravels, poorly graded high plasticity, soft to stiff, brown, moist		8" BOREHOLE				
10							
12			4" PVC WELL SCREEN	2RS		100	
13.00	CL-CLAYS, with silts, trace fine to coarse gravels, poorly graded, fine to medium grained, low plasticity, stiff, gray, moist to very moist, petroleum-like odor, staining		SAND PACK				
14							
16							
18							
20							
22	- increase in silts, mottled at 22.0ft BGS			3RS		100	
24		24.00					
24.00	ML-SILTS, trace clays, poorly graded, slight plasticity, gray, firm, very moist						
26							
27.00	CH-CLAYS, trace fine to coarse gravels, poorly graded high plasticity, soft to stiff, gray, moist						
28							
30	- soft at 31.0ft BGS			4RS		100	
32							
34	- stiff at 35.0ft BGS						
36							
37.00	END OF HOLE @ 37.0ft BGS						
38							
40							
42							
44							

WELL DETAILS
Screened interval:
10.00 to 30.00ft BGS
Length: 20ft
Diameter: 4in
Slot Size: 0.010
Material: PVC
Sand Pack:
8.00 to 37.00ft BGS
Material: SANDS

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

ENCORE OVERBURDEN 17487.GPJ CRA_CORP.GDT 11/10/05

Appendix G

Memo to U.S. EPA Regarding Suspension of MPE Operation with Follow-up Responses to Comments

ENCORE
Environmental Corporate Remediation ©

MEMORANDUM

To: Peter Ramanaskaus/U.S. EPA

Date: 3/20/2006

From: Robert Hare/ENCORE

cc: Jean Caufield/ENCORE
Ron Hemedag/USPS
Curt Wolfe/ECT
John McKenna/BBL
Gavin O'Neill/CRA

Re: LNAPL Area No. 3
Status of LNAPL Remediation Program
Pontiac North Campus
Pontiac, Michigan

This memorandum presents the status of the light non-aqueous phase liquid (LNAPL) remediation Interim Measure (IM) program within LNAPL Area No. 3 in the Area of Industrial Redevelopment (AIR) at Pontiac North Campus (Site), Pontiac, Michigan. The information is presented in the following order:

- Background;
- Summary of MPE Operational Details and Results;
- Overall IM Results to Date;
- Additional Considerations;
- Conclusions and Recommendations; and
- References.

The information presented herein will be included in a formal IM report documenting the LNAPL remediation activities in LNAPL Area No. 3. However, due to the timing associated with the redevelopment of the property, the Environmental Corporate Remediation Company, Inc. (ENCORE) Environmental Consortium (EEC) is requesting an expedited review of the information and recommendations provided in this memorandum.

BACKGROUND

LNAPL Area No. 3 was discovered during subsurface investigation field activities at the Site associated with the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), which commenced in 2001. To date, the following documents have been submitted to the United States Environmental Protection Agency (U.S. EPA) detailing the investigations associated with characterizing and delineating the LNAPL in LNAPL Area No. 3:

- The RFI Report (ENCORE, 2002) was submitted to U.S. EPA on April 30, 2002;
- RFI Supplemental Report No. 1 (ENCORE, 2003a) was submitted to U.S. EPA on November 26, 2003;
- The Corrective Measures Proposal (CMP) was submitted to U.S. EPA on November 26, 2003 (ENCORE, 2003b); and
- RFI Work Plan Addendum No. 10 (ENCORE, 2004a) was submitted to U.S. EPA on January 13, 2004.

The following documents have been previously submitted to U.S. EPA regarding Interim Measures (IMs) planned and/or implemented at LNAPL Area No. 3:

- The Interim Measures Work Plan (IMWP) for the implementation of the QED Ferret system was submitted to U.S. EPA on March 2, 2004 (ENCORE, 2004b);
- The IMWP for a Multi-Phase Extraction/Pneumatic Air Lift (MPE/PAL) and Pneumatic Fracturing System (PFS) Remedial Pilot Study was submitted to U.S. EPA on May 20, 2004 (ENCORE, 2004c);
- The Report on the MPE/PAL and PFS Remedial Pilot Study was submitted to U.S. EPA on August 31, 2004 (ENCORE, 2004d);
- The IMWP for LNAPL recovery by MPE – Area of Interest (AOI) W-8, LNAPL Area No. 3 was submitted to U.S. EPA on September 27, 2004 (ENCORE, 2004e); and
- Periodic operational data summaries were electronically submitted to U.S. EPA.

Previous risk assessment calculations associated with the presence of LNAPL in AOI W-8 indicated that the LNAPL did not present an unacceptable risk in terms of direct contact with soil, or vapor inhalation. Consequently, an aggressive remedy was not required based on risk. The decision to proceed with a highly aggressive LNAPL remediation technology and expedited schedule in LNAPL Area No. 3 was based on negotiations established with the United States Postal Service (USPS) for redevelopment of the property in the AIR.

The results of a remedial pilot study (ENCORE, 2004d) indicated that high vacuum multi-phase extraction (MPE) with pneumatic air-lift (PAL) and pneumatic fracturing (PF) would be technically feasible for the aggressive remediation of LNAPL in LNAPL Area No. 3. Based on the results of the pilot study, the original extraction and injection well network was to be comprised of 34 extraction wells and 6 injection wells. However, additional LNAPL delineation efforts in LNAPL Area No. 3 indicated that the extent of LNAPL was larger than originally determined. Consequently, an additional 57 extraction wells and 15 injection wells were installed throughout the larger LNAPL Area No. 3 area. The approximate extent of the LNAPL area (including an outline of the original LNAPL area in the southeast portion) and the locations of extraction and injection wells are provided in Figure 1.

It should be noted that the delineated extent of the LNAPL area was based on either the observation of product in monitoring wells or the evidence of potential product during drilling using various field screening techniques as presented in the RFI and IM Work Plans. Approximately 10% of the wells that were installed where evidence of potential product was encountered during drilling did not develop free product in the well. Another 13% of the wells installed where evidence of product was observed in soil borings exhibited only minimal product thicknesses (<1-foot).

This memorandum presents a summary of the performance of the remediation systems and the status of the remediation program in LNAPL Area No. 3, and provides a recommendation to terminate the operation of aggressive LNAPL recovery (MPE/PAL and PF) and the implementation of follow-up monitoring.

SUMMARY OF MPE OPERATIONAL DETAILS AND RESULTS

Three (3) MPE systems were installed in LNAPL Area No. 3. The first system (System 1), comprising a Ground Effects Environmental Services (GEE) Model MPVE 2750 Titan, was installed in the southeast portion of the original LNAPL area to evaluate LNAPL recovery from the eastern portion of the area (which now comprises the southeast portion of the LNAPL Area No. 3 area). The second system (System 2), comprising a GEE Model MPVE 2750, was installed in the northwest portion of the original LNAPL area to evaluate LNAPL recovery from the western portion of the original area. However, due to

low LNAPL recoveries, System 2 was subsequently relocated to the west portion of LNAPL Area No. 3. The third system (System 3), comprising a GEE Model MPVE 27100 Titan, was installed in the west portion of LNAPL Area No. 3. However, due to low LNAPL recoveries, System 3 was subsequently relocated to another part of the Site (LNAPL Area No. 9/10). Figure 1 shows the assumed boundary of the LNAPL area and the locations of the systems. The following sections present system-specific discussions of operational details and LNAPL recovery results:

SYSTEM 1

Operational Summary

- February 24, 2005 - February 13, 2006: 12 months operation in southeast portion of LNAPL Area No. 3 (eastern portion of original LNAPL area);
    - Operating between 4-12 extraction wells at a time;
    - Operating between 1-2 PF wells at a time;
- November 25, 2005 - December 20, 2005: shut down for methane monitoring; and
- January 4, 2006 – February 13, 2006;
    - Operating between 4-12 extraction wells at a time; and
    - Operating between 1-2 PF wells at a time.

System 1 produced an average applied vacuum of 15-20 inches of mercury ("Hg) and extracted an average air flowrate of 460 standard cubic feet per minute (scfm) from the subsurface. Extraction wells were selected based on observed system performance and in-well LNAPL thickness data. Initially, extraction wells were varied to ensure adequate spatial coverage of the respective area of LNAPL Area No. 3. As system performance was observed to decrease, well selection was primarily based on where appreciable LNAPL thicknesses were present in an attempt to maximize recovery potential.

Recovery Results

The performance of System 1 indicated that the only appreciable amount of recoverable LNAPL was located within the eastern portion of the original LNAPL Area No. 3 (see Figure 1). System 1 recovered a total of 3,685 gallons of LNAPL with 90,000 gallons of groundwater over 5,400 hours of operation. The phase-specific breakdown of LNAPL recovery is as follows:

- 92% of LNAPL recovered in the free phase;
- 7% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase.

Table 1 and Figure 2 summarize the performance of System 1. The cumulative recovery curve shown in Figure 2 shows that recovery for System 1 was initially high (represented by a more vertical slope), and gradually decreased over time as the slope of the curve approaches horizontal. As the slope of the cumulative recovery curve approaches horizontal, the LNAPL recovery rate approaches zero. The recovery rates detailed in Table 1 show a gradual decrease over time to values less than 1 gallon per day near the end of the operating period. The change in recovery rate over time is further described by the asymptotic trend in recovery rate shown in Figure 2.

SYSTEM 2

Operational Summary

- May 4, 2005 - June 17, 2005: operation in southeast portion of LNAPL Area No. 3 (western portion of original LNAPL area);
    - Operating between 4-12 extraction wells at a time;
    - Operating between 1-2 PF wells at a time;
- September 15, 2005 - October 18, 2005: operation in southeast portion of LNAPL Area No. 3 (western portion of original LNAPL area);
- October 18, 2005: shut down for methane monitoring;
- December 20, 2005 - February 13, 2006: moved to previous location of System 3 (see Figure 1) and operated in west portion of LNAPL Area No. 3 (west of original LNAPL area);
    - January 9, 2006 - January 12, 2006: running on four wells on the northwestern portion of LNAPL Area No. 3;
    - January 12, 2006 - January 16, 2006: running on seven wells on the northwestern portion of LNAPL Area No. 3;
    - January 16, 2006 - January 23, 2006: running on four wells in the center of west portion of LNAPL Area No. 3; and
    - January 23, 2006 - February 13, 2006: running on four wells on the north end of surcharge pile.

System 2 produced an average applied vacuum of 15-20 inches of mercury ("Hg) and extracted an average air flowrate of 600 standard cubic feet per minute (scfm) from the subsurface. Extraction wells were selected based on observed system performance and in-well LNAPL thickness data by the same methodology described for System 1.

Recovery Results

The performance of System 2 was poor in comparison with System 1 (Systems 1 and 2 have the same operational capabilities). System 2 was only able to extract a total of 298 gallons of LNAPL along with more than 65,000 gallons of groundwater over 2,000 hours of operation. The phase-specific breakdown of LNAPL recovery is as follows:

- 73% of LNAPL recovered in the free phase;
- 26% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase.

SYSTEM 3

Operational Summary

- August 29, 2005 - October 18, 2005: operation in west portion of LNAPL Area No. 3 (west of original LNAPL area);
    - Operating between 4-12 extraction wells at a time;
    - Operating between 1-3 frac wells at a time;
- October 18, 2005: shut down for methane monitoring; and
- Subsequently moved to LNAPL Area No. 9/10.

System 3 produced an average applied vacuum of 15-20 inches of mercury ("Hg) and extracted an average air flowrate of 920 standard cubic feet per minute (scfm) from the subsurface. Extraction wells were selected based on observed system performance and in-well LNAPL thickness data by the same methodology described for System 1.

Recovery Results

The performance of System 3 was poor in comparison with System 1 (System 3 has double the operational capability of Systems 1 and 2). System 3 was only able to extract a total of 38 gallons of LNAPL along with more than 85,000 gallons of groundwater over 550 hours of operation. The phase-specific breakdown of LNAPL recovery is as follows:

- 27% of LNAPL recovered in the free phase;
- 72% of LNAPL recovered in the vapor phase; and
- <1% of LNAPL recovered in the dissolved phase.

OVERALL IM RESULTS TO DATE

In addition to the operation of the MPE systems, pneumatic skimmers were operated in the original LNAPL Area No. 3 area for approximately 8 months in 2004. The total amount of LNAPL recovered from LNAPL Area No. 3 from the operation of the pneumatic skimmers in 2004, the MPE/PAL and PF remedial pilot study in 2004, and the operation of the three full-scale MPVE systems in 2005-2006 is approximately 4,758 gallons. A summary of LNAPL recoveries and operation times are as follows:

- Pneumatic skimmer system recovery (8 months) – 588 gallons;
- MPE/PAL and PF remedial pilot study (2 weeks) – 147 gallons; and
- Full-scale MPE/PAL and PF recovery (1 year) – 4,023 gallons.

It is important to note that EEC has made no attempt to quantify the amount of biodegradation of LNAPL that has occurred in the subsurface before and during the operation of MPE/PAL and PF. However, there is evidence that biodegradation of LNAPL was taking place before and during the operation of the MPE systems. The presence of methane at the Site (geographically correlated with certain LNAPL areas) and the glacial till soil (that is likely under anaerobic conditions) are both suggestive that a significant amount of anaerobic LNAPL degradation was taking place prior to operation of the MPE systems via methanogenesis (conversion of organic compounds to methane under anaerobic conditions). During the operation of the MPE systems, large quantities of high-pressure air were injected at depth via the performance of PF. In addition, evidence of biofouling was identified in the various MPVE systems, particularly System 1. Research shows that high vacuum MPE operations have the ability to enhance significant hydrocarbon degradation in the subsurface due to the supply of air (oxygen) to previously oxygen-depleted zones (i.e., anaerobic conditions converted to aerobic conditions). Due to the high vacuums and airflow rates exerted by the systems, in addition to the air injections provided by PF, EEC believes that aerobic biodegradation has likely played a significant role in reducing the overall presence of LNAPL and petroleum hydrocarbons in LNAPL Area No. 3 during the operation of the MPE systems.

ADDITIONAL CONSIDERATIONS

FUTURE LNAPL RECOVERABILITY

Although LNAPL recoverability can be estimated using model simulations (e.g., API Interactive LNAPL Guide), the best line of evidence for evaluating LNAPL recoverability is site-specific recovery data. This, in large part, is due to the numerous soil heterogeneities in the subsurface, including heterogeneities within and throughout a given LNAPL plume. The longer the recovery data spans (for a given technology), the better the understanding for future recovery potentials.

A plot of LNAPL recovery rate, from plumes where there is no continuing release, generally follows an exponential decay pattern over time. Similarly, cumulative LNAPL recoveries also tend to display an exponential decay pattern. This trend reflects the concept that as the remediation progresses, the LNAPL saturation levels in the subsurface approach residual levels, which are deemed to be unrecoverable. LNAPL recovery data collected over time can be used to approximate future LNAPL recoveries. Based on the performance data and information presented in this memorandum, only System 1 (MPVE 2750 Titan) was able to recover a sufficient amount of LNAPL to warrant continued operation (beyond a 6-month timeframe) in LNAPL Area No. 3. Based on initial LNAPL recovery results, it appeared as though System 1 may have been draining LNAPL from more permeable sand seams in the extreme southeast portion of LNAPL Area No. 3.

The total cumulative LNAPL recovery for System 1 exhibits a classic exponential decay pattern with decreased LNAPL recovery over time. Figure 2 displays the cumulative LNAPL recovery curve and the recovery rate data for System 1. The recovery rate data is representative of 'real-time' recovery rates calculated for the intervals between each system monitoring event (approximately daily), as opposed to dividing the total LNAPL collected at any point by the total operating time at that point (which produces an average recovery rate over the entire operational period, and does not account for fluctuations in recovery rate that would be more pronounced as the time-scale is reduced). The latter portion of the System 1 cumulative recovery curve shown in Figure 2 is representative of an LNAPL recovery rate that has dropped below 2 gallons per day (see Table 1). Furthermore, the change in recovery rate over time displayed in Figure 2 shows an asymptotic trend. It is reasonable to assume that System 1 recovery rates would continue to approach zero with continued operation of the system. The recoveries achieved by Systems 2 and 3 were so poor that no meaningful graphical representation can be made, as recovery rates were less than 2 gallons per day for most of their operation.

The U.S. EPA, in its document entitled *A Decision-Making Framework for Cleanup of Sites Impacted with Light Non-Aqueous phase Liquids (LNAPL)* (U.S. EPA, 2005), discusses remediation endpoints in the context of LNAPL management goals. Some endpoints may be specific in nature. One of the examples listed is based on the recovery rate for an LNAPL recovery system being reduced to an established value – such as three gallons per day. Although EEC established no such specific endpoints prior to commencement of remedial operations, the data discussed above shows that the LNAPL recovery rate achieved by System 1 has dropped below this threshold. Recovery rates for Systems 2 and 3 were below this threshold for most of their operating time. Consequently, EEC believes this is supportive that an appropriate endpoint for active remediation has been achieved.

COST CONSIDERATIONS

In terms of cost, EEC plotted Operations and Maintenance (O&M) Costs per gallon of LNAPL recovered for System 1. This plot is shown in Figure 3. The supporting data is provided in Table 2. The cost plot indicates that the O&M costs associated with System 1 has increased over time to the point where it is cost prohibitive to continue running the system. Cost per gallon plots for Systems 2 and 3 were not developed as the low recoveries achieved by these systems indicate infinitely high cost per gallon numbers by default. The current prohibitive O&M cost further demonstrates the greatly diminished returns associated with continued LNAPL recovery. Consequently, EEC believes that this is also supportive that an appropriate endpoint for active remediation has been reached.

CURRENT LNAPL CONDITIONS

EEC recorded the depth to product and depth to water measurements in all monitoring and extraction wells in LNAPL Area No. 3 throughout the RFI and the various IMs implemented to date. Most recently, product/water levels were recorded on February 14-15, 2006, one day after LNAPL recovery operations via MPE were discontinued. The depth to product/water measurements, and corresponding LNAPL in-well thicknesses, where applicable, are provided in Attachment A.

As indicated in Attachment A, a number of monitoring and extraction wells contain LNAPL with apparent thicknesses ranging from a sheen to 8.6 feet. Throughout the course of the remediation program, EEC focused LNAPL recovery efforts on wells containing the greatest in-well or apparent LNAPL thicknesses. However, often times, the amount of LNAPL recovered from these wells was minimal, thereby suggesting that: (1) the LNAPL in the vicinity of these wells is not present at saturations much higher than residual; (2) the LNAPL in the vicinity of these wells is not likely mobile; and/or (3) the LNAPL in the vicinity of the wells may be present under a confined condition whereby the in-well thickness represents equilibrium with the potentiometric head in the soil formation, and not the true thickness of LNAPL in the formation. EEC's experience at the Site has indicated that there is no direct correlation between apparent LNAPL thickness and recoverability. That is, a large in-well thickness of LNAPL does not guarantee that LNAPL will be recovered in appreciable quantities from said well. This observation supports the concept that free-product being present within wells does not necessarily mean that active remediation is desirable or feasible (technically or economically).

RISK CONSIDERATIONS

Previous LNAPL-related risk assessment calculations for AOI W-8 (ENCORE, 2003a) indicated that:

- Risk calculations for potential exposures of routine workers to surface soil in unpaved areas, and potential exposures of construction workers to surface and subsurface soil in the AIR, result in a cancer risk of 4×10^{-5} and hazard index of 1; and
- LNAPL constituents, if assumed to migrate to indoor air (through soil and foundation cracks), would not exceed any occupational inhalation limit.

The risk calculations were based on conservative assumptions for the AIR. As previously mentioned, ENCORE's decision to aggressively address LNAPL impacts was not based on risk. Rather, the decision to proceed with an aggressive LNAPL remediation alternative in LNAPL Area No. 3 was based on negotiations established with the USPS for redevelopment of the property in the AIR.

EEC has been investigating and monitoring the presence of methane associated with the anaerobic biodegradation of LNAPL in the AIR. A passive venting system will be installed beneath the concrete floor slab of the proposed USPS building to address LNAPL-related methane issues. Further, ENCORE was informed by USPS that a passive methane venting system will be installed beneath the entire building floor slab, including those areas where no LNAPL exists.

In summary, no unacceptable risks due to direct contact with LNAPL, soil vapor intrusion, or methane generation will exist following the suspension of active remediation in LNAPL Area No. 3

CONCLUSIONS AND RECOMMENDATIONS

EEC, on behalf of ENCORE, implemented an aggressive LNAPL remediation program at the General Motors Corporation (GM) Pontiac North Campus facility (Site) to reduce LNAPL present in LNAPL Area No. 3. The aggressive remediation program was implemented in support of property redevelopment, as a portion of LNAPL Area No. 3 is situated beneath a proposed building in an area of the Site targeted for redevelopment. The objective of the remediation program was to aggressively remediate LNAPL Area No. 3 in the timeframe permitted prior to commencement of construction of the proposed building (until approximately March 1, 2006). The aggressive remediation program involved the use of three high vacuum multi-phase extraction (MPE) systems coupled with pneumatic air-lift (PAL) and pneumatic fracturing (PF).

Despite the implementation and use of three aggressive MPE systems, only one of the systems (System 1 - MPVE 2750 Titan) was able to achieve adequate LNAPL recovery for a period of approximately three to six months, after which LNAPL recoveries continued to decline at an exponential rate. The latter portion of the System 1 cumulative recovery curve shown in Figure 2 is representative of an LNAPL recovery rate that has dropped below 2 gallons per day (see Table 1). Furthermore, the change in recovery rate over time displayed in Figure 2 shows a clear asymptotic trend. It is reasonable to assume that System 1 recovery rates would continue to approach zero with continued operation of the system. The recoveries achieved by Systems 2 and 3 were so poor that no meaningful graphical representation can be made, as recovery rates were less than 2 gallons per day for most of their operation. Based on this information, it appears that the remediation program in LNAPL Area No. 3 has reduced LNAPL saturations in the vicinity of the extraction well network to near residual levels. Operation and maintenance costs associated with the continued running of the systems have increased to the point of being prohibitive on a cost per gallon recovery basis. Consequently, EEC proposes that the active remediation at LNAPL Area No. 3 has passed the point of diminishing returns. It should be noted that Site observations suggest that LNAPL in LNAPL Area No. 3 will continue to be biodegraded under methanogenic conditions following the suspension of active remediation.

In light of the diminished LNAPL recoveries in LNAPL Area No. 3, the prohibitive costs associated with the continued operation of the aggressive recovery systems, and the fact that there are no unacceptable risks to human health and the environment from the LNAPL present in the subsurface, EEC believes that it would be appropriate and reasonable to terminate the operation of aggressive LNAPL recovery (MPE/PAL and PF) in LNAPL Area No. 3 at this time. EEC is thereby requesting a decision from U.S. EPA on the suspension of active remediation at LNAPL Area No. 3.

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Higinbotham, J. 2006. Imperial Oil Limited - Remediation and Reclamation Services (RRS) Workshop, Calgary, Alberta. February 8, 2006.

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LEGEND

- CURRENT LNAPL AREA NO. 3
- ORIGINAL LNAPL AREA NO. 3
- RWW8-07 MONITORING WELL LOCATION
- RWW8-04 SYSTEM RECOVERY WELLS
- FRAC-1 EXISTING PFS WELLS
- EXTRACTION LINES

GENERAL MOTORS
PONTIAC, MICHIGAN

AOI W-8/LNAPL AREA NO. 3

LNAPL AREA 3 REMEDIAL SYSTEM PLAN

ENCORE

FIGURE 1

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Figure 2
Recovery Rate Estimates and Cumulative Recovery
LNAPL Area No. 3 System 1
General Motors Pontiac North Campus
Pontiac, Michigan

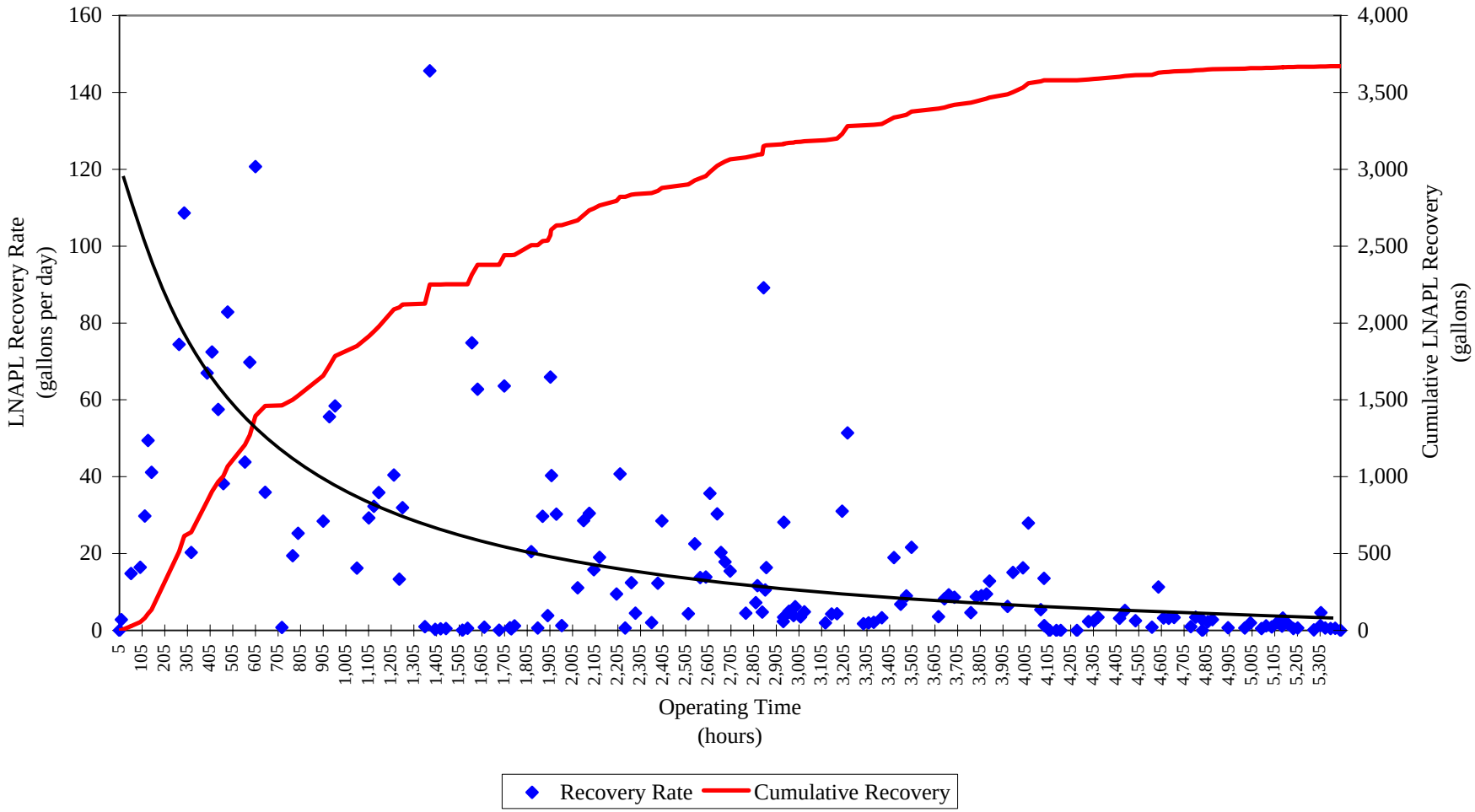


Figure 3
O&M Cost/Gallon Recovered
LNAPL Area No. 3 System 1
GM Pontiac North Campus
Pontiac, Michigan

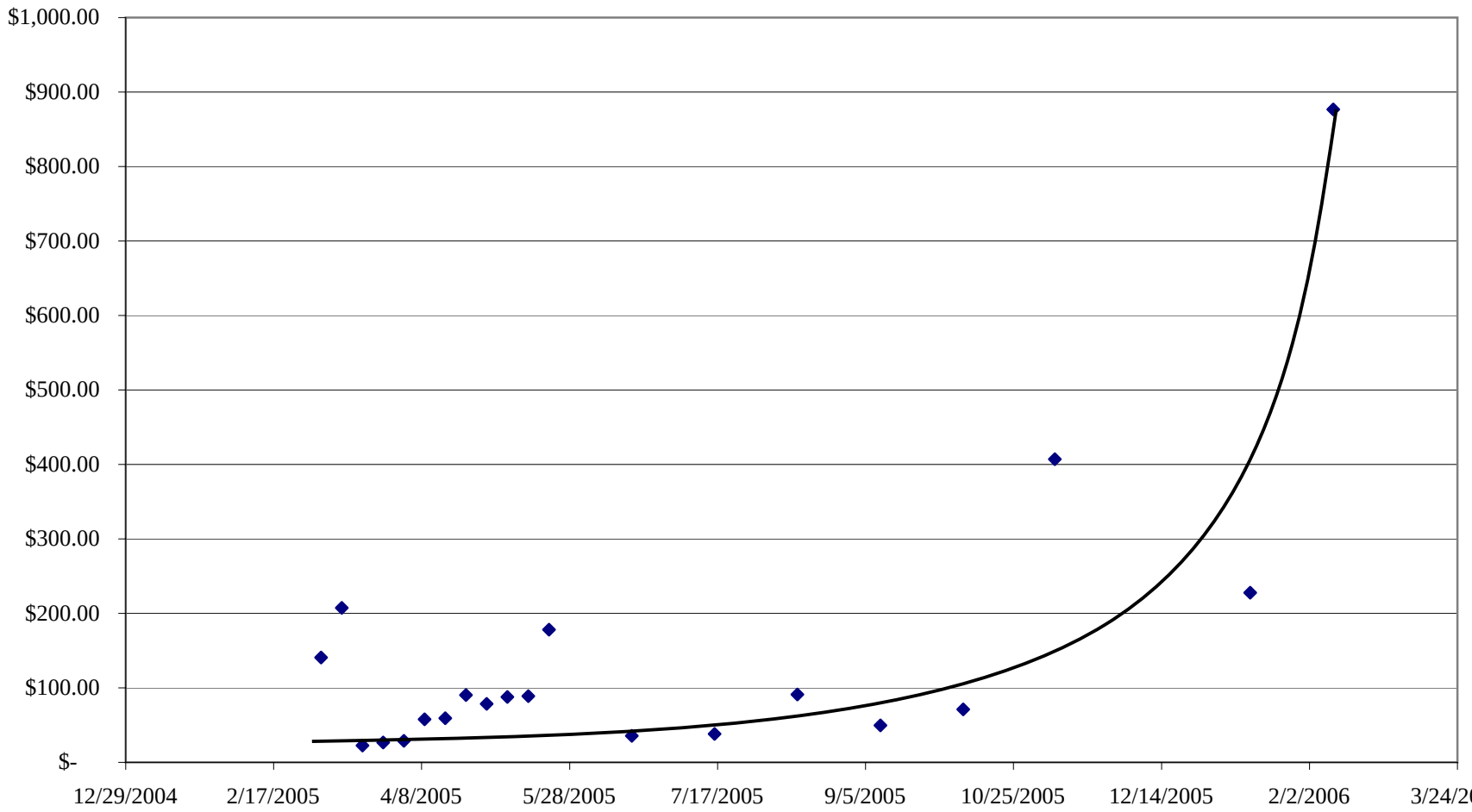


Table 1

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
2/26/2005	5.1	0	50	0	0	0.0	0.0	0	233
2/27/2005	13.6	0	539	1	1	0.0	100.0	3	1,382
3/1/2005	56.3	25	2,915	2	27	91.2	8.8	15	1,335
3/3/2005	96.8	50	4,779	5	55	90.7	9.3	16	1,105
3/4/2005	117.6	75	5,470	6	81	92.7	7.3	30	798
3/10/2005	131.3	100	6,005	9	109	91.7	8.3	49	937
3/11/2005	146.7	125	6,258	11	136	92.3	7.7	41	394
3/16/2005	268.4	500	7,215	13	513	97.5	2.5	74	189
3/17/2005	290.7	600	7,470	14	614	97.8	2.2	109	275
3/18/2005	321.0	625	7,635	14	639	97.7	2.3	20	130
3/21/2005	392.9	825	8,207	15	840	98.2	1.8	67	191
3/22/2005	413.9	888	8,367	16	904	98.2	1.8	72	183
3/23/2005	440.2	950	8,522	17	967	98.3	1.7	57	142
3/24/2005	463.9	988	8,830	17	1,004	98.3	1.7	38	312
3/25/2005	482.1	1,050	8,988	17	1,067	98.4	1.6	83	208
3/28/2005	558.8	1,188	9,700	20	1,207	98.4	1.6	44	223
3/29/2005	580.5	1,250	9,941	20	1,270	98.4	1.6	70	267
3/30/2005	605.5	1,375	10,098	21	1,396	98.5	1.5	121	151
4/1/2005	648.8	1,438	10,635	23	1,461	98.4	1.6	36	298
4/4/2005	722.4	1,438	11,492	26	1,463	98.3	1.7	1	280
4/6/2005	769.0	1,475	11,884	26	1,501	98.3	1.7	19	202
4/7/2005	793.4	1,500	12,047	27	1,527	98.3	1.7	25	160
4/12/2005	904.1	1,625	12,847	33	1,658	98.0	2.0	28	174
4/13/2005	931.5	1,688	12,847	34	1,721	98.0	2.0	56	0
4/14/2005	957.7	1,750	13,738	35	1,785	98.0	2.0	58	816
4/18/2005	1,053.4	1,813	16,191	37	1,850	98.0	2.0	16	615
4/20/2005	1,105.0	1,875	17,235	38	1,913	98.0	2.0	29	486
4/21/2005	1,128.3	1,906	17,333	38	1,944	98.1	1.9	32	101
4/22/2005	1,149.6	1,938	17,410	38	1,976	98.1	1.9	36	86
4/26/2005	1,216.4	2,049	17,731	40	2,089	98.1	1.9	40	115
4/27/2005	1,240.2	2,061	17,768	41	2,102	98.1	1.9	13	37
4/28/2005	1,254.6	2,080	17,798	41	2,121	98.1	1.9	32	50
5/2/2005	1,353.5	2,080	18,100	45	2,125	97.9	2.1	1	73
5/3/2005	1,374.1	2,205	18,186	45	2,250	98.0	2.0	146	100
5/4/2005	1,398.6	2,205	18,263	45	2,250	98.0	2.0	0.3	75
5/5/2005	1,422.6	2,205	18,376	46	2,251	98.0	2.0	0.4	114
5/6/2005	1,446.5	2,205	18,447	46	2,251	98.0	2.1	1	70

Table 1

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
5/9/2005	1,519.0	2,205	18,906	47	2,251	97.9	2.1	0.1	152
5/10/2005	1,541.4	2,205	19,056	47	2,252	97.9	2.1	1	161
5/11/2005	1,561.6	2,268	19,213	48	2,315	98.0	2.1	75	186
5/12/2005	1,585.6	2,330	19,438	48	2,378	98.0	2.0	63	225
5/13/2005	1,615.0	2,330	19,800	49	2,379	98.0	2.0	1	295
5/16/2005	1,681.3	2,330	20,804	49	2,379	97.9	2.1	0.1	364
5/17/2005	1,704.9	2,393	21,112	49	2,441	98.0	2.0	64	313
5/18/2005	1,729.3	2,393	21,456	50	2,442	98.0	2.0	1	339
5/19/2005	1,734.0	2,393	21,526	50	2,442	98.0	2.0	0.4	356
5/20/2005	1,749.9	2,393	21,753	51	2,443	97.9	2.1	1	343
5/23/2005	1,823.5	2,455	22,572	51	2,506	98.0	2.0	21	267
5/24/2005	1,851.5	2,455	22,572	52	2,507	97.9	2.1	1	0
5/25/2005	1,872.4	2,480	22,792	52	2,532	97.9	2.1	30	253
5/26/2005	1,895.1	2,483	23,327	53	2,536	97.9	2.1	4	566
5/27/2005	1,907.8	2,518	23,399	54	2,571	97.9	2.1	66	136
6/7/2005	1,909.0	2,549	23,399	54	2,602	97.9	2.1	629	0
6/8/2005	1,912.9	2,555	23,486	54	2,609	97.9	2.1	40	536
6/9/2005	1,933.3	2,580	23,647	55	2,635	97.9	2.1	30	189
6/10/2005	1,957.7	2,580	23,968	56	2,636	97.9	2.1	1	315
6/13/2005	2,027.8	2,611	24,855	57	2,668	97.9	2.1	11	304
6/14/2005	2,054.9	2,643	25,246	58	2,701	97.8	2.2	29	346
6/15/2005	2,079.9	2,674	25,626	59	2,732	97.9	2.1	30	364
6/16/2005	2,099.8	2,686	25,951	59	2,745	97.8	2.2	16	392
6/17/2005	2,124.6	2,705	26,343	60	2,765	97.8	2.2	19	380
6/20/2005	2,199.8	2,730	27,758	65	2,795	97.7	2.3	10	452
6/21/2005	2,214.9	2,755	27,984	66	2,821	97.7	2.3	41	359
6/22/2005	2,237.5	2,755	28,388	66	2,821	97.7	2.3	1	429
6/23/2005	2,264.6	2,768	29,037	68	2,835	97.6	2.4	12	574
6/24/2005	2,282.9	2,770	29,411	69	2,839	97.6	2.4	4	490
6/27/2005	2,354.5	2,773	30,710	72	2,845	97.5	2.5	2	435
6/28/2005	2,381.5	2,785	30,799	73	2,858	97.4	2.6	12	79
6/29/2005	2,399.1	2,805	31,199	74	2,879	97.4	2.6	29	545
7/4/2005	2,516.5	2,818	34,093	83	2,901	97.1	2.9	4	592
7/5/2005	2,545.4	2,843	34,671	85	2,928	97.1	2.9	23	480
7/6/2005	2,568.9	2,855	35,267	86	2,941	97.1	2.9	14	608
7/7/2005	2,593.3	2,868	35,847	88	2,955	97.0	3.0	14	571

Table 1

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
7/8/2005	2,611.2	2,893	36,191	89	2,982	97.0	3.0	36	461
7/11/2005	2,643.4	2,930	36,869	93	3,023	96.9	3.1	30	506
7/13/2005	2,660.1	2,943	36,962	94	3,037	96.9	3.1	20	133
7/14/2005	2,678.3	2,955	37,136	95	3,050	96.9	3.1	18	230
7/15/2005	2,700.7	2,968	37,542	97	3,065	96.8	3.2	15	435
7/18/2005	2,770.2	2,974	39,123	104	3,078	96.6	3.4	5	546
7/19/2005	2,814.7	2,983	40,124	108	3,091	96.5	3.5	7	540
7/20/2005	2,821.3	2,985	40,633	109	3,094	96.5	3.5	12	1,853
7/21/2005	2,842.9	2,988	40,876	111	3,098	96.4	3.6	5	270
7/25/2005	2,847.9	3,036	40,937	111	3,147	96.5	3.5	235	290
7/26/2005	2,848.6	3,039	40,937	112	3,150	96.5	3.5	89	0
7/27/2005	2,855.9	3,041	40,966	112	3,153	96.4	3.6	11	96
7/29/2005	2,860.3	3,044	41,131	113	3,156	96.4	3.6	16	375
8/1/2005	2,935.6	3,044	43,522	120	3,163	96.2	3.8	2	713
8/2/2005	2,936.3	3,044	43,522	120	3,164	96.2	3.8	3	680
8/3/2005	2,938.6	3,046	42,613	120	3,166	96.2	3.8	28	444
8/4/2005	2,960.3	3,049	43,976	122	3,171	96.1	3.9	5	653
8/5/2005	2,981.2	3,050	44,092	124	3,174	96.1	3.9	4	558
8/9/2005	2,988.8	3,051	44,451	125	3,176	96.1	3.9	6	599
8/10/2005	3,012.2	3,052	45,026	127	3,179	96.0	4.0	4	600
8/11/2005	3,028.7	3,054	44,759	129	3,182	96.0	4.0	5	520
8/15/2005	3,121.0	3,056	45,742	134	3,190	95.8	4.2	2	424
8/16/2005	3,148.9	3,059	46,186	136	3,195	95.7	4.3	4	300
8/17/2005	3,172.6	3,061	46,582	138	3,199	95.7	4.3	4	311
8/18/2005	3,195.5	3,089	46,853	140	3,229	95.7	4.3	31	396
8/19/2005	3,219.6	3,139	47,035	142	3,280	95.7	4.3	51	283
8/22/2005	3,289.4	3,139	48,055	147	3,285	95.5	4.5	2	309
8/23/2005	3,312.2	3,139	48,690	149	3,287	95.5	4.5	2	315
8/24/2005	3,335.9	3,139	48,859	151	3,289	95.4	4.6	2	284
8/26/2005	3,370.0	3,140	50,877	154	3,294	95.3	4.7	3	430
8/29/2005	3,424.6	3,176	53,379	161	3,337	95.2	4.8	19	604
8/30/2005	3,454.3	3,182	53,861	163	3,346	95.1	4.9	7	603
8/31/2005	3,478.0	3,189	54,262	166	3,354	95.1	4.9	9	603
9/1/2005	3,501.6	3,207	54,568	168	3,376	95.0	5.0	22	605
9/6/2005	3,620.9	3,214	55,561	180	3,394	94.7	5.3	4	510

Table 1

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
9/7/2005	3,646.5	3,220	55,909	183	3,402	94.6	5.4	8	528
9/8/2005	3,666.9	3,226	56,079	184	3,410	94.6	5.4	9	500
9/9/2005	3,691.0	3,232	56,341	187	3,419	94.5	5.5	9	506
9/12/2005	3,763.5	3,239	56,956	194	3,433	94.3	5.7	5	371
9/13/2005	3,787.2	3,245	57,314	197	3,442	94.3	5.7	9	260
9/14/2005	3,810.7	3,251	57,581	199	3,450	94.2	5.8	9	251
9/15/2005	3,832.4	3,257	57,822	202	3,459	94.2	5.8	9	241
9/16/2005	3,846.7	3,264	61,773	203	3,467	94.1	5.9	13	501
9/19/2005	3,925.8	3,276	62,712	211	3,487	93.9	6.1	6	563
9/20/2005	3,949.7	3,289	62,801	214	3,502	93.9	6.1	15	546
9/22/2005	3,993.5	3,314	63,068	218	3,532	93.8	6.2	16	514
9/23/2005	4,017.1	3,339	63,248	221	3,559	93.8	6.2	28	508
9/26/2005	4,072.6	3,345	63,428	227	3,572	93.7	6.3	5	502
9/29/2005	4,086.0	3,352	63,896	228	3,579	93.6	6.4	14	529
10/6/2005	4,087.9	3,352	64,203	228	3,579	93.6	6.4	1	573
10/26/2005	4,111.7	3,352	64,881	228	3,579	93.6	6.4	0	607
10/27/2005	4,141.9	3,352	65,785	228	3,579	93.6	6.4	0	326
10/28/2005	4,160.2	3,352	66,329	228	3,579	93.6	6.4	0	370
10/31/2005	4,231.7	3,352	67,770	228	3,579	93.6	6.4	0	423
11/2/2005	4,283.3	3,357	68,776	228	3,584	93.6	6.4	2	473
11/3/2005	4,307.4	3,359	69,315	228	3,587	93.6	6.4	2	502
11/4/2005	4,324.8	3,362	69,673	228	3,589	93.7	6.3	3	594
11/7/2005	4,420.6	3,364	71,779	238	3,602	93.4	6.6	3	565
11/8/2005	4,443.1	3,367	72,241	241	3,607	93.3	6.7	5	543
11/11/2005	4,490.7	3,369	73,172	243	3,612	93.3	6.7	3	525
11/14/2005	4,563.5	3,372	74,317	243	3,615	93.3	6.7	1	486
11/15/2005	4,591.1	3,385	74,845	243	3,628	93.3	6.7	11	474
11/16/2005	4,614.3	3,388	75,251	243	3,631	93.3	6.7	3	469
11/17/2005	4,637.9	3,391	75,833	243	3,634	93.3	6.7	3	478
11/18/2005	4,660.2	3,394	76,234	243	3,637	93.3	6.7	3	471
11/21/2005	4,734.4	3,397	77,902	243	3,640	93.3	6.7	1	482
11/22/2005	4,756.4	3,400	78,375	243	3,643	93.3	6.7	3	471
11/23/2005	4,782.1	3,403	78,881	243	3,646	93.3	6.7	3	470
1/4/2006	4,785.1	3,403	80,242	243	3,646	93.3	6.7	0	576
1/5/2006	4,809.1	3,406	80,481	243	3,649	93.3	6.7	2	602

Table 1

Phase-Specific LNAPL Recovery and Water Production Summary- System 1
LNAPL Area No. 3 Full Scale Remediation
General Motors Pontiac North Campus
Pontiac, Michigan

Field Data:				Calculations:				Rate Estimates:	
Date	*Elapsed Time (hours)*	*Cumulative Liquid-Phase LNAPL Recovery (gallons, product)*	*Cumulative Water Production (gallons)*	*Cumulative Vapor-Phase LNAPL Recovery (gallons, product)*	*Overall Cumulative LNAPL Recovery (gallons, product)*	*Fraction of Total LNAPL Recovered as Liquid (%)*	*Fraction of Total LNAPL Recovered as Vapor (%)*	*Intermittent LNAPL Recovery Rate (gallons per day)*	*Intermittent Water Production Rate (gallons per day)*
1/6/2006	4,830.7	3,408	80,656	243	3,651	93.3	6.7	3	582
1/9/2006	4,899.5	3,410	81,066	243	3,653	93.3	6.7	1	489
1/12/2006	4,973.3	3,412	81,350	243	3,655	93.4	6.6	1	395
1/13/2005	4,997.5	3,414	81,358	243	3,657	93.4	6.6	2	365
1/16/2006	5,047.2	3,415	81,730	243	3,658	93.4	6.6	0.5	294
1/17/2006	5,067.2	3,416	81,898	243	3,659	93.4	6.6	1.2	272
1/18/2006	5,092.7	3,417	82,065	243	3,660	93.4	6.6	0.9	246
1/19/2006	5,115.9	3,419	82,248	243	3,662	93.4	6.6	2.1	146
1/20/2006	5,137.6	3,420	82,559	243	3,663	93.4	6.6	1.1	152
1/23/2006	5,141.3	3,421	82,763	243	3,664	93.4	6.6	3.2	163
1/24/2006	5,164.0	3,422	82,951	243	3,665	93.4	6.6	1.6	171
1/26/2006	5,187.9	3,423	83,637	243	3,666	93.4	6.6	0.5	256
1/27/2006	5,206.1	3,423	84,320	243	3,666	93.4	6.6	0.7	341
1/30/2006	5,277.7	3,424	86,348	243	3,667	93.4	6.6	0.2	481
1/31/2006	5,306.9	3,425	88,415	243	3,668	93.4	6.6	1.2	653
2/6/2006	5,309.5	3,426	88,517	243	3,669	93.4	6.6	4.6	714
2/7/2006	5,328.0	3,426	88,979	243	3,669	93.4	6.6	0.6	762
2/8/2006	5,351.9	3,427	89,524	243	3,670	93.4	6.6	0.5	780
2/9/2006	5,372.6	3,427	89,892	243	3,670	93.4	6.6	0.6	740
2/10/2006	5,395.3	3,427	90,345	243	3,670	93.4	6.6	0.0	767

Table 2

Summary of System 1 Recovered LNAPL and O&M Costs
GM Pontiac North Campus LNAPL Area No. 3
Pontiac, Michigan

Week	*Week Ending Date*	*Weekly/Monthly Recovery (gallons)*	*O&M Cost/Recovery ($/gallon)*
1	3/5/2005	81	$ 140.71
2	3/12/2005	55	$ 207.22
3	3/19/2005	503	$ 22.66
4	3/26/2005	428	$ 26.63
5	4/2/2005	394	$ 28.93
6	4/9/2005	197	$ 57.85
7	4/16/2005	192	$ 59.36
8	4/23/2005	126	$ 90.45
9	4/30/2005	145	$ 78.60
10	5/7/2005	130	$ 87.67
11	5/14/2005	128	$ 89.04
12	5/21/2005	64	$ 178.08
16	6/18/2005	322	$ 35.40
20	7/16/2005	300	$ 37.99
24	8/13/2005	125	$ 91.18
28	9/10/2005	229	$ 49.77
32	10/8/2005	160	$ 71.23
36	11/8/2005	28	$ 407.05
40	1/13/2006	50	$ 227.95
44	2/10/2006	13	$ 876.72

<u>System 1</u>
Average Monthly O&M Cost $ 45,589.24
Average Weekly O&M Cost: $ 11,397.31

<u>System 2</u>
Average Monthly O&M Cost $ 53,952.91
Average Weekly O&M Cost: $ 13,488.23

<u>System 3</u>
Average Monthly O&M Cost $ 46,913.30
Average Weekly O&M Cost: $ 11,728.33

ATTACHMENT A

GROUNDWATER/LNAPL ELEVATIONS AND LNAPL THICKNESSES

Location	2/14-2/15/06		
	DTP (feet)	DTW (feet)	Thickness
MWW8-03	NA	NA	NA
MWW8-06	27.45	32	4.55
MWW8-07	30.98	33.35	2.37
MWW8-08	--	32.4	--
MWW8-09	22.08	22.95	0.87
MWW8-14	--	31.38	--
MWW8-15	26.26	27.9	1.64
MWW8-16	26.89	28.87	1.98
MWW8-24*	24.89	24.9	0.01
MWW8-26	9.67	9.82	0.15
MWW8-27	NA	NA	NA
MWW8-33*	19.39	19.4	0.01
MWW8-34*	15.52	16.32	0.8
MWW8-36	17.03	17.91	0.88
MWW8-45*	--	18.43	--
MWW8-47	26.41	26.84	0.43
MWW8-48*	20.75	21.21	0.46
MWW8-58*	--	--	--
RWW8-01	26.75	26.76	0.01
RWW8-02	--	31.77	--
RWW8-03	--	21.17	--
RWW8-04	--	43.52	--
RWW8-05	--	DRY	--
RWW8-06	26.28	26.55	0.27
RWW8-07	--	26.54	--
RWW8-08	27.33	32	4.67
RWW8-10	25.85	26.08	0.23
RWW8-11	28.39	29.28	0.89
RWW8-12	27.28	27.9	0.62
RWW8-13	--	12.41	--
RWW8-14	--	36.84	--
RWW8-15	22.1	22.16	0.06
RWW8-16	25.82	26.1	0.28
RWW8-17	37.45	37.47	0.02
RWW8-18	32.07	32.11	0.04
RWW8-19	--	39.05	--
RWW8-20	--	38.13	--
RWW8-21	--	38.58	--
RWW8-22	36.45	36.5	0.05
RWW8-23	--	37.13	--
RWW8-24	--	27.52	--
RWW8-25	31.5	31.52	0.02
RWW8-26	--	33.62	--
RWW8-27	--	34.82	--
RWW8-28	24.47	24.91	0.44
RWW8-29	29.48	29.5	0.02
RWW8-30	19.9	26.25	6.35
RWW8-31	27.31	34.7	7.39
RWW8-32	29.45	29.46	0.01
RWW8-33	--	26.83	--

Location	2/14-2/15/06		
	DTP (feet)	DTW (feet)	Thickness
RWW8-34	--	20.56	--
RWW8-35	--	31.26	--
RWW8-36	--	30.03	--
RWW8-37	28.46	28.93	0.47
RWW8-38	--	22.55	--
RWW8-39	NA	NA	NA
RWW8-40	--	25.26	--
RWW8-41	--	27.59	--
RWW8-42	--	27.37	--
RWW8-43	--	27.6	--
RWW8-44	27.48	27.6	0.12
RWW8-45	--	17.24	--
RWW8-46	26	33.45	7.45
RWW8-47	27.49	27.89	0.4
RWW8-48	--	28.03	--
RWW8-49	--	24.6	--
RWW8-50	--	23.27	--
RWW8-51	--	22.16	--
RWW8-52	--	21.79	--
RWW8-53	24.05	24.12	0.07
RWW8-54	--	17.25	--
RWW8-55	24.25	24.46	0.21
RWW8-56	22.75	23.13	0.38
RWW8-57	--	DRY	--
RWW8-58	44.12	44.15	0.03
RWW8-59	--	DRY	--
RWW8-60	44.24	44.7	0.46
RWW8-61	43.81	43.85	0.04
RWW8-62	--	24.42	--
RWW8-63	--	29.37	--
RWW8-64	43.36	44.02	0.66
RWW8-65	39.65	39.87	0.22
RWW8-66	--	33.04	--
RWW8-67	33.41	33.67	0.26
RWW8-68	33.71	33.95	0.24
RWW8-71	--	39.07	--
RWW8-72	--	13.9	--
RWW8-73	--	18.43	--
RWW8-74	--	18.31	--
RWW8-75	--	17.75	--
RWW8-76	17.4	17.42	0.02
RWW8-77	--	13.52	--
RWW8-78	19.78	28.4	8.62
RWW8-79	18.45	21.91	3.46
RWW8-80	--	15.967	--
RWW8-81	--	18.68	--
RWW8-82	--	18.9	--
RWW8-83	--	18.25	--
RWW8-84	--	20.85	--
RWW8-85	--	20.94	--

Location	2/14-2/15/06		
	DTP (feet)	DTW (feet)	Thickness
RWW8-86	--	20.6	--
RWW8-87	20.34	21.08	0.74
RWW8-88	--	22.49	--
RWW8-89	13.1	13.51	0.41
RWW8-90	--	28.15	--
RWW8-91	--	31.01	--

MEMORANDUM

To: Peter Ramanauskas/U.S. EPA Region V

Date: April 21, 2006

From: Robert Hare/ENCORE

cc: Gavin O'Neill/CRA
John McKenna/BBL

Re: Responses to U.S. EPA Comments on
3/20/06 EEC Memorandum Pertaining to
LNAPL Area 3
Pontiac North Campus
Pontiac, Michigan

The following responses were developed in response to your comments received via email on April 6, 2006 on our memo to you dated March 20, 2006. The memo in question was developed to request U.S. EPA's decision on the discontinuation of the operation of the multi-phase extraction systems (MPE) at LNAPL Area 3. Your comments were received by email on April 6, 2006. The following responses have been itemized for clarity with each of your comments noted.

U.S. EPA Comment #1: Please provide an explanation of how the extraction system pumping rates were optimally set for the 3 systems to ensure maximum LNAPL recovery, what that was based on (show the systems were operating as designed for optimal recovery), and how you tried to adjust the 3 systems for better performance prior to their shutdown.

Response to Comment #1: Recovery performance was optimized by operating each respective system, powered by either a 50 Hp or 100 Hp rotary lobe blower, at maximum operating capacity (i.e., vacuum and air flowrate). In addition, the multi-phase extraction (MPE) systems were operated utilizing pneumatic air-lift (PAL). The depths of the extraction wells were deep enough that the vacuum applied at the top of the well (typically 15-20"Hg) could not extract liquids alone, with the result being that liquids were only discharged from the wells with the aid of the PAL cycle. The PAL lines were extended to the bottom of each extraction well to ensure that each well would be completely evacuated during each PAL cycle. A typical PAL cycle would consist of injecting compressed air into the bottom of an extraction well for a period of 30-seconds every 2-3 minutes. Visual observations at each well were utilized to ensure the respective PAL cycle was sufficient to completely evacuate the well (i.e., compressed air was injected into the well until the flow of extracted liquids was observed to cease). Consequently, the extraction systems were optimized by maintaining the extraction wells in a near-evacuated state, rather than focus on pumping rates (which would not be accurately quantitative with this type of pulsed operation). This was done to maximize drawdown on the vicinity of each extraction well in order to expose the maximum amount of LNAPL for recovery. In addition, pneumatic fracturing was utilized to maximize recovery. Pneumatic fracturing was previously tested during the MPE pilot test (May-June 2004) and was observed to increase recovery potential.

In order to make maximum use of the available remediation time, the systems were always used to extract from multiple extraction wells at any given time. As such, extraction rates were not quantified at any individual well. However, the extraction wells being operated were constantly varied as LNAPL recovery was observed to be poor or to decrease over time in a given area. If an area was found to perform well,

extraction was continued. Furthermore, a full-time field technologist was dedicated to the operation of these systems in order to monitor the recovery operations, maximize system up-time, and alternate extraction wells as necessary to maximize recovery.

U.S. EPA Comment #2: How much extraction were you getting from your sands or expected "worst cast" zones?

Response to Comment #2: LNAPL extraction was performed for the longest duration (i.e., approximately 12 months on a near continuous basis) at and in the vicinity of MWW8-24, where extraction well screens intersect sand seams that may have contained LNAPL. This was also found to be an area of relative high recovery during the MPE pilot study conducted from May 25 to -June 5, 2004. For this reason, the majority of the total recovery is likely attributable to the area in the vicinity of MWW8-24. That is, the majority of the recovery illustrated in Figure 2 of our March 20, 2006 memo was extracted from this area. Consequently, the drop-off in recovery rates to the most recent levels (less than 3 gallons per day) is also attributable to this 'worst-case' area.

U.S. EPA Comment #3: Explain the zones of influence of the extraction systems over the extent of the LNAPL #3 area (i.e., vertical/lateral influence over LNAPL #3).

Response to Comment #3: Full plume coverage was achieved due to an extraction well spacing of approximately 40', and extraction wells typically having 20' screens across the water table/oil-water interface. Influence was also enhanced through the use of pneumatic fracturing to enhance the permeability of the formation. Evidence of the system's ability to produce a significant zone of influence was most notably documented during the MPE pilot study conducted in May/June, 2004. The following observations detail these effects:

- Vacuum influence was documented by well headspace pressure readings that exhibited a negative pressure at distances greater than 60' from the active extraction area; and
- Hydraulic influence was documented by measured drawdown of liquid levels in wells at distances greater than 100' from the active extraction area.

Please note that the pilot study was conducted by operating a maximum of 4 extraction wells at any given time. Conversely, as many as 12 to 15 extraction wells were operated simultaneously during the year of operation of the full-scale system. Well headspace pressure measurements taken during the operation of the full-scale recovery system have confirmed the observations of the pilot study.

U.S. EPA Comment #4: Explain whether adjustment of water extraction rates would result in increased LNAPL recovery rates (gpd).

Response to Comment #4: As previously noted in the response to Comment #1, operating extraction wells were maintained in a near-evacuated state while simultaneously applying a high vacuum to the well. Maintaining each well in a near-evacuated state corresponds to the maximum achievable liquid extraction rate (especially given the aggressiveness of the extraction method including pneumatic fracturing). A decrease in liquid extraction could only have been achieved by raising the PAL lines within the well (i.e., raise the elevation of the extraction point) or scaling back the operating condition of the system (i.e.,

decrease the applied vacuum). Either one of these effects would have resulted in less influence on liquids in the well, and less drawdown, with the expected result that more LNAPL would become entrapped and immobile/unrecoverable. This is due to the fact that residual saturation is typically much higher beneath the water table in the saturated zone than in the unsaturated zone (API, 2004).

U.S. EPA Comment #5: U.S. EPA Comment #1: Why do you believe there would be no product rebound effect resulting in additional LNAPL removal should the system(s) be restarted in the future? The fact that you are seeing up to 8.6 feet of product continue to appear in wells after the systems were shut down shows that product continues to be mobile and move out of the formations. Provide a calculation/estimate of the LNAPL recoverability rate from those wells.

Response to Comment #5: We do not believe that any significant rebound effect would be experienced should the systems be restarted in the future. There were several periods of extended downtime (2-3 weeks) for System 1 during methane monitoring activities and various maintenance activities. There were no significant spikes in recovery observed upon restarting the system (even while operating in the best-performing recovery area). Furthermore, we believe that given the aggressive nature of the extraction systems, and the eventual drop-off in recovery rates, that the LNAPL in the extraction area is near field residual saturation levels. The recovery rates achieved by the system near the end of the operating period were poor. It is reasonable to assume that if a recovery system that induces such an exaggerated gradient in the subsurface cannot achieve a good recovery rate, then the LNAPL is very unlikely to be mobile under normal hydraulic conditions (i.e., normal hydraulic gradient, unfractured soil).

We do not believe that a significant LNAPL thickness in a well is necessarily an indication of mobility within the plume, especially given the predominantly fine-grained heterogeneous soil conditions. A well screened within a predominantly fine-grained formation creates a low-pressure macropore that may induce the flow of LNAPL into the well. The LNAPL may be under hydraulic pressure given the heterogeneous conditions, which could create a large LNAPL thickness in a well that is not reflective of the formation. Above all, we believe that the poor recovery of LNAPL from these wells by the MPE system is the best indication that the LNAPL is not mobile, regardless of the apparent thickness.

We would hesitate to provide an estimate of future LNAPL recovery from any given well. Estimating LNAPL recovery is difficult at best, and we maintain that our actual recovery data showing that recovery has reached an asymptotic plateau is the best possible line of evidence of an extremely low future recovery potential.

U.S. EPA Comment #6: Provide a decline-curve analysis figure based on your existing data to estimate continued recovery performance (e.g. how much more time would you need to run to recover 'x' additional gallons).

Response to Comment #6: A decline curve analysis is provided in the attached figure. The analysis was performed by plotting LNAPL recovery rate (gallons per day) against cumulative LNAPL recovery (gallons). The figure suggests that the maximum recoverable volume of LNAPL in the area is approximately 3,725 gallons. The MPE system recovered 3,670 gallons of LNAPL. This suggests that approximately 55 gallons of recoverable product remains in the ground. Assuming a recovery rate of 1 gallon per day, which is slightly higher (i.e., more conservative) than what was actually achieved near the conclusion of the MPE operating period, 55 days would be required to recover this LNAPL. The O&M

cost to operate the MPE system for an additional 55 days would be on the order of $84,000. Relocation of the system components and reinstallation of an extraction network following USPS construction could incur a cost in excess of $100,000. The resulting cost per gallon would be in excess of $3,000. This cost is well beyond what would be considered reasonable to achieve this recovery.

*U.S. EPA Comment #7: Referring to the Excel spreadsheets created to track cumulative LNAPL totals, provide explanation of how the cumulative liquid-phase LNAPL recovery column on the 'Recovery by phase & water - S1' sheet was done. For example, for 3/22/05 the listed value in column C is 888 gallons which is calculated by the formula 200+(5.5/8)*1000 which does not reference any other cells containing LNAPL recovery data. Other such formulas exist throughout the column.*

Response to Comment #7: This formula is a simple arithmetic calculation of LNAPL recovery volume based on manual LNAPL storage tank level measurements (based on a combination of tank gauge readings and manual measurement with an oil-water interface probe).

U.S. EPA Comment #8: Provide the analytical results from LNAPL #3 showing results of VOC, SVOC, metal, PCB content.

Response to Comment #8: We have attached a table summarizing the results of chemical analytical testing performed on the LNAPL in LNAPL Area 3

U.S. EPA Comment #9: How many samples of LNAPL do you have data on throughout the plume showing it has uniform properties throughout the area? Provide that info.

Response to Comment #9: The following list summarizes the LNAPL samples collected from wells in LNAPL Area 3:

- 5 samples have been collected since 2001 and analyzed for chemical constituents;
- 2 samples have been collected since 2001 (1 each from the eastern and western portions of the area) and fingerprinted; and
- 3 samples were collected in 2005 (from both the eastern and western portions of the area) and analyzed for select physical properties.

We have attached a table (in response to Comment #8) summarizing the results of chemical analytical testing performed on the LNAPL in LNAPL Area 3. The fingerprinting results for both samples indicated the LNAPL was predominantly a weathered diesel/No. 2 fuel oil with lesser amounts of No. 6 oil. The 2005 samples exhibited the following physical properties:

Sample Location	Specific Gravity @ 70°F	Viscosity @ 70°F
RWW8-30	0.8463	8.66 centipoise
MWW8-42	0.85	9.5 centipoise
RWW8-78	0.8456	8.25 centipoise

The chemical analytical data shows that the LNAPL is of similar composition across the area, with the exception that PCB concentrations increase as you move west. The fingerprinting and physical property results further suggest a high degree of uniformity across the area.

That being said, we do not believe that uniformity or non-uniformity of the LNAPL in the area is an issue as we attempted to recover product with the MPE systems from the entire LNAPL area utilizing over 100 extraction wells. Furthermore, we are presenting real recovery data, and are not attempting to estimate or model recovery in any way where uniformity of LNAPL would be important due to the need to extrapolate data across a plume.

U.S. EPA Comment #10: Provide a better explanation of Figure 2 with respect to the causes of recovery rate spikes and whether this is an artifact of some changes in subsurface properties or tweaks in the recovery system. I believe Gavin mentioned this as being an artifact of system cleanout in a prior email, but want to confirm for these points.

Response to Comment #10: The recovery rate spikes are an artifact of system cleanouts. The spikes are artificial, and are due to the LNAPL removed from various system components during cleaning becoming available for measurement.

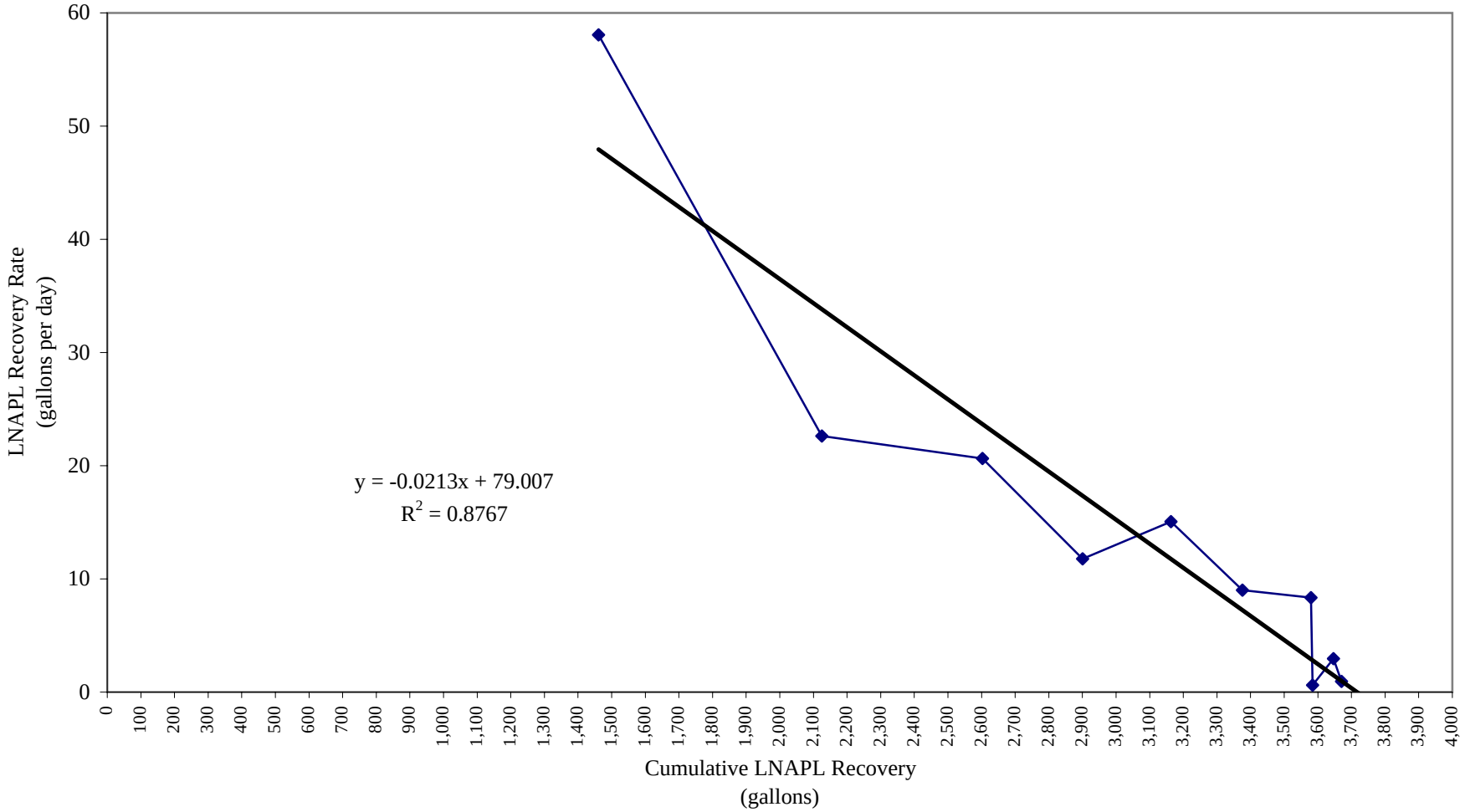
U.S. EPA Comment #11: Provide the PCB sample results for the 1000-gallon tank batches of product tested prior to shipping.

Response to Comment #11: We have attached a table providing a summary of these data. Analytical results for PCBs from samples that were collected from the 1,000-gallon tank ranged from not detected to 1.7 ppm.

U.S. EPA Comment #12: What are the USPS issues/concerns regarding addressing residual LNAPL?

Response to Comment #12: To date, we have not received comments from the USPS regarding this question.

Decline Curve Analysis
LNAPL Area No. 3 System 1
General Motors Pontiac North Campus
Pontiac, Michigan



Sample Location:		*MWW8-03*	*MWW8-03*	*MWW8-42*	*RWW8-29*	*RWW8-31*
Sample ID:		*MWW8-03-NP(16-26)*	*MWW8-03-P-012402*	*MWW8-42 LNAPL*	*LNAPL-RWW8-29-121605*	*LNAPL-RWW8-31-121605*
Sample Date:		*9/17/2001*	*1/24/2002*	*1/6/2005*	*12/16/2005*	*12/16/2005*
Parameter:	*Units*					
VOCs						
1,1,1-Trichloroethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,1,2,2-Tetrachloroethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,1,2-Trichloroethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,1-Dichloroethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,1-Dichloroethene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,2,4-Trichlorobenzene	ug/kg	14000 U	--	78 J	2800 U	2900 U
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
1,2-Dibromoethane (Ethylene Dibromide)	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,2-Dichlorobenzene	ug/kg	14000 U	--	2900 UJ	2800 U	2900 U
1,2-Dichloroethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,2-Dichloropropane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
1,3-Dichlorobenzene	ug/kg	14000 U	--	2900 UJ	2800 U	2900 U
1,4-Dichlorobenzene	ug/kg	14000 U	--	33 J	2800 U	2900 U
2-Butanone (Methyl Ethyl Ketone)	ug/kg	59000 U	--	260 J	5800 U	6000 U
2-Hexanone	ug/kg	59000 U	--	6000 UJ	5800 U	6000 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	ug/kg	59000 U	--	6000 UJ	5800 U	6000 U
Acetone	ug/kg	59000 U	--	330 J	5800 U	6000 U
Benzene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Bromodichloromethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Bromoform	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Bromomethane (Methyl Bromide)	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
Carbon disulfide	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Carbon tetrachloride	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Chlorobenzene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Chloroethane	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
Chloroform (Trichloromethane)	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Chloromethane (Methyl Chloride)	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
cis-1,2-Dichloroethene	ug/kg	7300 U	--	740 UJ	720 U	740 U
cis-1,3-Dichloropropene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Cyclohexane	ug/kg	30000 U	--	6000 UJ	140 J	120 J
Dibromochloromethane	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Dichlorodifluoromethane (CFC-12)	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
Ethylbenzene	ug/kg	1200 J	--	310 J	550 J	960 J
Isopropylbenzene	ug/kg	800 J	--	420 J	560 J	620 J
Methyl acetate	ug/kg	14000 U	--	2900 UJ	2800 U	2900 U
Methyl cyclohexane	ug/kg	620 J	--	150 J	380 J	380 J
Methyl Tert Butyl Ether	ug/kg	59000 U	--	6000 UJ	5800 U	6000 U
Methylene chloride	ug/kg	14000 U	--	1500 UJ	780 J	800 J
Styrene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Tetrachloroethene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Toluene	ug/kg	14000 U	--	1500 UJ	130 J	250 J
trans-1,2-Dichloroethene	ug/kg	7300 U	--	740 UJ	720 U	740 U
trans-1,3-Dichloropropene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Trichloroethene	ug/kg	14000 U	--	1500 UJ	1400 U	1500 U
Trichlorofluoromethane (CFC-11)	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
Trifluorotrichloroethane (Freon 113)	ug/kg	30000 U	--	6000 UJ	5800 U	6000 U
Vinyl chloride	ug/kg	30000 U	--	2900 UJ	2800 U	2900 U
Xylene (total)	ug/kg	1300 J	--	1500 J	1400	1800
SVOCs						
2,2'-oxybis(1-Chloropropane) (bis(2-chloroisopropyl) ether)	ug/kg	1000000 U	--	--	500000 U	1000000 U
2,4,5-Trichlorophenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2,4,6-Trichlorophenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2,4-Dichlorophenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U

Sample Location:		*MWW8-03*	*MWW8-03*	*MWW8-42*	*RWW8-29*	*RWW8-31*
Sample ID:		*MWW8-03-NP(16-26)*	*MWW8-03-P-012402*	*MWW8-42 LNAPL*	*LNAPL-RWW8-29-121605*	*LNAPL-RWW8-31-121605*
Sample Date:		*9/17/2001*	*1/24/2002*	*1/6/2005*	*12/16/2005*	*12/16/2005*
Parameter:	*Units*					
VOCs						
2,4-Dimethylphenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2,4-Dinitrophenol	ug/kg	4800000 U	--	1900000 UJ	2400000 U	4800000 U
2,4-Dinitrotoluene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2,6-Dinitrotoluene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2-Chloronaphthalene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2-Chlorophenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2-Methylnaphthalene	ug/kg	120000 J	--	130000 J	150000 J	140000 J
2-Methylphenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
2-Nitroaniline	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
2-Nitrophenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
3,3'-Dichlorobenzidine	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
3-Nitroaniline	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
4,6-Dinitro-2-methylphenol	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
4-Bromophenyl phenyl ether	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
4-Chloro-3-methylphenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
4-Chloroaniline	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
4-Chlorophenyl phenyl ether	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
4-Methylphenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
4-Nitroaniline	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
4-Nitrophenol	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
Acenaphthene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Acenaphthylene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Acetophenone	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Anthracene	ug/kg	1000000 U	--	220000 J	140000 J	1000000 U
Atrazine	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Benzaldehyde	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Benzo(a)anthracene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Benzo(a)pyrene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Benzo(b)fluoranthene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Benzo(g,h,i)perylene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Benzo(k)fluoranthene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Biphenyl	ug/kg	160000 J	--	79000 J	500000 U	1000000 U
bis(2-Chloroethoxy)methane	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
bis(2-Chloroethyl)ether	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
bis(2-Ethylhexyl)phthalate	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Butyl benzylphthalate	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Caprolactam	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Carbazole	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Chrysene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Dibenz(a,h)anthracene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Dibenzofuran	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Diethyl phthalate	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Dimethyl phthalate	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Di-n-butylphthalate	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Di-n-octyl phthalate	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Fluoranthene	ug/kg	1000000 U	--	400000 U	160000 J	73000 J
Fluorene	ug/kg	190000 J	--	230000 J	420000 J	340000 J
Hexachlorobenzene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Hexachlorobutadiene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Hexachlorocyclopentadiene	ug/kg	4800000 U	--	1900000 U	2400000 U	4800000 U
Hexachloroethane	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Indeno(1,2,3-cd)pyrene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Isophorone	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Naphthalene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Nitrobenzene	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
N-Nitrosodi-n-propylamine	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U

Sample Location:		*MWW8-03*	*MWW8-03*	*MWW8-42*	*RWW8-29*	*RWW8-31*
Sample ID:		*MWW8-03-NP(16-26)*	*MWW8-03-P-012402*	*MWW8-42 LNAPL*	*LNAPL-RWW8-29-121605*	*LNAPL-RWW8-31-121605*
Sample Date:		*9/17/2001*	*1/24/2002*	*1/6/2005*	*12/16/2005*	*12/16/2005*
Parameter:	*Units*					
VOCs						
N-Nitrosodiphenylamine	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Pentachlorophenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Phenanthrene	ug/kg	780000 J	--	720000	1100000	980000 J
Phenol	ug/kg	1000000 U	--	400000 U	500000 U	1000000 U
Pyrene	ug/kg	1000000 U	--	85000 J	160000 J	85000 J
Metals						
Aluminum	mg/kg	--	--	--	20.0 U	20.0 U
Antimony	mg/kg	6.0 U	--	2.0 U	6.0 U	6.0 U
Arsenic	mg/kg	1.0 U	--	0.50 U	30.0 U	30.0 U
Barium	mg/kg	20.0 U	--	1.0 U	0.41 J	20.0 U
Beryllium	mg/kg	0.50 U	--	0.10 U	0.50 U	0.50 U
Cadmium	mg/kg	0.50 U	--	0.50 U	0.50 U	0.50 U
Calcium	mg/kg	--	--	--	29.9 B J	36.7 B J
Chromium Total	mg/kg	1.0 U	--	1.0 U	0.17 J	1.0 U
Cobalt	mg/kg	5.0 U	--	1.0 U	5.0 U	5.0 U
Copper	mg/kg	0.29 J	--	0.61	2.5 U	2.5 U
Iron	mg/kg	--	--	--	9.8 J	10.0 U
Lead	mg/kg	0.30 U	--	0.33	10.0 U	10.0 U
Magnesium	mg/kg	--	--	--	4.0 B J	500 U
Manganese	mg/kg	1.5 U	--	1.0 U	0.31 B J	0.30 B J
Mercury	mg/kg	0.10 U	--	0.030 J	0.10 U	0.10 U
Nickel	mg/kg	4.0 U	--	2.0 U	4.0 U	4.0 U
Potassium	mg/kg	--	--	--	21.8 B J	19.5 B J
Selenium	mg/kg	0.50 U	--	0.35 J	25.0 U	0.33 J
Silver	mg/kg	1.0 U	--	0.50 U	1.0 U	1.0 U
Sodium	mg/kg	--	--	--	500 U	500 U
Thallium	mg/kg	1.0 U	--	1.0 U	200 U	200 U
Vanadium	mg/kg	5.0 U	--	1.0 U	5.0 U	5.0 U
Zinc	mg/kg	2.0 U	--	1.8 J	0.92 B J	0.85 B J
PCBs						
Aroclor-1016 (PCB-1016)	ug/kg	1000 U	--	2000 U	1000 U	1000 U
Aroclor-1221 (PCB-1221)	ug/kg	1000 U	--	2000 U	1000 U	1000 U
Aroclor-1232 (PCB-1232)	ug/kg	1000 U	--	2000 U	1000 U	1000 U
Aroclor-1242 (PCB-1242)	ug/kg	1000 U	--	2000 U	1000 U	1000 U
Aroclor-1248 (PCB-1248)	ug/kg	2700	--	18000 J	1900	1000 U
Aroclor-1254 (PCB-1254)	ug/kg	1000 U	--	2000 U	1000 U	1000 U
Aroclor-1260 (PCB-1260)	ug/kg	1000 U	--	2600 J	2200	380 J
Diox Fur						
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	28.5 U	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	1090	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	7.3 U	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	195	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	8.9 U	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	3.3 U	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	6.5 U	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	3.4 U	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	6.6 U	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	4.0 U	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	6.5 U	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	2.3 U	--	--	--

Sample Location:		*MWW8-03*	*MWW8-03*	*MWW8-42*	*RWW8-29*	*RWW8-31*
Sample ID:		*MWW8-03-NP(16-26)*	*MWW8-03-P-012402*	*MWW8-42 LNAPL*	*LNAPL-RWW8-29-121605*	*LNAPL-RWW8-31-121605*
Sample Date:		*9/17/2001*	*1/24/2002*	*1/6/2005*	*12/16/2005*	*12/16/2005*
Parameter:	*Units*					
VOCs						
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	3.2 U	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	3.4 U	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	2.2 U	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	2.0 U	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	2.1 U	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	pg/g	--	8.0 U	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	420	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	pg/g	--	19.2	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	37.7	--	--	--
Total Pentachlorodibenzofuran (PeCDF)	pg/g	--	33.3 J	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	3.2 U	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	pg/g	--	121 J	--	--	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	2.1 U	--	--	--
General Chemistry						
pH Corrosivity	S.U.	--	--	--	5.0	5.0

Notes:

U Not present at or above the associated value

J Estimated concentration

UJ Estimated reporting limit

B Possible method blank contamination

Sample Location:		*LNAPL3-1*	*LNAPL3-1*	*LNAPL3-1*	*LNAPL3-1*
Sample ID:		*LNAPL-17487-T1-CB-062005*	*LNAPL-17487-T3-CB-062005*	*LNAPL-17487-T3-CB-082405*	*LNAPL-17487-T1-CB-111405*
Sample Date:		*6/20/2005*	*6/20/2005*	*8/24/2005*	*11/14/2005*
Parameters:	*Units*				
PCBs					
Aroclor-1016 (PCB-1016)	ug/kg	1000 U	1000 U	1000 U	1000 U
Aroclor-1221 (PCB-1221)	ug/kg	1000 U	1000 U	1000 U	1000 U
Aroclor-1232 (PCB-1232)	ug/kg	1000 U	1000 U	1000 U	1000 U
Aroclor-1242 (PCB-1242)	ug/kg	830 J	1100	960 J	1000 U
Aroclor-1248 (PCB-1248)	ug/kg	1000 U	1000 U	1000 U	1000 U
Aroclor-1254 (PCB-1254)	ug/kg	1000 U	1000 U	1000 U	1000 U
Aroclor-1260 (PCB-1260)	ug/kg	400 J	640 J	1000 U	240 J

Notes:

U Not present at or above the associated value

J Estimated concentration

UJ Estimated reporting limit

B Possible method blank contamination