April 24, 2003

GROUNDWATER NOT IN AN AQUIFER (GWNIAA) EVALUATION REPORT

FORMER PEREGRINE (US) INC.
COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

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1.0 INTRODUCTION

1.1 GENERAL

Conestoga-Rovers & Associates Inc. (CRA) was retained by Remediation and Liability Management Company, Inc. (REALM), a wholly owned subsidiary of General Motors Corporation (GM), to complete a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for the former Peregrine (US) Inc., (Peregrine) Coldwater Road Facility (Facility) in Genesee Township, Michigan. The RFI Report (CRA, 2000c) submitted to the Michigan Department of Environmental Quality (MDEQ) Waste Management Division (WMD) in November 2000 concluded that the water in the shallow overburden at the Facility was sporadically encountered in a discontinuous layer of perched sand that can be classified as Groundwater Not In An Aquifer (GWNIAA). REALM received comments on the RFI Report from the MDEQ-WMD on March 29, 2001. Comment No. 9 indicated the GWNIAA determination in the RFI Report was not adequate. Therefore, a Technical Memorandum with additional supporting documentation was provided to the MDEQ-WMD as part of the formal response to comments on March 28, 2002. In order to meet the concerns raised by the MDEQ-WMD, REALM proposed additional investigations in support of the perched zone GWNIAA designation. The MDEQ-WMD, in a letter dated May 14, 2002, re-iterated their request for additional supporting documentation for the GWNIAA designation. REALM agreed to conduct additional investigations in the Response to Comments dated August 30, 2002.

1.2 PURPOSE OF REPORT

This GWNIAA Evaluation Report (Report) has assembled all supporting documentation for the GWNIAA designation for the shallow overburden at the Facility into a comprehensive document. In completing the evaluation, CRA/REALM have addressed the following:

- MDEQ-WMD Comment No. 9 in letter dated March 29, 2001;
- MDEQ-WMD Comment No. 9 in letter dated May 14, 2002; and
- MDEQ-WMD Staff Guidance document relating to GWNIAA dated May 4, 2000 (provided in Appendix A).

As outlined above, CRA/REALM have completed additional field investigations at the Facility to support the GWNIAA designation.

Ultimately, classification of the shallow perched groundwater at the Facility as GWNIAA will allow the groundwater ingestion exposure pathway to be eliminated in accordance with Michigan Act 451, Part 201. This conclusion will be presented in the RFI Report and used in the Corrective Measures Study (CMS) Report.

1.3 REPORT ORGANIZATION

This Report has been organized into seven sections, including this introduction:

Section 2.0 - summarizes the regional and Facility setting.

Section 3.0 - summarizes the methodologies applied in this evaluation, including a literature review, field work, and data analysis.

Section 4.0 - provides a summary of the concepts behind the GWNIAA designation, including a review of water supply regulations and the concept of well yield.

Section 5.0 - presents the Facility setting with a specific focus on definition of hydrostratigraphic units and their water-bearing characteristics, and presents the technical supporting documentation for the GWNIAA designation.

Section 6.0 - presents the Report conclusions and recommendations.

Section 7.0 - provides a listing of references.

All figures and tables referenced throughout this Report are provided immediately following the text. Supporting data and reference material are provided in Appendices A through J, following the tables. All plans are provided in pockets at the end of the Report.

2.0 PHYSICAL SETTING

The regional and general Facility settings have been previously described by CRA (2000a and 2000c). This section provides an overview of the physical setting, with a more detailed evaluation of specific hydraulic parameters provided in Section 4.0, as part of the GWNIAA evaluation.

2.1 REGIONAL SETTING

The following sub-sections summarize the regional setting information for the Facility. For more detailed information, including figures illustrating the following, the reader is referred to the RFI Report (CRA, 2000c) which reproduces maps from the Hydrogeologic Atlas of Michigan (WMU, 1981):

- glacial drift surface deposition;
- glacial drift thickness;
- bedrock geology;
- bedrock topography;
- groundwater flow; and
- river drainage basins.

2.1.1 LAND USE

The Facility location and surrounding land are shown on Figure 2.1. The Facility is bordered on the north by REALM property (i.e., the closed waste management area) on the south by East Coldwater Road, on the west by Horton Street, and on the east by CSX Transportation property and railroad tracks. The Facility is currently zoned for industrial activities, with operations at the Facility dating back to 1952.

The property to the north contains the permitted wastewater treatment sludge mono-fill landfill, former WWTP (demolished by GM in 1999), and a restored wetlands area owned and maintained by REALM. Stanley Road runs east-west immediately north of this adjacent REALM property.

The property immediately south of East Coldwater Road is a mixture of light industrial, commercial, and residential property.

The property to the west, across Horton Street, is primarily residential. Interstate Highway I-475 curves through the area west of Horton Street from an east-west path to the north-south direction.

The property to the east of the Facility contains a railroad right-of-way that is the property of CSX Transportation. The railway tracks within this right-of-way run in a north northwest/south southeast direction.

2.1.2 REGIONAL HYDROLOGY

The Flint River (located approximately 2 miles east of the Facility) runs approximately forty miles across Genesee County and drains the majority of the County. The southern halves of Argentine Township and Fenton Township drain to the Shiawassee River (located approximately 20 miles west of the Facility). Reported average recorded stream flows are 362 million gallons per day (mgd) at the Flint River gauging station near Flint and 231 mgd at the Flint River gauging station near Genesee.

The Flint River has seven main tributaries: Swartz Creek, Thread River, Kearsley Creek, Butternut Creek, Brent Run, Pine Run, and Armstrong Creek. The Misteguay drainage system and Swartz Creek drain the southwest portion of Genesee County. The Thread River and Kearsley Creek drain the southeast portion of the County. The northeast portion of the County is drained by Butternut Creek. Armstrong Creek, Pine Run, and Brent Run drain the western areas of the County.

2.1.3 REGIONAL OVERBURDEN GEOLOGY

The bedrock of Genesee County is covered with glacial deposits. These glacial materials generally thicken from the northwest corner to the southeast corner of the County. Glacial deposits in the northwest corner range between 100 and 150 feet, and increase to 150 to 200 feet in thickness toward the middle of the County. In some small areas in the southeast corner of the County, the glacial cover ranges between 200 and 400 feet in thickness.

Geologic evidence south of Genesee County indicates four major advances of glacial ice in the past two million years (during the Pleistocene period). These glacial advances and the interglacial periods between them left complex deposits of till and stratified drift. Because each subsequent advance reworked deposits from previous advances,

and because the deposits were derived from the same source, it is difficult to distinguish deposits from each separate advance.

The Huron-Erie and Saginaw lobes of the most recent Wisconsinan glaciation carried clay, silt, sand, gravel, and boulders into what is now Genesee County. These materials are deposited in many forms such as till plains, lake plains, moraines, outwash, beaches, bars, and deltas.

The surficial deposits in the vicinity of the Facility consist of soils from the Conover-Brookston and Celina-Conover-Miami, based on information contained in the Soil Survey of Genesee County, Michigan prepared by the United States Department of Agriculture and the Soil Conservation Service. In general, these soil associations are characterized as level to gently sloping, somewhat poorly drained to well drained loams, that have a clay loam subsoil. In combination, the Conover-Brookston and Celina-Conover-Miami soil associations occupy 56 percent of the surficial soils throughout Genesee County.

2.1.4 REGIONAL BEDROCK GEOLOGY

The bedrock of Genesee County is composed of evaporites, carbonates, and clastics that are Paleozoic in age, more specifically, Mississippian and Pennsylvanian. These carbonates, clastics, and evaporates were formed in the Michigan Basin that developed by late Silurian time.

The three uppermost bedrock formations can be found beneath approximately 100 to 200 feet of glacial overburden in Genesee County. The Marshall Formation underlies the whole of Genesee County. This formation is Mississippian in age and ranges in thickness from 100 to 150 feet. The Marshall Formation is fine to coarsely grained, gray and white sandstone with some conglomerate, shale, and dolomite beds.

The Michigan Formation (Mississippian) lies on top of the Marshall Formation, and is between 50 and 210 feet thick. The Michigan Formation is predominantly composed of gray shale with some blue or green shale, and intermittent thick beds of gypsum and dolomite.

The uppermost bedrock formation in Genesee County is the Saginaw Formation (Pennsylvanian). The Saginaw Formation is composed of very fine to coarse, sub-rounded to rounded sandstone and is light gray or brownish gray to grayish brown in color. Crossbedding can often be seen in the Saginaw Formation sandstone. If

crossbedding is observed, it is common to see alternating bands of lighter coarse-grained quartz and darker fine-grained quartz. Sandy shale, shale, coal, and limestone are also found in the Saginaw Formation. The shale is frequently thinly bedded, fissile, micaceous, firm to very hard, and gray to dark gray in color.

2.1.5 REGIONAL HYDROGEOLOGY

Both the glacial overburden and the bedrock in Genesee County have water bearing geologic units. The glacial overburden consists of mainly low permeability tills that are poor sources of groundwater, but lenses of sand and gravel may provide adequate volumes of water for domestic use. The sandstone beds of the Saginaw and Marshall Formations are the best and most commonly used water bearing hydrogeologic units in Genesee County. This is because of the high yields that can be obtained and because bedrock wells in these formations are well protected by overlying clays and are easily maintained.

Rainfall, and subsequent infiltration, is the primary source of recharge for the water bearing units in the glacial overburden. These water bearing units are generally hydraulically connected to the surface waters in Genesee County. As a result, dry weather flow for most streams and rivers is supported by groundwater discharge. Further, water levels and groundwater flow directions in the shallow glacial water bearing units are influenced by local drainage areas such as lakes, creeks, and rivers, which act as points of discharge.

The glacial drift water bearing units may also be locally connected hydraulically to the bedrock water bearing zones. Rainfall is the main source of recharge, and the upland areas in the southern part of the County act as a regional recharge source. The flow direction in the bedrock conforms to a regional pattern and generally moves from recharge areas toward the Flint River, which acts as a general point of groundwater discharge.

The types of material in Genesee County, and their formation are relevant to the potential for aquifer contamination. According to the Hydrogeologic Atlas of Michigan (WMU, 1981) map "Aquifer Vulnerability to Surface Soil Contamination in Michigan", the majority of Genesee County contains moderately or slowly permeable soils over low sensitivity drift material. The Hydrogeologic Atlas of Michigan (WMU, 1981) map "Quaternary Geology of Southern Michigan (upper 1 to 10 meters)", shows that these low permeability soils are predominantly comprised of medium textured tills from end moraines or till plains, lacustrine clays, and lacustrine silts. As a result, groundwater in

glacial overburden is generally of limited extent and usability. In many locations, groundwater may be considered to be present as "groundwater not in an aquifer".

Some unconsolidated water bearing units along the Flint River and in the northwest corner of Genesee County are more vulnerable to contamination according to the Hydrogeologic Atlas of Michigan aquifer vulnerability map. The quaternary geology map (WMU, 1981) indicates that these areas are primarily glacial outwash sands and gravels, postglacial alluvium, or lacustrine sands and gravels. These units would generally be more capable of producing significant yields of groundwater.

2.2 FACILITY SETTING

2.2.1 TOPOGRAPHY

The local topography of the Facility is presented on Plan 1. The Facility is located on a terminal moraine, which is a local topographic high in an area that is generally flat.

2.2.2 SURFACE WATER DRAINAGE

There are no rivers, streams, or surface water bodies located within the Facility's property boundaries. Surface water drainage at the Facility is generally toward a low area that occupies the northwest corner of the adjacent REALM property, to the north of the Facility. Water drainage in the storm sewer network at the Facility discharges northwest of the Facility to Hughes Drain.

2.2.3 HYDROLOGY

The surface water bodies nearest to the Facility are Mott Lake, approximately 2 miles east, and wetlands adjacent to the landfill, approximately 1,500 feet northwest. Mott Lake was created in 1971 with the construction of a 30-foot high dam across the Flint River. The 500-acre lake is used solely for recreational activities, such as fishing, boating, and swimming. The wetlands were created in 1993 and 1994 to replace wetlands damaged during closure of the landfill. The wetlands have an area or approximately 20 acres and a depth of approximately 5 feet, and have been observed to contain water year round.

2.2.4 GEOLOGY

The stratigraphy encountered at the Facility generally consists of a relatively thin (approximately 0 to 10 feet) silt/silty sand unit. The silty sand is comprised of fill used in construction of the facility.

The silty sand unit is underlain by a glacial clay till unit. Boreholes completed during historical investigations at the Facility and residential well logs consistently identified thick clay till at shallow depths within 0 to 10 feet below ground surface both across the area limits of, and in the vicinity of the Facility. The clay till unit was identified to extend to a depth of at least 30 feet, the maximum depth at which the borings were completed during the current RFI sampling program. Borehole logs from pre-RFI investigations and work at the waste management area north of the Facility indicate clay till is on the order of 55 feet thick, before encountering a drift aquifer.

The thickness of the drift aquifer was determined at only one location (PFW-1) to be 14 feet thick. Clay was identified underlying the drift aquifer, but the nature and extent was not determined.

The uppermost bedrock at the Facility, assumed from regional information, is part of the Saginaw Formation of Pennsylvania age, which consists primarily of sandstone, shale, and limestone.

2.2.5 FACILITY HYDROGEOLOGY

The overburden glacial deposits contain one potential water bearing zone (overburden drift aquifer water bearing zone), as well as a discontinuous perched water table zone found near the ground surface (upper 10 to 15 feet). These two zones are separated from each other and from the upper bedrock water bearing zone by thick glacial clay till aquitards. The drift aquifer water bearing zone consists of a sand/silty sand unit that is located below a clay aquitard at a depth of approximately 80 feet below ground surface (bgs). This unit rests on a continuous unit of silty clay glacial till which is assumed to extend to bedrock.

Vertical water movement from the perched water table zone and drift aquifer water bearing zone is severely restricted by the underlying glacial clay till aquitards. Differences in static water levels between the perched water table zone and the drift aquifer water bearing zone confirm that the intervening clay till unit serves as an effective aquitard.

The perched water table flow direction (if present) is controlled by topography. The drift aquifer water bearing zone is protected from any potential impacts within the discontinuous perched water table zone by the glacial clay till aquitard which exists beneath the surface soils. Groundwater flow in the drift aquifer water bearing zone is expected to be westerly or northerly (TechLaw, 1998).

2.3 GROUNDWATER USE

2.3.1 MUNICIPAL SUPPLY

The Beecher Metropolitan District provides the water supply for the Beecher Area (see Figure 2.2) from five wells (wells 3, 4, 5, 6, and 7). Four of the wells are completed within the overburden drift aquifer water-bearing zone at depths of approximately 125, 130, 100, and 89 feet bgs for wells 4, 5, 6, and 7, respectively. The fifth well, well 3, is completed within the bedrock aquifer at a depth of approximately 350 feet bgs. All five wells are located more than 1 mile west of the Facility, at a position that is potentially upgradient with respect to drift aquifer groundwater flow from the Facility. This is discussed more in Section 5.4.1.

2.3.2 RESIDENTIAL SUPPLY

As part of the RFI (CRA, 2000c) a review of private water wells in the vicinity of the Facility was undertaken, with an updated/more comprehensive review represented in the Response to Comments document (CRA, 2002a). As the issue of private water supply is key in the supporting documentation for GWNIAA (see Guidance document in Appendix A), a more detailed discussion is provided in Section 5.5.

3.0 STUDY METHODOLOGIES

The following activities were included in the GWNIAA evaluation:

- literature review of regulations and standard practices for construction of water supply wells;
- installation of shallow monitoring wells in the perched zone in the vicinity of the existing deep overburden drift aquifer monitoring well PFW-1;
- step–testing of PFW-1 to determine well capacity;
- constant-rate pumping test of the deep overburden drift aquifer at PFW-1, with monitoring of hydraulic response in both deep overburden and shallow overburden monitoring wells to determine vertical connectivity;
- single well response (slug) testing of shallow overburden monitoring wells; and
- collection of groundwater samples from both the shallow and deep overburden aquifers.

This GWNIAA evaluation was completed in accordance with the procedures outlined in the RFI Work Plan (CRA, 2000b) and the RFI Work Plan Addendum #2 (CRA, 2002b).

For ease of reference, the following sub-section provides an overview of the methodologies applied in completing the above-noted tasks. Table 3.1 provides a summary table of all scheduled and completed field testing for this GWNIAA evaluation.

3.1 LITERATURE REVIEW

An extensive literature review of published documentation related to groundwater supply for potable water, standard engineering and scientific practices, guidelines, and regulations was undertaken. The purpose of the literature review was to allow formal definition of terminology contained in the MDEQ-WMD guidance document and to determine if there were any regulations that would prohibit use of the shallow overburden at the Facility for potable water supply.

The results of the literature review are provided in Section 4.0 of this report.

3.2 INSTALLATION OF MONITORING WELLS

As per the RFI Work Plan Addendum #2 (CRA, 2002b) shallow monitoring wells were installed surrounding the deep overburden monitoring well PFW-1. The new monitoring wells (MW1-02, MW2-02, MW3-02, and MW4-02) are located between 11 and 56 feet of PFW-1 (see Plan 1).

The monitoring wells were installed at the Site on June 27, 2002. At each location boreholes were advanced using 4 1/4-inch inside diameter (ID) hollow-stem augers (HSA) to the target depth of 15 feet. Samples of the soils were collected in 5 foot lengths using continuous coring techniques, to allow the geologic conditions to be recorded. The soil samples indicated that the shallow overburden consisted of sandy to clayey fill that contained no water, overlying native clay that contained isolated saturated silty sand seams. Therefore, the monitoring well screens (PVC, 5-foot long, 2-inch diameter) were set between 10 to 15 feet below ground surface at each location, within the native clay and straddling the sand seams. A silica sand pack was placed surrounding the well screen and extended 2 feet above the screen. The remaining borehole annulus was filled with a bentonite pellet seal to ground surface, and a lockable protective casing was placed around the PVC riser pipe.

Originally, grab samples of the soil material forming the well screen were scheduled to be collected (CRA, 2002b) to allow for grain size analysis and determination of the Hazen hydraulic conductivity estimate. However, since the screen straddled both sand seams and clay, it was determined that the Hazen conductivity estimate would only be representative of one formation and not the response of the well screen. Therefore, no grain size samples were collected.

Following installation, the monitoring well screens were developed by removal of 5 standing well volumes or until the well went dry, to ensure good hydraulic communication between the screen and the surrounding formation.

3.3 SINGLE WELL RESPONSE TESTS

A single well response test provides an estimate of the hydraulic properties of the formation surrounding the monitoring well screened interval. Single well response tests can be performed in a number of ways; either adding or removing a known volume to the water column to cause an instantaneous change in head (water level), and then monitoring the recovery of the water level to the static condition.

Single well response tests were completed at shallow overburden perched zone monitoring locations MW1-02, MW2-02, MW3-02, MW4-02, MW-3, MW-OBG, PFW-9, and PFW-10. These wells are scattered throughout the Site (Plan 1).

Given that the static water level in several of the wells was within the screen, the bail method was determined to be the most viable procedure for the single well response tests.

The field procedure consisted of obtaining an initial static water level followed by a second water level reading if the monitoring location required installation of poly-tubing and a foot-valve to account for any displacement of the water column. The entire standing water column in the monitoring well was rapidly removed by pumping with the foot-valve assembly, and discharged into a graduated bucket in order to determine the total volume removed. Water level measurements were obtained at the end of pumping and then recorded approximately every 10 seconds until the time for a change in water level to be realized was greater than 10 seconds. Water level measurements were then monitored every 30 seconds until the time for a change in water level to be realized was greater than 30 seconds. This process was repeated in intervals of approximately 1, 5, 10, 30, and 60 minute periods. None of the tested wells recovered to within 80 percent at the end of day, therefore a final reading was obtained at least 24 hours after the start of the test.

3.4 STEP-DRAWDOWN TEST

A step-drawdown test allows for calculation of the specific-capacity and long-term yield of a well, and therefore an appropriate rate for a constant-rate test. A step-drawdown pumping test was performed at deep overburden drift aquifer monitoring well PFW-1 on October 7, 2002.

The step-drawdown test consisted of pumping the well for one-hour at each of three different flow rates using a Grundfos pump, starting from the lowest flow rate and progressing to the maximum which was determined using well construction details. The field procedure consisted of obtaining an initial static water level reading, and then recording the water level during each of the different pumping rates in time intervals starting at 30 seconds and increasing to one, two and finally five minutes.

The first step was initiated at a rate of 4 gallons per minute (gpm); however, the rate was quickly reduced to only 1 gpm as it became evident that 4 gpm was too high a rate. The

second and third steps were completed at pumping rates of 2.75 and 4.625 gpm, respectively.

Originally, a step-drawdown test was also scheduled for well B-23D; however, the well was unable to be pumped even at very low rates without going dry, so testing was not completed.

3.5 CONSTANT RATE PUMPING TESTS

A constant-rate pumping test allows for monitoring the hydraulic response of the pumped aquifer and also the response of other stratigraphic units (i.e., perched zone) to pumping of the aquifer. If no hydraulic response is observed in the perched zone during testing, it can be concluded that there is no hydraulic connection between the aquifer and the perched zone. The rate for the constant pumping test is determined from the step-drawdown test.

A constant rate pumping test was performed at PFW-1 while measuring water levels at monitoring wells MW1-02, MW2-02, MW3-02, MW4-02, MW-1, MW-3, MW-OBG, PFW-2, PFW-9, PFW-10, PFW-11, B-9, B-22D, and B-23D (see Plan 1 for locations). The test was initiated at 9:30 a.m. on October 8, 2002 and terminated at 10:00 a.m. on October 9, 2002. The pumping rate was 4.7625 to 4.875 gpm throughout the test, with the exception of an approximate 45 minute period at 2:00 p.m. on October 8, 2002 when the generator failed. During the test, and for a period of 24 hours following shutdown, water levels were measured in the monitors outlined above.

Since groundwater levels can be influenced by climatic conditions, barometric pressure and precipitation data for the Flint Airport were obtained from the National Weather Service website.

3.6 GROUNDWATER SAMPLING

To evaluate the groundwater quality of the deep overburden drift aquifer both for comparison to the shallow overburden quality and to determine disposal options for water removed during the pumping tests, groundwater samples were collected from PFW-1 during the constant-rate pumping test.

Groundwater samples were collected at the discharge line at 1 hour, 12 hours, and 24 hours intervals following the start of pumping and analyzed for VOCs and filtered lead.

4.0 OVERVIEW OF GWNIAA CONCEPTS

4.1 MDEQ GUIDELINES

4.1.1 WASTE MANAGEMENT DIVISION

The MDEQ Waste Management Division (WMD) had developed an interpretive guidance document, for use by MDEQ-WMD staff, that outlines two recommended guidelines listed below to demonstrate that groundwater beneath a site is Groundwater Not In An Aquifer (GWNIAA). For ease of reference, the MDEQ-WMD guidance document is provided in Appendix A.

1. the formation yields an insignificant amount of water below the site; and
2. the groundwater in question is not in hydraulic communication with groundwater in an aquifer.

The guideline outlines possible methods to show that these two guidelines have been met. Additionally, a number of other types of useful information are outlined in the guidance document and include typical hydrogeologic information such as cross-sections, groundwater elevation data, groundwater chemistry data, and information related to local groundwater use. For a complete listing, the reader is referred to pages 3 and 4 of the Guidance presented in Appendix A.

4.1.2 STORAGE TANK DIVISION

The MDEQ Storage Tank Division (STD) has developed Operational Memorandum No. 11, which is a guidance document for use by MDEQ-STD staff to eliminate the potable groundwater pathway. For ease of reference, the MDEQ-STD guidance document is provided in Appendix B.

The four criteria established by the MDEQ-STD to demonstrate that the groundwater beneath a site is of insufficient quantity to meet the definition of aquifer are:

1. the groundwater formation below the site must yield an insufficient quantity of water considering local and regional hydrogeology;
2. demonstrate that a continuous confining layer exists across the entire site, and that a saturated zone is not in lateral or vertical communication with a lower adjacent aquifer;

3. provide supporting documentation regarding regional and site-specific hydrogeology and groundwater use; and
4. monitoring wells must be properly constructed, and developed in accordance with standard operating practices.

Much of the specific information required by the MDEQ-STD document are the same as those outlined in the MDEQ-WMD document. Therefore, this evaluation will focus on the requirements of the MDEQ-WMD document.

4.2 TECHNICAL CONCEPTS

In order to fully evaluate the hydrogeologic conditions at the Facility against the MDEQ-WMD guidelines, there are a number of key terms used in the guidelines that require some discussion and definition.

4.2.1 DEFINITION OF AN AQUIFER

According to Michigan Public Act 451, Part 201 administrative rules (R299.5101(c)), the Code of Federal Regulation (CFR, Part 40, Section 149.2) and the MDEQ-WMD GWNIAA Guideline, an aquifer is defined as "... *a geological formation, group of formations, or part (portion) of a formation that is capable of yielding a significant amount of groundwater to wells or springs*". The MDEQ-WMD GWNIAA Guideline goes on to define a formation as *"a unique lithologic unit that can be mapped, but does not include a unit composed of material that has been physically or chemically altered, transformed, or used during a manufacturing process..."*. Therefore, the term "geologic formation" implies that the geologic media within such a unit are native to the region, and as such, a water bearing zone consisting of fill material would not be considered an aquifer. This concept is applicable to many situations, including:

- sites with engineered permeable backfill;
- sites with backfill such as construction rubble and debris;
- backfilled excavations (e.g., UST removals/closures/former basements); and
- landfills.

4.2.2 SIGNIFICANT YIELD

Of particular note in the definition of an aquifer is the concept that there must be a "significant" yield. However, the term significant is undefined in hydrogeologic terms. Webster's Collegiate dictionary defines significant as *"having meaning"* or *"having or likely to have influence or effect: Important"*, as well as *"measurably large amount"*.

The concept of yield is defined in hydrogeologic terms, and refers to either well yield or specific yield. Specific yield is *"the volume of water that an unconfined aquifer releases from storage per unit surface area of aquifer per unit decline of the water table"* (Kruseman and de Ridder, 1994). Well yield is *"the volume of water per unit time discharged from a well, either by pumping or free flow. It is measured commonly as a pumping rate in gallons per minute or cubic metres per day"* (Driscoll, 1986). Therefore, specific yield deals with the aquifer as a whole whereas well yield focuses on each individual well.

Significant yield can be interpreted as a large enough well yield for water supply purposes. Therefore, in general, the concept of significant yield can be interpreted as follows:

1. to be important; and
2. to be a measurably large amount.

These concepts, although similar, require serious review in order to determine if the groundwater in question can be classified as groundwater in an aquifer. Factors that need to be considered include:

- the availability of municipal water supplies;
- prohibitions against water wells;
- presence of better yields and water quality in other aquifers; and
- presence of a routinely utilized aquifer versus a shallow water bearing zone.

4.2.3 WATER CONSUMPTION AND SUPPLY NEEDS

From a practical standpoint, groundwater wells must have a sustainable yield to be useful as a water supply. The following is a review of available information to determine an objective numerical quantity that could meet this requirement for a typical family of four that uses a groundwater well as the primary source of water.

The United States Geological Survey (USGS) has published an "Estimated Use of Water in the United States in 1995" (USGS, 1998), which provides quantitative information on national water consumption trends. Their research showed that *"the average water consumption in the United States is approximately 101 gallons per capita per day for domestic purposes (i.e., drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns)"* (USGS, 1998).

For a family of four this equates to an average daily household consumption of 404 gallons. The majority of water is used over a six-hour period within a household (Tchobanoglous & Schroeder, 1985). This equates to a minimum rate of approximately 1.1 gpm, which does not account for peak flow conditions.

To account for peak flow conditions, the minimum required yield from a groundwater well can be calculated from the following formula developed by the Connecticut Well Drillers Association which considers well storage, well flow (or yield), peak load, and peak load time (Hunt, 1978):

$$Yield \geq \frac{peakload - storage}{peaktime} \qquad \text{[Equation 1]}$$

Using this formula, for a family of four with two bathrooms and a well storage volume of 100 gallons, the required well flow to sustain a 4-person household would be approximately 4.5 gpm.

4.2.4 WATER SUPPLY REGULATIONS

Well Yield

Several states and many counties or regional health departments within the State of Michigan, have a variety of regulations governing water supply wells that specify minimum yield requirements.

For example, the former MDEQ Drinking Water and Radiological Protection Division (DWRPD), now the water division, made recent revisions to the Administrative Rules on the Subdivision of Land, Section R 560.411, which specifies a pumping rate requirement for domestic use. The new rule states that a *"water well drilling contractor shall perform a yield or performance test to demonstrate that water can be withdrawn from an on-site water supply well for drinking and household purposes at a sustained pumping rate which is not less*

than 10 gpm and which meets or exceeds peak water demand for not less than a 4-hour period of time."

Another example relating specifically to yield, is the Washtenaw County minimum well construction requirements for single-family residential water supply wells, which states *"Yield: Seven gpm for two hours of continuous pumping without interference with or from neighboring wells. Ten gpm for four hours for wells located in subdivisions…".*

Well Construction

In addition to regional and state requirements for minimum yield, there are also examples of rules which specify well construction requirements such as minimum well depths.

For example, MDEQ-DWRPD Section R 325.1632(3) and Section R 325.10818 state that *"A casing shall extend not less than 25 feet below, and terminate not less than 12 inches above, the ground surface."* Accordingly, any surficial water bearing unit that has an underlying confining unit that is less than 25 feet below land surface cannot be legally used as a water supply in Michigan.

Administrative Rules on the Subdivision of Land, Section R 560.408 state that the following methods of well protection shall be given consideration in order to construct a water supply free of contamination:

"a) Penetration of an impervious layer which is of sufficient areal extent, but which is not less than 10 feet thick.

b) Maintaining a minimum of 50 feet from static water level to the bottom of the casing or top of the screen in an unconfined aquifer.

c) An increase in the minimum horizontal isolation distance between the well and a source from which groundwater contamination may occur.

d) A combination of the methods in subdivisions (a), (b), and (c) of this sub-rule or another method that the department determines will provide adequate protection for the on-site water supply."

Groundwater Use

In addition to well yield requirements, the former MDEQ-DWRPD has made recent revisions to the Administrative Rules on the Subdivision of Land, Sections R 560.401 to R 560.405, prohibiting the use of shallow wells to obtain water for drinking or household

purposes. The new rule is stated as follows *"...water for drinking or household purposes that is intended to furnish new dwellings located in a subdivision or on a development site less than one acre in size, shall not be obtained from a dug well, crock well, hauled water system, cistern, surface water body, spring, or other similar device."*

This rule is clearly intended to prohibit the use of shallow perched water zones as domestic water supply.

5.0 GWNIAA EVALUATION

5.1 STRATIGRAPHIC CONDITIONS

The stratigraphic conditions at the Site can be generally described by the following stratigraphic units (in descending order):

- concrete/asphalt or topsoil;
- silty sand to sandy clay fill;
- clay till with occasional sand/silt seams;
- sand/silt aquifer unit;
- silt/clay till; and
- bedrock.

The upper four units have been confirmed through drilling at the Facility during numerous investigations. The lower two units are inferred based on regional conditions and from review of water well records. Figure 5.1 shows a typical cross-section with approximate thicknesses for each unit. Additionally, using the Facility-specific geologic information (borehole logs) three cross-sections have been prepared, with the locations presented on Plan 1 and the sections illustrated on Plan 2.

A review of the cross-sections on Plan 2 confirm and illustrate the general stratigraphic conditions previously described. Not accounting for the thin cover material (topsoil or concrete/asphalt) the upper 5 to 10 feet of material across the Facility can be described as a silty sand fill. The upper silty sand is actually fill material and not a native formation. Based on the definition of an aquifer presented in the guidelines, fill material is not to be considered an aquifer.

This layer is underlain by a clay till, with occasional very thin (less than 1 foot) sand seams within 30 feet of ground surface. The clay till is approximately 55 feet thick; however, given the limited number of deep boreholes at the Facility, generation of an isopach map showing the thickness of the till is not feasible, but Cross-Section C-C' (Plan 2) clearly shows that the thickness across the facility is quite uniform.

The clay till is underlain by a silt/sand water bearing formation. At PFW-1 the silt/sand unit appears to have been fully penetrated during drilling, with clay reported at the base of the log, and a total aquifer thickness at this location of 14 feet. At B-22D and B-23D the lower aquifer has not been fully penetrated, so the thickness can not be defined but is at least 3 and 4.5 feet, respectively.

5.2 REGIONAL AQUIFER MAPPING

Figure 5.2, a reproduction of the Drift Aquifer Characterization map from WMU (1981), maps four main classifications of drift that have been defined for Michigan based on a detailed review of available data from numerous sources (WMU, 1981). A review of Figure 5.2 illustrates that the Facility is located at the junction of Type II and Type IIIB material. Type II is drift that generally does not represent an aquifer, although thin interbedded aquifers may be present at depth. Type IIIB is drift that may or may not represent an aquifer at or near the surface, but generally consists of interbedded aquifers, aquicludes, and aquitards at depth. This regional mapping supports the designation of the upper perched zone at the Facility as GWNIAA.

5.3 HYDROGEOLOGICAL CHARACTERISTICS

5.3.1 SHALLOW PERCHED ZONE

During historical investigations conducted at the Facility, perched groundwater within the shallow silty sand was generally found to be absent. When present, it was intermittent and discontinuous in nature and is associated with engineered permeable fill placed during the construction of the plant. The discontinuous perched water table is underlain by a glacial clay till aquitard.

Water Levels

Water levels in the perched zone have been measured historically, with results summarized in the Description of Current Conditions Report (CRA, 2000a) and the RFI Work Plan (CRA, 2000b). During the recent field activities at the Site water levels were measured at all available perched zone monitoring wells. The results are summarized on Figure 5.3, and show that the presence of water in the perched zone is somewhat sporadic and generation of groundwater flow contours is not possible on Site.

The water levels at MW1-02 to MW3-02 are also shown on Cross-section C-C' on Plan 2, and illustrate that even in wells in close proximity to each other, the water levels are significantly different. This illustrates that the groundwater is indeed perched within the individual sand seams at the various monitoring well locations, and does not represent a true water table or aquifer. Given the highly variable nature of the water

levels, generation of isopach maps showing the saturated thickness of the perched zone is not feasible.

Hydraulic Conductivity

Testing of the shallow perched zone for estimates of hydraulic conductivity have been completed during numerous investigations, both at the Facility and on the adjacent waste management area property. Hydraulic conductivity is a measure of *"the rate of flow of water in gallons per day* [typically expressed in cm/s] *through a cross-section of one square foot under a unit hydraulic gradient"* (Bates and Jackson, 1984). Therefore, material with a high hydraulic conductivity will be able to transmit large quantities of water and conversely materials with a low hydraulic conductivity will not allow large quantities of water to be transmitted.

Estimates of hydraulic conductivity can be made using several different techniques, including the method of Hazen (1911) based on grain size distribution, laboratory permeameter tests with either constant or falling head on soil samples, and slug/bail testing of monitoring wells. These methods have all been used at the Facility, meaning the results will not be biased by a single estimation method.

Table 5.1 provides a summary of hydraulic conductivity and flow velocity testing completed historically at the waste management area north of the Facility. A review of Table 5.1 shows that both horizontal and vertical hydraulic conductivities have been estimated for the perched zone. The horizontal hydraulic conductivity values range from 4.4×10^{-4} cm/s for samples of the sand seams to 1.3×10^{-7} cm/s for the silty fill. More importantly; however, are the vertical hydraulic conductivity estimates ranging from 3.6×10^{-7} to 2.1×10^{-8} cm/s, which clearly indicate that vertical movement of water that may be present in the perched zone will be very limited.

Testing for hydraulic conductivity of the silty sand perched zone was completed using the Hazen equation based on grain size distribution as part of the RFI (CRA, 2000c). Table 5.2 provides the results, which indicate bulk hydraulic conductivities (not differentiated between horizontal and vertical) of 1.2×10^{-6} and 2.0×10^{-7} cm/s.

As part of this GWNIAA evaluation bail tests were completed at eight monitoring wells screened within the silty sand fill or sand seams within the upper portions of the clay till where water was first encountered at these locations. The raw data and analysis are provided in Appendix D, with the results summarized in Table 5.3. The bulk hydraulic conductivities estimated from this method ranged from 3.6×10^{-6} to 1.6×10^{-8} cm/s.

Based on the various testing and data presented above, it is clear that the hydraulic conductivity of the upper perched zone as a whole is less than 1.0×10^{-6} cm/s. A few results are slightly greater than 1.0×10^{-6} cm/s, but these represent discrete locations where a sand seam is present, not the overall nature of the upper perched zone.

Well Recovery Rates

During the bail tests conducted at the Facility in October 2002, it was noted that the wells were very slow to recover. The wells were bailed dry on October 15, 2002 and the recovery was monitored until the end of that day, and again in the morning and afternoon of October 16, 2002. Table 5.4 summarizes the percent recoveries achieved during the monitored period. At MW1-02, MW2-02, MW3-02, MW4-02, MW-OBG, and PFW-10 in periods ranging from 24 to 35 hours of elapsed time since bailing, the monitoring wells recovered to between only 19.8% and 52.4% of their pre-bail water levels. At PFW-9, 16.5 hours following bailing the water level had recovered 78.3%, and by 28.5 hours recovery was on the order of 80%. The one exception was monitoring well MW-3, which recovered to 89% of its static water level in 17.4 hours and remained basically unchanged at the 29.7 hour mark.

5.3.2 TILL AQUITARD

The hydraulic conductivity of the clay till unit, which separates the silty sand fill perched zone from the drift aquifer, has also been determined. Table 5.1 presents historical values from the waste management area to the north of the Facility, indicating horizontal hydraulic conductivity ranging from 6.7×10^{-5} to 4.9×10^{-7} cm/sec, and a vertical hydraulic conductivity ranging from 2.2×10^{-8} to 1.5×10^{-8} cm/sec. Table 5.2 presents bulk hydraulic conductivity Hazen (1911) estimates based on grain size distribution curves for samples collected during the RFI (CRA, 2000c), with results ranging from 4.9×10^{-7} to 1.2×10^{-8} cm/sec. Table 5.5 provides bulk hydraulic conductivity estimates based on constant head permeameter tests from the RFI (CRA, 2000c), with results in the range 8.1×10^{-8} to 5.5×10^{-9} cm/sec.

These low hydraulic conductivity values for the till aquitard indicate that the movement of water from the perched zone to the drift aquifer would be extremely slow, if at all.

5.3.3 DEEPER DRIFT AQUIFER

Well Yield

The capacity of the drift aquifer at PFW-1 was determined from the step-drawdown testing completed during the current study. The data and analysis are provided in Appendix E, and indicate that PFW-1 is capable of pumping at a maximum rate less than 14.5 gallons per minute (gpm) based on the length of the available water column in the well at the time of the step test. A step-drawdown test was also attempted at well B-23D located at the adjacent waste management area; however, the well was unable to be pumped even at very low rates without going dry, so testing was not completed. This may reflect the fact that B-23D is not a fully penetrating well and the screen in fact straddles the upper portion of the drift aquifer and the lower portion of the clay till (see Cross-Section C-C, Plan 2).

It is important to note that these results are reflective of the conditions at PFW-1 and B-23D specifically, and would vary for wells of differing construction (i.e., diameter) within the same formation.

Hydraulic Conductivity

The hydraulic conductivity of the drift aquifer was determined for monitoring wells at the waste management area north of the Facility by Chester Engineers (1986) to be on the order of 9.2×10^{-4} to 1.2×10^{-4} cm/sec, typical for silty sand aquifers (Freeze and Cherry, 1979).

As part of the constant-rate pumping test completed during the current study, estimates of the transmissivity and hydraulic conductivity were made for the drift aquifer at PFW-1. The data and analysis are provided in Appendix F, and summarized in Table 5.6. The estimated hydraulic conductivity from the constant rate test drawdown and recovery data in the pumped well are 3.0×10^{-2} and 2.4×10^{-2} cm/sec, respectively, typical for clean sand aquifers (Freeze and Cherry, 1979). It is important to note that this is an estimated value only, as analysis of data from the pumped well during a constant-rate test provides an approximation only.

The two orders of magnitude difference in the results may be reflective of the difference in screen positioning, as discussed above, with the lower hydraulic conductivity value represented where the screens straddled both the clay till and the upper portions of the drift aquifer.

5.4 HYDRAULIC COMMUNICATION BETWEEN PERCHED ZONE AND DRIFT AQUIFER

5.4.1 DISTINCT FLOW ZONES

Groundwater elevation data from the waste management area to the north of the Facility reveals that the perched zone and drift aquifer are two distinct flow systems. The discontinuous perched zone has a flow direction and gradient controlled by topography, which is generally to the northwest as presented on Figure 5.4. The water in the drift aquifer has a direction and gradient independent of the water in the perched zone, with a gradient of approximately 0.008 in the south direction as presented on Figure 5.5, generally towards Mott Lake. This gradient is important to note in relation to the position of the municipal supply wells discussed in Section 2.3.1. The municipal wells are west of the Facility, and therefore are located in an upgradient position with respect to groundwater flow.

5.4.2 DRIFT AQUIFER WATER LEVELS

The water levels measured in the drift aquifer monitoring wells PFW-1, B-22D, and B-23D are illustrated on cross-section C-C' (Plan 2). A review of the water levels provides some powerful supporting documentation for identifying the perched zone as GWNIAA.

A review of the water levels in the drift aquifer within the overall stratigraphic context shows that, in contrast to that which has been historically presented, at PFW-1 the drift aquifer is in fact not confined hydrogeologically. By definition, a confined aquifer (also known as an artesian aquifer) is one in which the *"groundwater* [is] *under sufficient hydrostatic pressure to rise above the aquifer containing it"* (Bates and Jackson, 1984). This means that when a monitoring well is constructed in a confined aquifer the measured water level in the monitoring well should be higher than the base of the overlying confining unit. However, as shown on cross-section C-C' (Plan 2) at PFW-1 the water level in the monitoring well is not only within the aquifer unit, but within the monitoring well screen itself. The monitoring well is constructed as a partially-penetrating well, meaning the base of the well screen is set at the base of the aquifer but does not extend to the top of the aquifer. Given the water level is within the screen, this indicates that there is in fact an unsaturated zone at the top of the drift aquifer. Perched groundwater is defined as *"unconfined groundwater separated from the underlying main body of groundwater by unsaturated rock* [or soil]" (Bates and Jackson,

1984). Hydrogeologically, the presence of the unsaturated zone means that there is no hydraulic connection between the drift aquifer and the perched zone, and therefore the perched zone can be classified as GWNIAA.

5.4.3 PUMPING TEST RESULTS

To confirm the absence of a hydraulic connection between the drift aquifer and the perched zone, a minimum 24 hour constant rate pumping test was conducted at PFW-1, while monitoring the water levels in the available perched zone monitoring wells at the Facility, and also some drift aquifer monitoring wells at the waste management area north of the Facility. The data collected during the constant-rate pumping test are provided in Appendix F, with a summary provided in Table 5.7. Climatic data, specifically precipitation for the months of September and October 2002, and barometric pressure for the testing period, are provided in Appendix G.

A review of the hydrographs provided in Appendix F clearly indicate that with the exception of the pumped well (PFW-1) no response to pumping was observed during the testing. The water levels in some of the perched zone monitors (MW1-02, MW2-02, MW3-02, MW4-02, PFW-9, and B-14) did show a decreasing trend over the monitored period, which included time before, during, and after pumping, but the trend is a steady overall decline in water levels and not a response to pumping (see hydrographs in Appendix F). Since the month of October 2002 was characterized by very low precipitation levels after several storm events in September 2002 (see Appendix G), the decreasing trend is interpreted to reflect decreasing water levels due to the low precipitation levels since water in the perched zone is directly related to precipitation levels.

The hydrographs for monitoring wells B-22D and B-23D, located at the waste management area and screened within the upper portion of the drift aquifer and the lower portion of the clay till, indicate that the water levels did not respond to pumping. The water levels at these two locations actually show an initial increase in water levels following initiation of pumping and then somewhat sporadic water levels for the remainder of the monitored period. As discussed in the proceeding subsection, the water levels in these wells are not truly indicative of the drift aquifer but a combination of the aquifer and overlying aquitard, and the water levels show some indication of being under confined conditions. A comparison of the water levels in B-22D and B-23D (Appendix F) to the barometric pressure graph (Appendix G) indicates that when the barometric pressure dropped the water levels rose, and conversely when the barometric pressure rose the water levels dropped. This is a known phenomena in confined

aquifers (Walton, 1987), and indicate there was no response to pumping at these locations. Perched zone monitors MW-1, MW-3, MW-OBG, PFW-2, and PFW-11 also showed a similar but slightly muted response to that seen at B-22D and B-23D, and do not reflect a response to pumping at PW-1.

Perched monitoring well PFW-10 showed a rise in water level throughout the pumping test, the cause of which is not known with certainty, but is clearly not a response to pumping of the drift aquifer.

5.5 GROUNDWATER USE

5.5.1 WATER WELL RECORD SEARCH

A water well inventory was completed and presented as part of the RFI Report (CRA, 2000c) with an updated search provided in the Response to Comments Document (CRA, 2002a). In total, 216 well records were identified within a 1.5 mile radius of the Facility. Attachment E of the Response to Comments Document (CRA, 2002a) provides copies of each well record, but a summary is provided in Table 5.8 of this Report. The wells have been plotted on Figure 5.6, with all wells that obtain water from the bedrock shown in blue and all wells that obtain water from the overburden shown in brown. As indicated on Figure 5.6, of the 216 well records identified, only 16 obtain water from an overburden, or drift source. A review of Table 5.8 shows that at all 16 of these wells, the screen is at a depth of 26 feet or greater, with the majority screened at depths greater than 60 feet. The 60-foot depth corresponds with the approximate depth of the drift aquifer at the Facility, confirming the perched zone is not used as a water supply and can be classed to GWNIAA. The one well (#14) that obtains water from a depth of 26 feet is located close to Mott Lake.

Using the water well records for the wells located along Coldwater Road, a cross-section (Figure 5.7) has been drawn to illustrate the geologic conditions. Although the water well records used to generate the figure were prepared by water well drillers and likely reflect rotary drilling methods showing only the significant layers, Figure 5.7 indicates both the continuity of the clay aquitard and the fact that the bedrock and not the overburden is the primary aquifer used for water supply in the area.

5.5.2 INPUT FROM LOCAL HEALTH DEPARTMENT

The Genesee County Health Department was contacted regarding their requirements for sufficient water yield in water well construction. In Chapter IV of the Genesee County Environmental Health Regulations (Water Well Construction, Abandonment, and Groundwater Protection Regulation), "safe and adequate water supply" is defined as follows: *"Safe and adequate water supply" means a water supply which is constructed and located in such a manner as to provide water which will not endanger the health of the user and which provides sufficient water yield and pressure to operate all connected plumbing fixtures."* Based on the results presented in this section, it is clear that the shallow perched zone at the Facility would not be considered a safe and adequate water supply.

The local health department has not provided any input/comment on the designation of the shallow perched zone at the Facility as GWNIAA; however, since the perched zone can not be used for water supply it is considered beyond their purview to provide comment.

5.5.3 WELL HEAD PROTECTION AREAS

The MDEQ-DWRPD was contacted to determine if the Facility was located in or near an approved Local Wellhead Protection Area (LWPA). MDEQ-DWRPD determined that the Facility was not located in a delineated wellhead protection area and that the nearest wellhead protection area is approximately 10 miles east-southeast of the Facility in Davison (see Appendix H).

5.6 GROUNDWATER QUALITY DATA

5.6.1 DRIFT AQUIFER WATER QUALITY

As part of the constant-rate pumping test, three groundwater samples from the drift aquifer at PFW-1 were collected and analyzed for volatile organic compounds (VOCs) and dissolved lead. The analytical results and data validation report are provided in Appendix I, with the sample key provided in Table 5.9 and a summary table of the results provided in Table 5.10. The results indicate that no VOCs or dissolved lead were detected in any sample from PFW-1.

5.6.2 COMPARISON OF PERCHED ZONE AND DRIFT AQUIFER

Background groundwater quality data from the waste management area north of the Facility shows that the perched zone contains significantly lower conductivity and concentrations of calcium and bicarbonate when compared to the data from the drift aquifer (Dames and Moore, 1980).

Groundwater monitoring was initiated at the waste management area to the north of the Facility in 1980. The Chester Engineers began a RCRA detection monitoring program in 1981, following Dames and Moore's initial groundwater assessment in 1980. During 1983, the initial RCRA monitoring system detected statistically significant changes in levels of pH and specific conductivity within the upper perched zone. These changes prompted the initiation of a groundwater assessment program in 1984.

The groundwater quality assessment program involved comprehensive analysis of groundwater from both the upper perched zone and the drift aquifer. The analytical parameters included the RCRA indicators, site specific indicators, and drinking water parameters, as well as volatile organic compounds, cyanide, chromium, copper, lead, nickel, and zinc (Chester Engineers, 1986). The groundwater quality assessment program conducted by Chester Engineers did not indicate the presence of hazardous waste constituents in either the upper perched zone or the drift aquifer, with the exception of detectable levels of chromium and lead in the upper perched zone in the area of the abandoned sludge lagoons north of the plant. The presence of these compounds in the perched zone and not the drift aquifer indicates that there is not a hydraulic connection between the two units.

5.7 FACILITY SEWER SYSTEM

Available details on the sewer system at the Facility are shown on the plan provided in Appendix J.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Based on the data and evaluation presented herein, the following conclusions are reached:

Fulfillment of GWNIAA Guideline #2

Based on the hydraulic conductivity data and well recovery rate data, it can be concluded that the perched zone has a hydraulic conductivity less than 1.0×10^{-6} cm/sec and wells purged dry do not recharge to within 80 percent of the original well volume within 24 hours, and therefore, meet Guideline #1 of the MDEQ-WMD GWNIAA Guidance document.

Fulfillment of GWNIAA Guideline #2

Based on the results of the pumping test and the detailed review of the hydrogeologic conditions, specifically the prevailing unconfined conditions of the drift aquifer, it can be concluded that the perched zone and drift aquifer at the Facility are not hydraulically connected, and therefore meet Guideline #2 of the MDEQ-WMD GWNIAA Guidance document.

Other Information Requirements

The information presented in the RFI Report (CRA, 2000c), the Response to Comments Document (CRA, 2002a), and this GWNIAA evaluation address the categories listed in the MDEQ-WMD GWNIAA Guidance Document.

6.2 RECOMMENDATIONS

The shallow perched zone at the Facility should be designated as Groundwater Not In An Aquifer (GWNIAA), and the groundwater ingestion exposure pathway should be eliminated in accordance with Michigan Act 451, Part 201.

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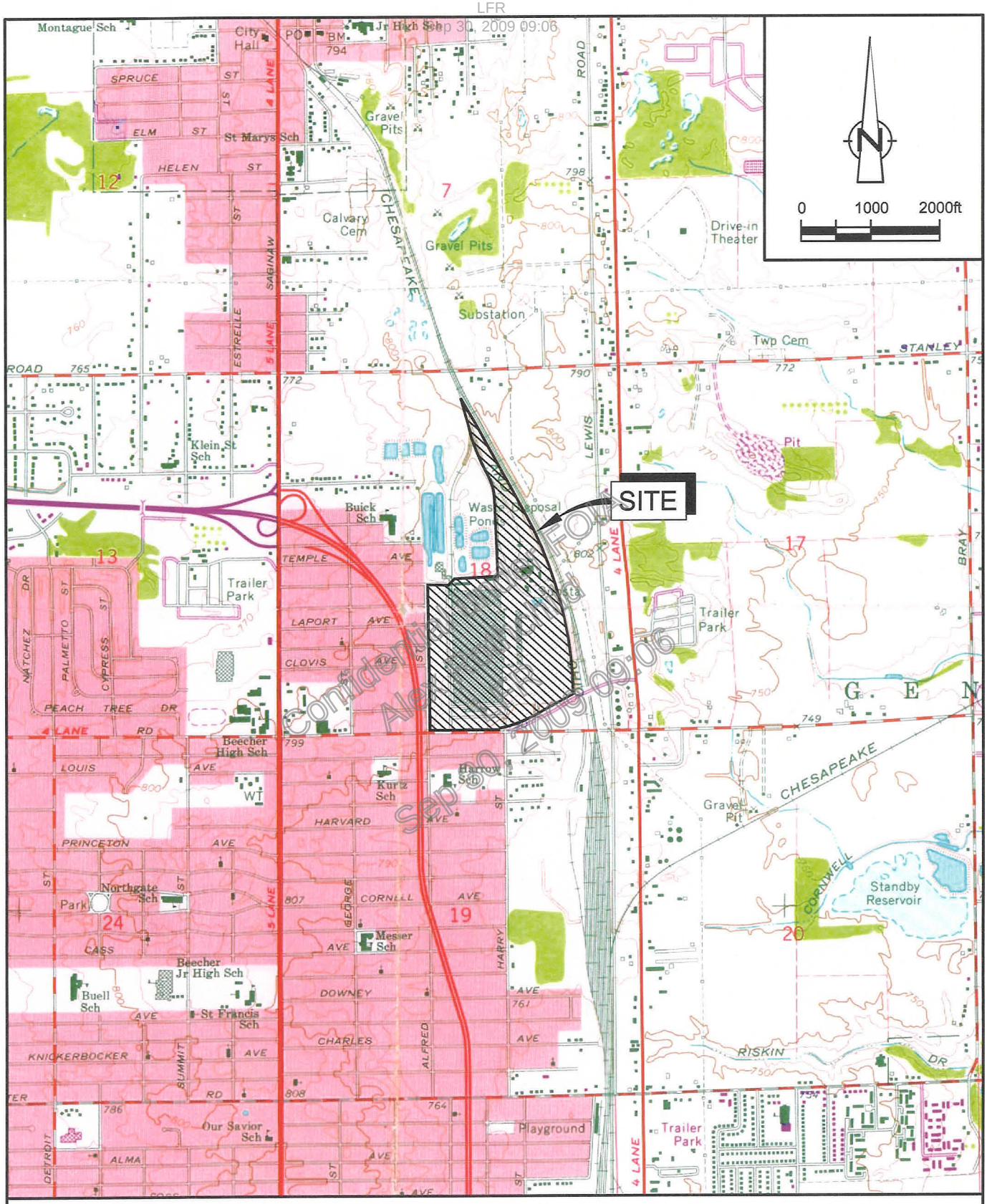
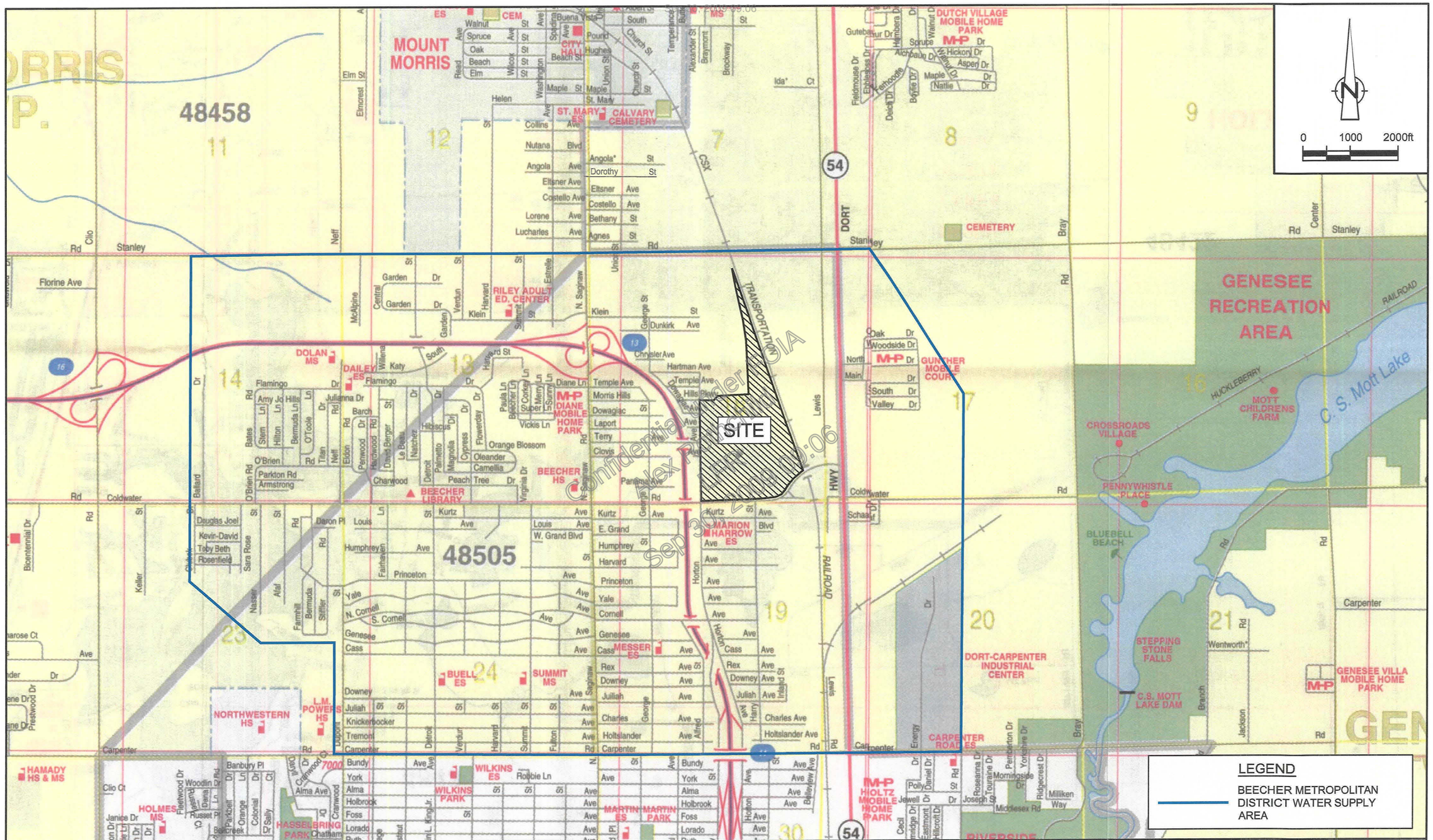


SOURCE: USGS QUADRANGLE MAP;
FLINT NORTH, MICHIGAN

figure 2.1

FACILITY LOCATION
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(025)GN-WA001 JAN 03/2003



SOURCE: UniversalMAP;
GREATER FLINT & GENESEE COUNTY, MICHIGAN STREETMAP

LEGEND

BEECHER METROPOLITAN DISTRICT WATER SUPPLY AREA

figure 2.2

BEECHER METROPOLITAN DISTRICT WATER SUPPLY AREA
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(025)GN-WA005 JAN 27/2003

GEOLOGIC UNIT	HYDROGEOLOGIC UNIT	GROUNDWATER DESCRIPTION	THICKNESS (FEET)
SILTY SAND (FILL)	PERCHED WATER TABLE ZONE	UNCONFINED PERCHED WATER TABLE	0 - 10
CLAY (TILL)	UPPER CONFINING UNIT	AQUITARD / AQUICLUDE	~55
SAND/ SILTY SAND	OVERBURDEN WATER BEARING ZONE DRIFT AQUIFER	UNCONFINED / SEMI-CONFINED	~14
SILT/ CLAY (TILL)	LOWER CONFINING UNIT	AQUITARD	30-75 (BASED ON REGIONAL INFORMATION)
SANDSTONE/ LIMESTONE/ SHALE	BEDROCK WATER BEARING ZONE	CONFINED	100+ (BASED ON REGIONAL INFORMATION)

figure 5.1

TYPICAL GEOLOGIC CROSS-SECTION
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

CRA

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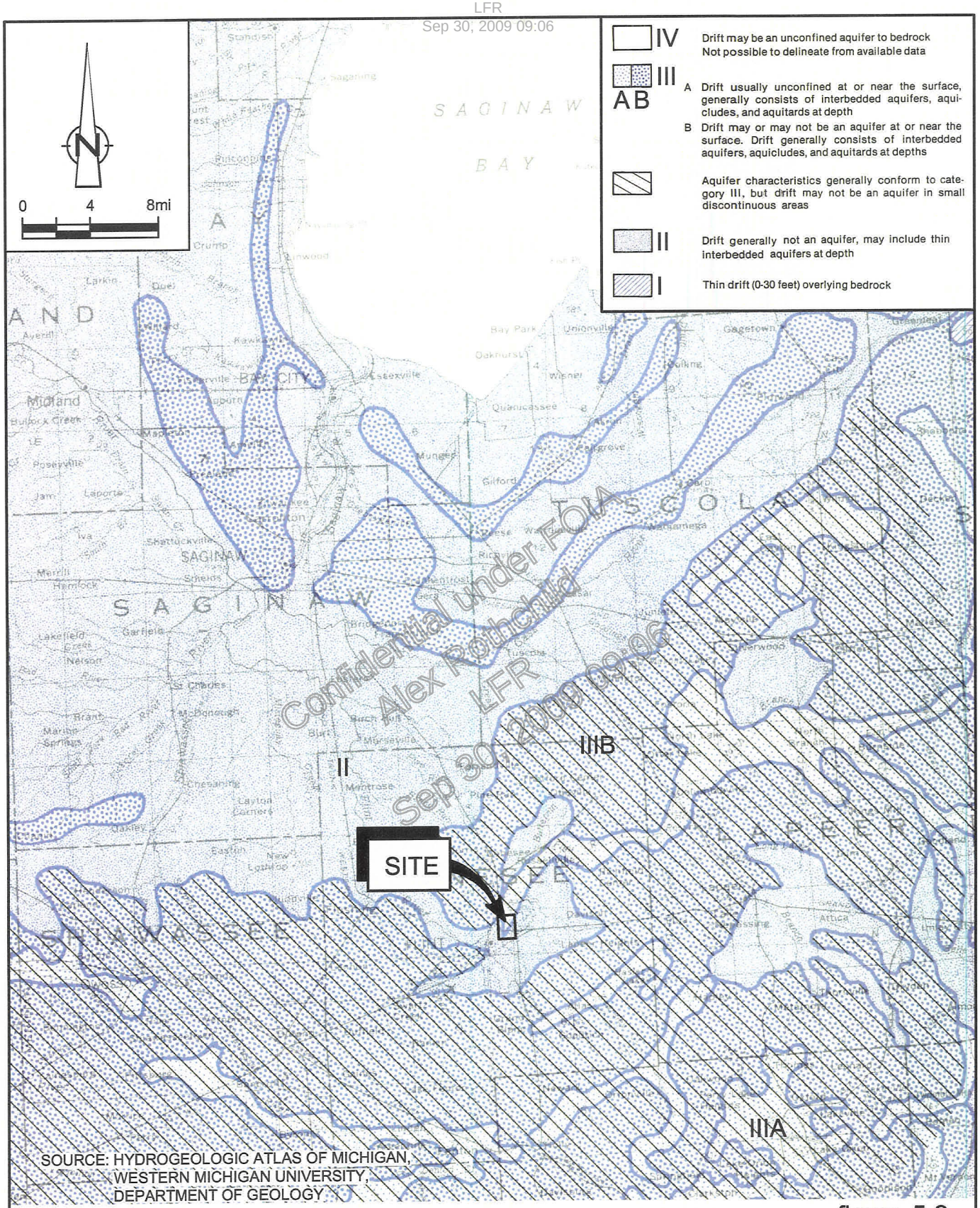

SOURCE: HYDROGEOLOGIC ATLAS OF MICHIGAN, WESTERN MICHIGAN UNIVERSITY, DEPARTMENT OF GEOLOGY

figure 5.2

AQUIFER CHARACTERISTICS OF GLACIAL TILL
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

CRA

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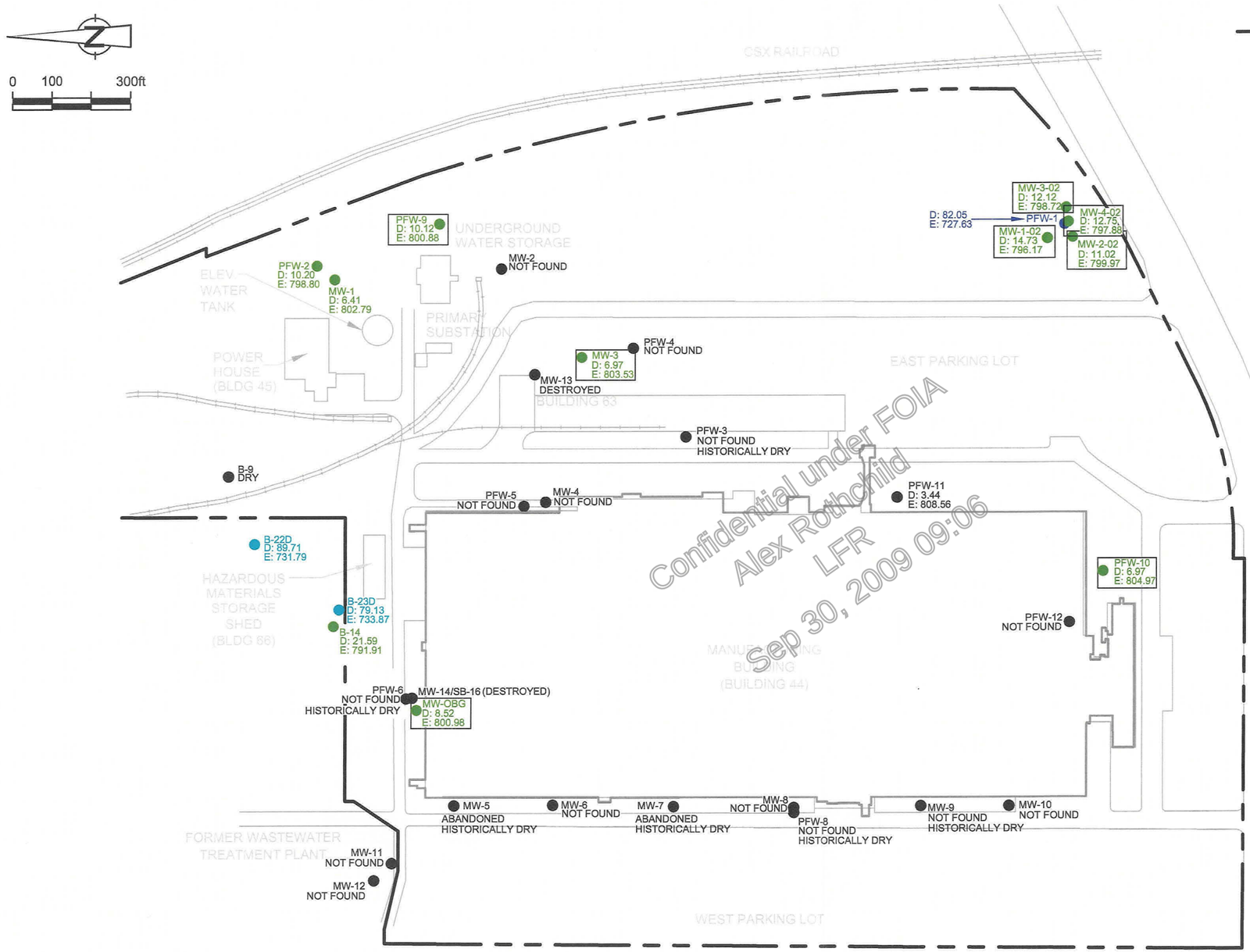

figure 5.3

SUMMARY OF AQUIFER TESTING
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(025)GN-WA007 APR 23/2003

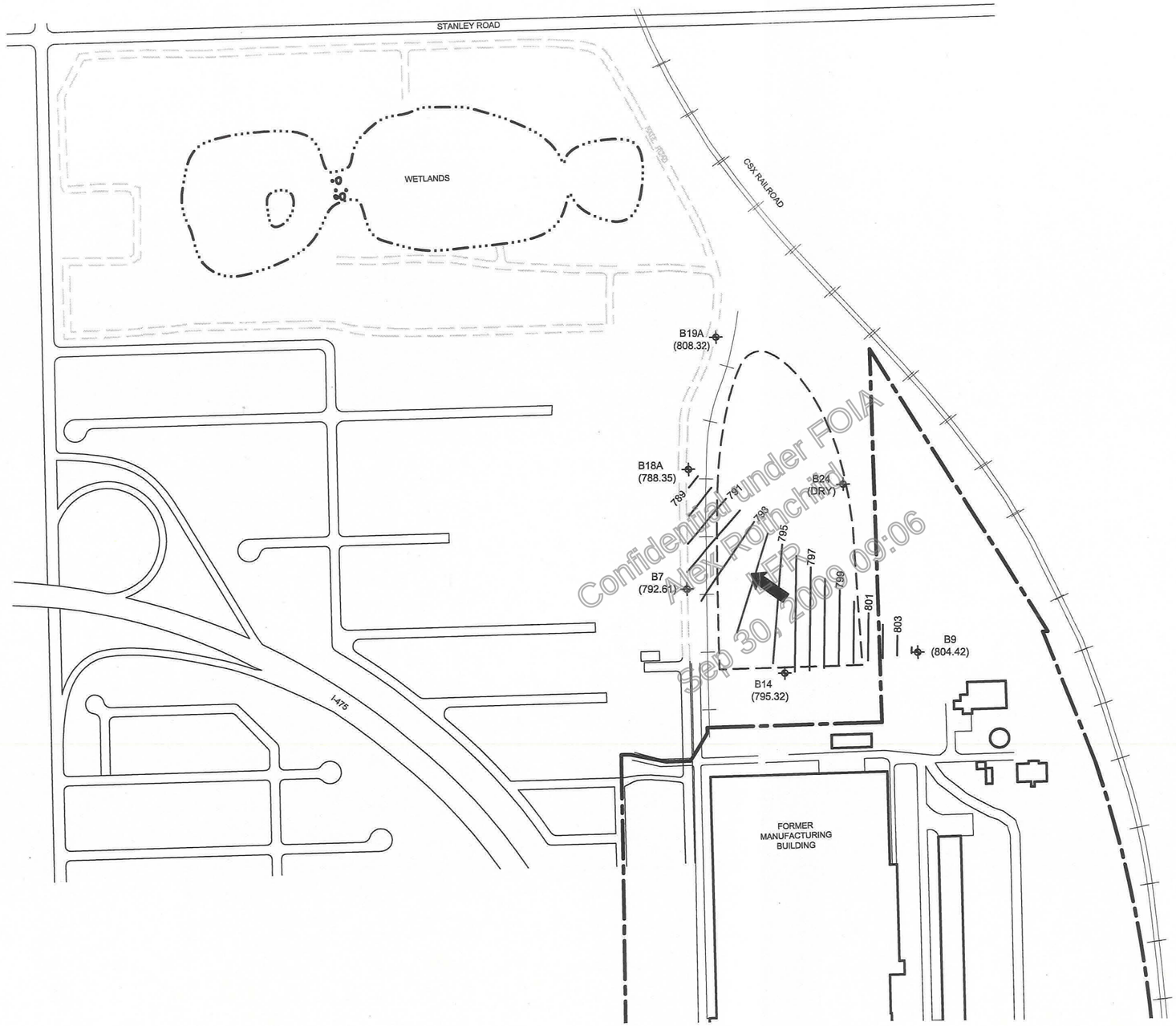

figure 5.4

UPPER PERCHED ZONE GROUNDWATER CONTOURS
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

Source:
O'BRIEN AND GERE, FIGURE 3, PERCHED GROUNDWATER
FLOW POTENTIOMETRIC MAP,
FILE NO. 4966.32223

12636-40(025)GN-WA011 JAN 27/2003

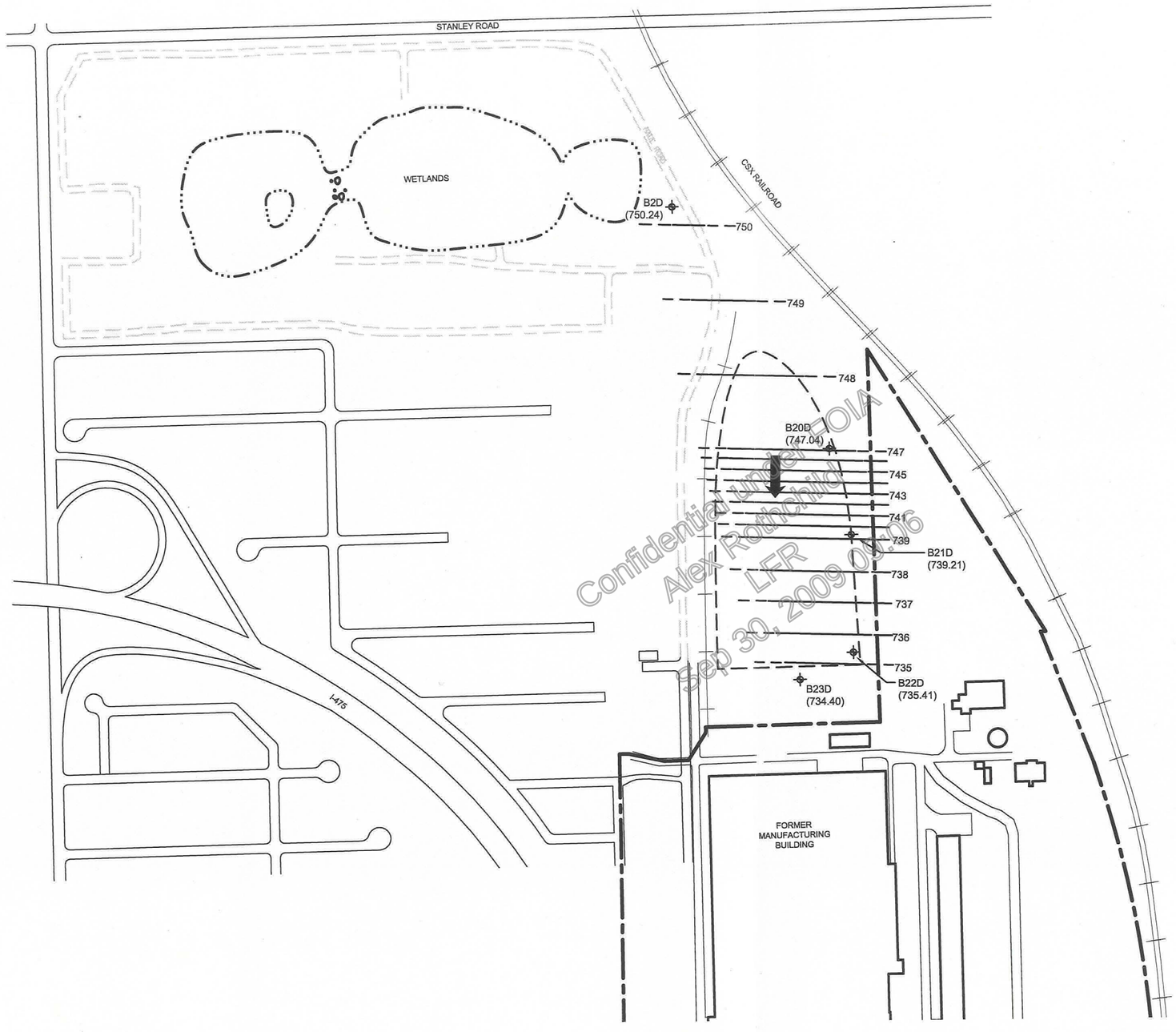

figure 5.5

DRIFT AQUIFER GROUNDWATER CONTOURS
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

Source:
O'BRIEN AND GERE, FIGURE 4, DRIFT AQUIFER GROUNDWATER
FLOW POTENTIOMETRIC MAP,
FILE NO. 4966.32223

12636-40(025)GN-WA012 JAN 24/2003

SOURCE: UniversalMAP;
GREATER FLINT & GENESEE COUNTY, MICHIGAN STREETMAP

figure 5.6

PRIVATE WATER WELL LOCATIONS
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(025)GN-WA013 APR 24/2003

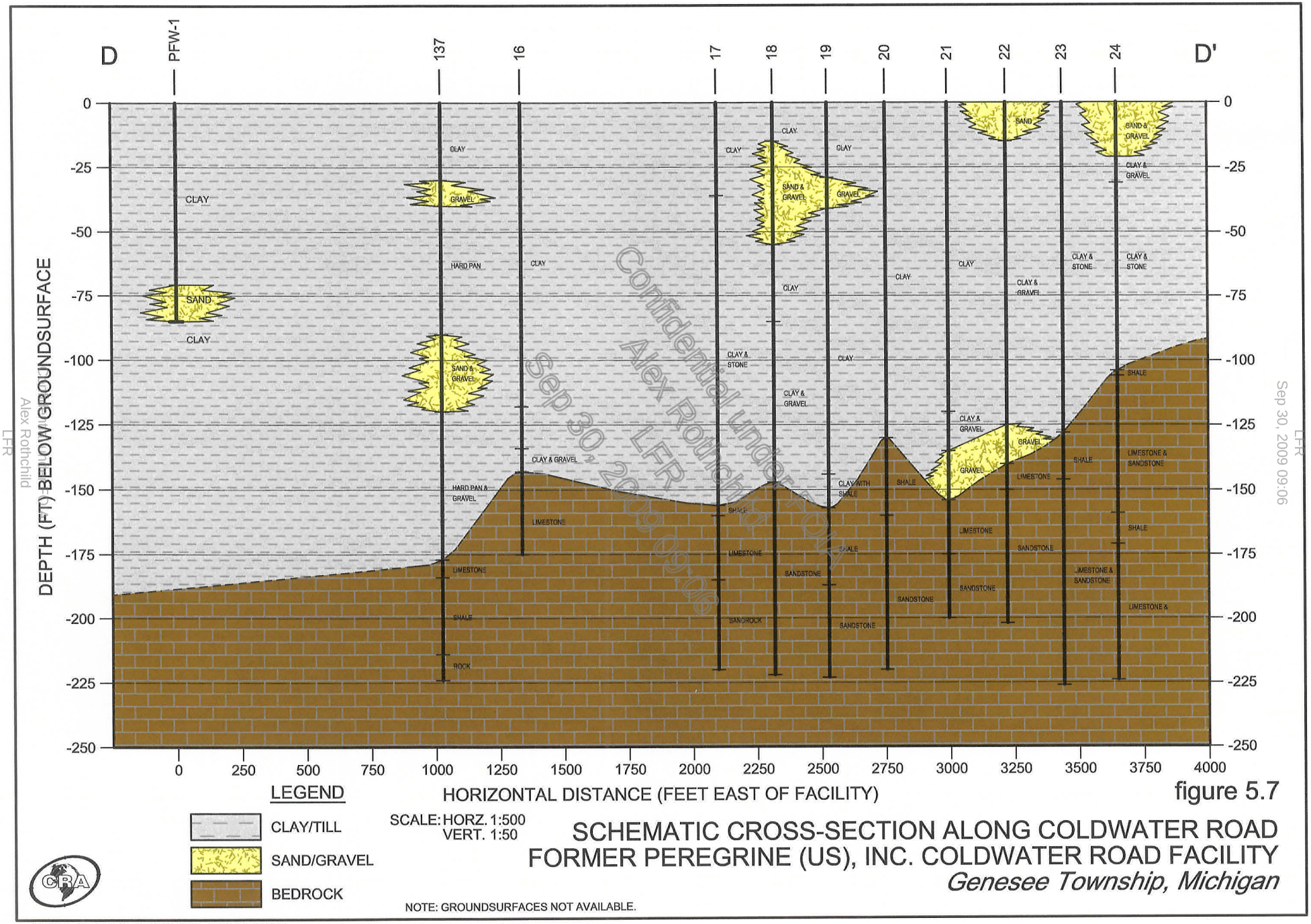

figure 5.7

SCHEMATIC CROSS-SECTION ALONG COLDWATER ROAD
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(025)GN-WA008 JAN 03/2003

TABLE 3.1

MONITORING WELL DETAILS AND TESTING SUMMARY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

	Ground Elevation (feet)	*Reference Point Description*	*Reference Elevation (feet)*	*Sounded Depth (ft BTOR)*	*Scheduled Testing*			*Completed Testing*			*Comments*
					Step-Rate Test	*Constant Rate Test*	*Slug Test*	*Step-Rate Test*	*Constant Rate Test*	*Slug Test*	
Pumped Well in Aquifer:											
PFW-1	807.92 (s)	tor	809.68 (s)	87.95	Y	Y		Y	Y		
Aquifer Monitoring Wells:											
B-22D	818.50 (e)	tor	821.50 (e)	--							
B-23D	810.00 (e)	tor	813.00 (e)	--	Y			N (well went dry)			
Perched Zone Monitoring Wells:											
MW1-02	808.00 (s)	tor	810.90 (s)	~17.3			Y			Y	
MW2-02	807.94 (s)	tor	810.99 (s)	~17.3			Y			Y	
MW3-02	808.05 (s)	tor	810.84 (s)	~17.3			Y			Y	
MW4-02	810.91 (s)	tor	810.63 (s)	17.42			Y			Y	
MW-1	806.20 (e)	tor	809.20 (e)	24.98							
MW-3	807.50 (e)	tor	810.50 (e)	13.17						Y (for PFW-4)	
MW-4											well could not be located
MW-5							Y				well could not be located
MW-9							Y			N	well could not be located
MW-10										N	well could not be located
MW-13											well vandalized and not functional
MW-OBG	806.50 (e)	tor	809.50 (e)	~17.3						Y (for MW-5)	
PFW-2	806.00 (e)	tor	809.00 (e)	16.79							
PFW-4							Y			Y	
PFW-9	808.00 (e)	tor	811.00 (e)	11.27			Y			Y	
PFW-10	809.00 (e)	tor	812.00 (e)	16.07						Y (for MW-9)	
PFW-11	809.00 (e)	tor	812.00 (e)	10.15							
PFB-24							Y			N	well could not be located
B-14	810.50 (e)	tor	813.50 (e)	--							

NOTES:

All perched zone monitors at the Facility were searched for - the presented list includes those specifically scheduled for monitoring, and all others that were monitored.
All other monitoring wells could not be located due to demolition and re-grading activities at the Facility.
(e) = ground surface elevations estimated from contours from site survey conducted in 2000. Riser pipes assumed to have a 3 foot stick-up.
(s) = ground surface and top of riser elevations from survey conducted July 2002.
tor = top of riser
ft BTOR = feet below top of riser

TABLE 5.1

**SUMMARY OF GROUNDWATER FLOW CONDITIONS AT WASTE MANAGEMENT AREA
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN**

	Permeability		*Velocity*	
Geologic Unit	*Horizontal (cm/sec)*	*Vertical (cm/sec)*	*Horizontal (ft/year)*	*Vertical (ft/year)*
Perched Zone	1.3E-07 to 4.4E-04	2.1E-08 to 3.6E-07	0.017 to 57	0.027 to 0.47
Upper Confining Unit	4.9E-07 to 6.7E-05	1.5E-08 to 2.2E-08	0.063 to 8.7	0.019 to 0.028
Drift Aquifer	1.2E-04 to 9.2E-04	--	16 to 120	--
Lower Confining Unit	1.1E-06 to 1.8E-05	3.9E-09	0.14 to 2.3	0.005
Bedrock	1.2E-04	--	--	--

Notes:
Data in this table compiled from the following sources:
1. Dames and Moore, 1980. "Hydrogeological Investigation", prepared for Fisher Body Division, General Motors Corporation, Flint, Michigan.
2. Chester Engineers, 1986. "Final Report on Groundwater Quality Assessment Program", prepared for Fisher Guide Division, General Motors Corporation, Flint, Michigan.

TABLE 5.2

**HYDRAULIC CONDUCTIVITY DETERMINED BY HAZEN EQUATION
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN**

Well Location	*D_{10} of Soil (mm)* [1]	*Sample Depth (ft. bgs)*	*Hydraulic Conductivity, K (cm/s)* [2]
Silty Sand Unit			
BK-1-00	0.0011	3.0	1.21E-06
BK-2-00	0.00045	4.0	2.02E-07
		Geometric Mean	4.9E-07
Clay Till Unit			
BK-1-00	0.00015	7.0	2.25E-08
BK-2-00	0.0007	10.0	4.9E-07
BK-3-00	0.0007	5.0	4.9E-07
BK-3-00	0.00012	11.0	1.44E-08
BK-4-00	0.00042	5.0	1.76E-07
BK-4-00	0.00011	10.0	1.21E-08
		Geometric Mean	7.41E-08

Notes:

(1) D_{10} grain size was found from extrapolating hydrometer analysis results.

(2) Calculated using the equation $K=CD_{10}^2$, where C = 1.0.

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TABLE 5.3

**HYDRAULIC CONDUCTIVITY MEASURED USING BAIL TESTS
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN**

Monitoring Location	*Screen Depth (ft BGS)*	*Hydraulic Conductivity (cm/sec)*	*Stratigraphic Description*
MW1-02	10 to 15	4.9E-07	Silty Clay
MW2-02	10 to 15	2.4E-08	Silty Clay
MW3-02	10 to 15	1.6E-08	Silty Clay
MW4-02	10 to 15	2.2E-07	Silty Clay
MW-3	15 to 25	3.6E-06	Silty Clay
MW-OBG	9.7 to 14.7	7.8E-08	Clay with Sand Seam
PFW-9	6.7 to 9.2	1.6E-06	Sandy Clay with Sand Seams
PFW-10	14.2 to 16.7	3.4E-07	Sandy Clay with Sand Seams
	Geometric Mean	2.2E-07	

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TABLE 5.4

BAIL TEST RECOVERY PERCENTAGES
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Well Id	*Well Depth (ft BTOR)*	*Static Water Level (ft BTOR)*	*Final Water Level (ft BTOR)*	*Total Elasped Time*		*Percent Recovery Achieved*
				(min)	*(hours)*	
MW1-02	17.30	14.95	16.44	2120.0	35.3	36.6%
MW2-02	17.30	11.34	15.81	1875.1	31.3	25.0%
MW3-02	17.30	12.25	16.30	2055.6	34.3	19.8%
MW4-02	17.42	13.18	15.54	2005.7	33.4	44.3%
MW-3	13.17	6.91	7.54	1042.8	17.4	89.9%
			7.59	1779.7	29.7	89.1%
MW-OBG	17.30	8.43	15.15	1440.2	24.0	24.2%
PFW-9	11.27	10.21	10.44	988.7	16.5	78.3%
			10.39	1709.8	28.5	83.0%
PFW-10	16.07	5.05	10.30	1811.6	30.2	52.4%

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TABLE 5.5

**HYDRAULIC CONDUCTIVITY MEASURED USING CONSTANT HEAD METHOD
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN**

Well Location	*Depth (feet bgs)*	*Hydraulic Conductivity (cm/s)*
Clay Till Unit		
BK-1-00	5 - 7	8.1E-08
BK-2-00	10 - 12	2.9E-08
BK-3-00	5 - 7	5.5E-09
BK-4-00	5 - 7	6.2E-09
	Geometric Mean	1.68E-08

Note:

(1) -Hydraulic conductivity measured using Constant Head Method.

-Samples were tested in a remolded state due to Shelby tube disturbance caused by the presence of cobbles or very dense clay. Dense hard pan clays may have a lower in-situ hydraulic conductivity than the remolded values present. The values presented should be evaluated with an understanding of the fact that they were remolded samples.

TABLE 5.6

HYDRAULIC CONDUCTIVITY FROM CONSTANT RATE PUMPING TEST
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Well	*Data Set*	*Transmissivity* (cm^2/sec)	*Saturated Thickness* (*feet*)	(*centimeters*)	*Hydraulic Conductivity* (*cm/sec*)
PW1	Drawdown	10.61	14	426.72	3.0×10^{-2}
PW1	Recovery	10.32	14	426.72	2.4×10^{-2}
				Geometric Mean	2.7×10^{-2}

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TABLE 5.7

CONSTANT RATE PUMPING TEST SUMMARY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Wells	*Distance to PFW-1 (feet)*	*Static Water Level (ft amsl)*	*Water Level at End of Test (ft amsl)*	*Change in Water Level (ft amsl)*	*Comments*
Drift Aquifer Wells					
PFW-1	0	727.63	727.11	0.52	Response to pumping
B-22D	2228	731.79	731.86	-0.07	Barometric Pressure Response - no response to pumping
B-23D	2082	733.87	733.95	-0.08	Barometric Pressure Response - no response to pumping
Perched Zone Wells					
MW1-02	56	796.17	796.13	0.04	Decline due to lack of recharge - no response to pumping
MW2-02	40	799.97	799.95	0.02	Decline due to lack of recharge - no response to pumping
MW3-02	42	798.72	798.67	0.05	Decline due to lack of recharge - no response to pumping
MW4-02	11	797.88	797.82	0.06	Decline due to lack of recharge - no response to pumping
MW-1	1842	802.79	802.83	-0.04	Possible Barometric Pressure Response - no response to pumping
MW-3	1272	803.53	803.57	-0.04	Possible Barometric Pressure Response - no response to pumping
MW-OBG	2052	800.98	800.99	-0.01	Possible Barometric Pressure Response - no response to pumping
PFW-2	1881	798.8	798.83	-0.03	Possible Barometric Pressure Response - no response to pumping
PFW-9	1574	800.88	800.85	0.03	Decline due to lack of recharge - no response to pumping
PFW-10	890	804.97	805.53	-0.56	Unknown Rise in Water Level - no response to pumping
PFW-11	814	808.56	808.47	0.09	Barometric Pressure Response - no response to pumping
B-14	2112	791.91	791.81	0.1	Decline due to lack of recharge - no response to pumping

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TABLE 5.8

DOMESTIC WELL SUMMARY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well ID Number	*Location*	*Total Depth (ft)*	*Overburden Thickness (ft)*	*Clay Aquitard (1) Thickness (ft)*	*Static Water Level (ft)*	*Screened Interval*	*Screened Unit*	*Screened Interval Protected/Confined (Y/N)*
1	1038 Agnes St	219	148	145	120	149 - 219	sandstone/limestone	Y
2	1049 Agnes St	262	160	35/95	90	170 - 262	shale/sandstone/limestone	Y
3	1067 Agnes St	300	160	100/44	80	170 - 300	slate/sandstone/limestone	Y
4	1068 Agnes St	300	169	169	90	179 - 300	sandstone/limestone	Y
5	1090 Angola Ave	200	135	98/17	70	151 - 200	shale/sandstone	Y
6	1101 Angola Ave	240	128	97/22	84	149 - 240	shale/sandstone	Y
7	1102 Angola Ave	240	135	34/58/28	85	149 - 240	shale/sandstone	Y
8	1110 Angola Ave	220	159	159	84	165 - 220	shale/sandstone/limestone	Y
9	1129 Angola Ave	300	122	97/14	94	153 - 300	shale/sandstone	Y
10	1038 Bethany St	300	140	18/105	106	145 - 300	shale/sandstone/limestone	Y
11	1050 Bethany St	210	148	48/46/38	79	153 - 210	shale/sandstone	Y
12	5373 Bray Road	160	139	25/99	25	144 - 160	sandstone/limestone	Y
13	5385 Bray Road	180	136	17/92/3	35	143 - 180	sandstone/limestone	Y
14	6139 Bray Road	29	29	14	10	26 - 29	gravel	Y
15	6497 Bray Road	182	145	60/60	30	155 - 182	sandstone/limestone	Y
16	Coldwater + Dort Hwy	200	118	95	40	147 - 200	sandstone/limestone	Y
17	2117 E Coldwater Rd	220	156	156	60	163 - 220	shale/sandstone/limestone	Y
18	2126 E Coldwater Rd	222	147	15/92	45	147 - 222	sandstone	Y
19	2127 E Coldwater Rd	223	144	29/103	55	160 - 223	shale/sandstone	Y
20	2134 E Coldwater Rd	220	130	130	65	160 - 220	shale/sandstone	Y
21	2135 E Coldwater Rd	200	154	135	90	162 - 200	sandstone/limestone	Y
22	2153 E Coldwater Rd	202	140	110	50	147 - 202	sandstone/limestone	Y
23	2182 E Coldwater Rd	226	128	128	85	147 - 226	shale/sandstone/limestone	Y
24	2184 E Coldwater Rd	224	104	83	46	117 - 224	shale/sandstone/limestone	Y
25	2264 E Coldwater Rd	200	118	22/91	N/A	117 - 200	sandstone/limestone	Y
26	2343 E Coldwater Rd	200	135	23/102	50	143 - 200	sandstone/limestone	Y
27	2363 E Coldwater Rd	155	146	25/114	30	147 - 155	limestone	Y
28	2369 E Coldwater Rd	180	137	137	73	141 - 180	sandstone/limestone	Y
29	1020 Collins Ave	268	137	26/95	89	147 -268	shale/sandstone	Y
30	1033 Collins Ave	240	130	130	95	155 - 240	shale/sandstone/limestone	Y
31	1037 Collins Ave	220	130	75/30	85	147 - 220	shale/sandstone/limestone	Y
32	1045 Collins Ave	236	136	136	90	160 - 236	slate/shale/sandstone/limestone	Y
33	1055 Collins Ave	240	158	44/96	65	174 - 240	shale/sandstone	Y
34	1071 Collins Ave	233	130	122	68	155 - 233	shale/sandstone	y
35	1023 W Costello Ave	245	157	30/106	N/A	169 - 245	shale/sandstone/limestone	Y
36	1038 W Costello Ave	260	150	105	85	154 - 260	sandstone/limestone	Y
37	1057 E Costello Ave	268	140	34/25/23	100	160 - 268	shale/sandstone/limestone	Y
38	1063 E Costello Ave	260	157	42/85	95	160 - 260	shale/sandstone/limestone	Y
39	1089 E Costello Ave	262	207	70/65	90	207 - 262	sandstone/limestone	Y
40	1071 Dorothy St	230	152	152	85	160 - 230	shale/sandstone	Y
41	1080 Dorothy St	265	158	158	100	179 - 265	shale/sandstone/limestone	Y
42	1092 Dorothy St	300	185	185	106	200 - 300	shale/sandstone/limestone	Y
43	1104 Dorothy St	300	185	65/85	100	192 - 300	shale/sandstone	Y
44	1130 Dorothy St	280	210	175	100	218 - 280	sandstone	Y
45	East Stanley + North Dort Hwy	302	187	42/129	64	238 - 302	shale/sandstone	Y
46	5021 North Dort Hwy	190	90	N/A	32	90 - 190	N/A	Y
47	5150 North Dort Hwy	161	116	15/54	45	117 - 161	shale/sandstone	Y
48	5158 North Dort Hwy	264	108	108	70	152 - 264	slate/sandstone/limestone	Y
49	5172 North Dort Hwy	170	91	78	45	109 - 170	shale/sandstone	Y
50	5182 North Dort Hwy	170	92	25/62	50	109 - 170	shale/sandstone	Y
51	5199 North Dort Hwy	172	97	18/40	50	113 - 172	shale/sandstone	Y
52	5220 North Dort Hwy	200	128	128	60	155 - 200	shale/sandstone	Y
53	5252 North Dort Hwy	200	112	110	80	150 - 200	shale/sandstone	Y
54	5300 North Dort Hwy	222	110	30/65	48	115 - 222	shale/limestone	Y
55	5320 North Dort Hwy	220	118	26/82	50	136 - 220	shale/sandstone/limestone	Y
56	5420 North Dort Hwy	220	138	48/50	50	146 - 220	sandstone/limestone	Y
57	5432 North Dort Hwy	240	139	25/101	78	149 - 240	shale/sandstone/limestone	Y
58	5452 North Dort Hwy	230	140	20/40/55	70	147 - 230	sandstone/limestone	Y
59	5455 North Dort Hwy	200	141	24/97	50	153 - 200	shale/sandstone	Y
60	5469 North Dort Hwy	212	140	140	52	140 - 212	sandstone	Y
61	6129 North Dort Hwy	242	195	35/75/15	80	195 - 242	sandstone/limestone	Y
62	6136 North Dort Hwy	300	180	57/3/100	102	203 - 300	shale/sandstone	Y
63	6190 North Dort Hwy	260	197	55/112	100	203 - 260	shale/sandstone/limestone	Y
64	6203 North Dort Hwy	264	191	191	87	201 - 264	slate/sandstone/limestone	Y
65	6339 North Dort Hwy	260	165	15/142	90	175 - 260	sandstone	Y
66	6368 North Dort Hwy	327	161	161	52	174 - 327	shale/sandstone	Y
67	6369 North Dort Hwy	230	168	53/78	80	175 - 230	sandstone/limestone	Y
68	6406 North Dort Hwy	220	127	30/85	70	174 - 220	quartz/sandstone/limestone	Y
69	6409 North Dort Hwy	265	192	192	90	199 - 265	slate/sandstone/limestone	Y
70	6455 North Dort Hwy	280	168	30/94	95	178 - 280	shale/sandstone	Y
71	6476 North Dort Hwy	268	189	37/121	80	191 - 268	shale/sandstone	Y
72	6500 North Dort Hwy	225	180	30/125	60	187 - 225	sandstone	Y
73	6524 North Dort Hwy	250	190	190	110	222 - 250	shale/sandstone/limestone	Y
74	7025 North Dort Hwy	270	211	80/125	95	213 - 270	sandstone	Y
75	7040 North Dort Hwy	57	57	46	33	53 - 57	sand	Y
76	7073 North Dort Hwy	277	200	45/140	100	220 - 277	shale/sandstone/limestone	Y
77	7074 North Dort Hwy	56	56	3/34	45	52 - 56	sandy gravel	Y
78	7085 North Dort Hwy	292	223	60/133	110	225 - 292	shale/sandstone/limestone	Y
79	7138 North Dort Hwy	320	235	17/140	95	240 - 320	shale/sandstone	Y
80	7141 North Dort Hwy	280	225	38/12/159	90	139 - 280	sandstone/limestone	Y
81	7191 North Dort Hwy	300	240	240	90	251 - 300	sandstone	Y
82	7257 North Dort Hwy	342	190	80/55/20	135	252 - 342	shale/sandstone	Y
83	7260 North Dort Hwy	339	205	95/95	135	255 - 339	shale/sandstone/limestone	Y
84	7293 North Dort Hwy	114	114	8/47/46	42	110 - 114	gravel	Y
85	7351 North Dort Hwy	104	104	70	40	96 - 104	gravel	Y
86	7365 North Dort Hwy	322	270	35/55/145	90	270 - 322	shale/sandstone/limestone	Y
87	1023 Elstner St	224	160	160	87	166 - 224	sandstone/limestone	Y
88	1030 Elstner St	260	140	80/39	101	171 - 260	shale/sandstone	Y
89	1104 Elstner St	220	122	45/32	80	135 - 220	sandstone/limestone	Y
90	5315 Energy Dr	260	102	20/43/23	55	140 - 260	shale/sandstone/limestone	Y

TABLE 5.8

DOMESTIC WELL SUMMARY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well ID Number	Location	Total Depth (ft)	Overburden Thickness (ft)	Clay Aquitard (1) Thickness (ft)	Static Water Level (ft)	Screened Interval	Screened Unit	Screened Interval Protected/Confined (Y/N)
91	7051 Estrelle Ave	222	137	42/75	80	140 - 222	sandstone/limestone	Y
92	7065 Estrelle Ave	247	125	38/72	80	140 - 247	shale/sandstone/limestone	Y
93	7103 Estrelle Ave	200	141	18/120	90	144 - 200	sandstone/limestone	Y
94	7117 Estrelle Ave	200	139	35/35/44	82	143 - 200	shale/sandstone	Y
95	7126 Estrelle Ave	220	140	140	85	143 - 220	sandstone/limestone	Y
96	7151 Estrelle Ave	255	117	88/12	92	133 - 255	shale/sandstone	Y
97	7158 Estrelle Ave	240	131	96/20	93	154 - 240	shale/sandstone	Y
98	7041 Harvard St	217	115	42/53	78	120 - 217	shale/sandstone/limestone	Y
99	7060 Harvard St	190	98	30/48	80	125 - 190	shale/sandstone/limestone	Y
100	7061 Harvard St	240	100	25/63	55	157 - 240	shale/sandstone/limestone	Y
101	7078 Harvard St	245	108	108	78	143 - 245	slate/shale/sandstone	Y
102	7070 Harvard St	222	100	45	75	189 - 222	shale/sandstone/limestone	Y
103	7093 Harvard St	244	111	111	75	149 - 244	slate/shale/sandstone/limestone	Y
104	7094 Harvard St	200	92	13/23	80	145-200	shale/sandstone/limestone	Y
105	7098 Harvard St	96	96	18/16	21	90-96	gravel	Y
106	7128 Harvard St	236	119	42/62	82	140 - 236	shale/sandstone/limestone	Y
107	7164 Harvard St	235	137	70/47	80	140 - 235	shale/sandstone/limestone	Y
108	7177 Harvard St	240	120	40/60	80	130 - 240	shale/sandstone/limestone	Y
109	7187 Harvard St	240	120	42/68	90	134 - 240	shale/sandstone/limestone	Y
110	7189 Harvard St	232	118	50/50	83	131 - 232	shale/sandstone/limestone	Y
111	7210 Harvard St	210	175	80/50	40	160-210	clay/shale/sandstone	Y
112	7211 Harvard St	220	120	80	95	156-220	shale/sandstone/limestone	Y
113	7219 Harvard St	247	180	34/64	85	144-247	shale/sand/limestone	Y
114	7244 Harvard St	225	150	119	83	162-225	slate/shale/sandstone	Y
115	1463 Ida Ct	290	254	254	120	254 - 290	sandstone	Y
116	1473 Ida Ct	300	199	69/120	120	254 - 300	shale/sandstone	Y
117	5503 Lewis Rd	220	147	147	90	158 - 220	shale/sandstone	Y
118	6086 Lewis Rd	242	180	60/20/75	95	185 - 242	sandstone/limestone	Y
119	6270 Lewis Rd	265	181	181	108	199 - 265	shale/sandstone/limestone	Y
120	6452 Lewis Rd	260	160	40/113	90	193 - 260	shale/sandstone/limestone	Y
121	6466 Lewis Rd	262	170	40/60	70	196 - 262	shale/sandstone/limestone	Y
122	6472 Lewis Rd	260	180	180	95	190 - 260	sandstone/limestone	Y
123	6480 Lewis Rd	270	183	18/12/24/87	90	203 - 270	shale/sandstone/limestone	Y
124	7049 Lewis Rd	72	72	53	41	67 - 72	gravel	Y
125	7064 Lewis Rd	69	69	58	42	63 - 69	sand	Y
126	7065 Lewis Rd	74	74	56	43	64 - 74	sand	Y
127	7209 Lewis Rd	185	185	68/92	100	180 - 185	gravel	Y
128	7221 Lewis Rd	75	75	62	69	69 - 75	sand and gravel	Y
129	7239 Lewis Rd	340	200	170	88	235 - 340	sandstone	Y
130	7289 Lewis Rd	75	75	15	44	69 - 75	gravel	Y
131	7303 Lewis Rd	75	75	66/2	49	63 - 73	sand	Y
132	7321 Lewis Rd	60	60	47	28	55 - 60	sand and gravel	Y
133	7333 Lewis Rd	322	245	90/130	135	248 - 322	sandstone/limestone	Y
134	7359 Lewis Rd	328	N/A	N/A	125	258 - 328	sandstone/limestone	Y
135	7373 Lewis Rd	300	250	53/78	117	265 - 300	sandstone	Y
136	9468 Lewis Rd	41	41	30	15	38 - 41	sand	Y
137	Lewis Rd + Coldwater Rd	396	177	30/50/57	N/A	N/A	shale/sandstone/limestone	Y
138	1022 Lorene Ave	222	135	20/10/45	95	145 - 222	shale/sandstone/limestone	Y
139	1028 Lorene Ave	220	110	35/55	90	145 - 220	shale/sandstone/limestone	Y
140	1038 Lorene Ave	242	130	130	96	140 - 242	shale/sandstone/limestone	Y
141	1045 Lorene Ave	202	N/A	N/A	82	140 - 202	shale/sandstone/limestone	Y
142	1083 Lorene Ave	205	135	135	85	145 - 205	shale/sandstone/limestone	Y
143	1093 Lorene Ave	200	145	145	90	150 - 200	shale/sandstone	Y
144	1097 Lorene Ave	202	155	40/100	95	155 - 202	sandstone	Y
145	1106 Lorene Ave	202	158	60/88	80	158 - 202	shale/sandstone/limestone	Y
146	1111 Lorene Ave	260	105	105	40	140 - 260	sandstone/limestone	Y
147	1121 Lorene Ave	200	132	132	65	132 - 200	shale/sandstone	Y
148	1127 Lorene Ave	150	132	27/100	70	132 - 150	sandstone	Y
149	1030 Lucharles Ave	223	135	135	78	142 - 223	slate/sandstone/limestone	Y
150	1035 Lucharles Ave	200	133	49/80	82	142 - 200	slate/shale/sandstone	Y
151	1039 Lucharles Ave	218	135	25/95	91	143 - 218	shale/sandstone	Y
152	1040 Lucharles Ave	220	135	20/50/35	50	147 - 220	shale/sandstone/limestone	Y
153	1085 Lucharles Ave	240	130	10/110	60	135 - 240	shale/sandstone/limestone	Y
154	1090 Lucharles Ave	200	135	15/60/40	80	150 - 200	shale/sandstone	Y
155	1094 Lucharles Ave	200	145	67/60	47	150 - 200	sandstone	Y
156	1111 Lucharles Ave	202	121	121	95	131 - 202	shale/sandstone/limestone	Y
157	1116 Lucharles Ave	220	150	150	90	150 - 200	shale/sandstone/limestone	Y
158	1126 Lucharles Ave	200	145	145	76	145 - 200	sandstone	Y
159	Nutana Blvd, 1/4 mi W of Saginaw Rd	240	140	65/10/40	45	168 - 240	shale/sandstone	Y
160	1026 Nutana Blvd	247	147	27/100	94	160 - 247	shale/sandstone/limestone	Y
161	1039 Nutana Blvd	230	150	40/90	40	168 - 230	shale/sandstone	Y
162	1056 Nutana Blvd	227	132	40/55	80	157 - 227	shale/sandstone/limestone	Y
163	1066 Nutana Blvd	260	115	38/45	85	150 - 260	shale/sandstone/limestone	Y
164	1075 Nutana Blvd	247	130	35/20/35	87	145 - 247	shale/sandstone/limestone	Y
165	1076 Nutana Blvd	235	141	141	81	156 - 235	slate/shale/sandstone/limestone	Y
166	1098 Nutana Blvd	300	170	170	88	180 - 300	shale/sandstone	Y
167	1104 Nutana Blvd	260	166	12/60/80	70	180 - 260	shale/sandstone/limestone	Y
168	1117 Nutana Blvd	240	118	35/60	N/A	145 - 240	shale/sandstone/limestone	Y
169	1118 Nutana Blvd	235	143	33/105	70	168 - 235	shale/sandstone	Y
170	1127 Nutana Blvd	230	112	60/39	81	135 - 230	shale/sandstone/limestone	Y
171	1128 Nutana Blvd	260	120	50/40	81	150 - 260	shale/sandstone/limestone	Y
172	7040 N Saginaw Rd	240	148	83/58	85	151 - 240	shale/sandstone	Y
173	7047 N Saginaw Rd	265	146	40/86	80	151 - 265	shale/sandstone/limestone	Y
174	7067 N Saginaw Rd	240	125	65/40	95	150 - 240	shale/sandstone/limestone	Y
175	7101 N Saginaw Rd	305	142	126	60	160 - 305	shale/sandstone	Y
176	7163 N Saginaw Rd	247	150	35/10/60	90	165 - 247	shale/sandstone/limestone	Y
177	7166 N Saginaw Rd	247	155	40/90	100	162 - 247	shale/sandstone/limestone	Y
178	7195 N Saginaw Rd	302	180	39/95	80	189 - 302	shale/sandstone/limestone	Y
179	7200 N Saginaw Rd	240	168	80/28	80	168 - 240	sandstone	Y
180	7211 N Saginaw Rd	245	152	8/90/18	60	152 - 245	water rock/limestone	Y

TABLE 5.8

DOMESTIC WELL SUMMARY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well ID Number	*Location*	*Total Depth (ft)*	*Overburden Thickness (ft)*	*Clay Aquitard (1) Thickness (ft)*	*Static Water Level (ft)*	*Screened Interval*	*Screened Unit*	*Screened Interval Protected/Confined (Y/N)*
181	1034 W Stanley Rd	215	100	40/40	80	140 - 215	shale/sandstone	Y
182	1097 E Stanley Rd	260	180	30/90	100	195 - 260	sandstone/limestone	Y
183	1128 W Stanley Rd	190	90	15/50/10	71	124 - 190	shale/sandstone	Y
184	1131 E Stanley Rd	290	190	12/100/60	100	212 - 290	shale/sandstone/limestone	Y
185	1290 E Stanley Rd	300	208	208	140	230 - 300	shale/sandstone	Y
186	1297 E Stanley Rd	292	190	6/100/26	95	200 - 292	shale/sandstone/limestone	Y
187	1139 W Stanley Rd	292	215	78/107	102	218 - 292	sandstone/limestone	Y
188	1148 W Stanley Rd	220	114	20/75	60	127 - 220	shale/sandstone/limestone	Y
189	1155 E Stanley Rd	280	230	90/50/78	100	240 - 280	shale/sandstone	Y
190	1166 W Stanley Rd	205	109	109	70	130 - 205	slate/shale/sandstone	Y
191	1180 W Stanley Rd	205	114	27/66	71	133 - 205	shale/sandstone	Y
192	1254 W Stanley Rd	220	89	50/19	50	129 - 220	shale/sandstone/limestone	Y
193	1260 W Stanley Rd	215	85	45/10	60	100 - 215	shale/sandstone	Y
194	1278 E Stanley Rd	295	180	25/20/80	100	231 - 295	shale/sandstone/limestone	Y
195	1302 E Stanley Rd	295	175	140	120	225 - 295	shale/sandstone/limestone	Y
196	1320 E Stanley Rd	245	207	163/27	90	213 - 245	shale/sandstone	Y
197	2008 E Stanley Rd	157	98	26/70	50	112 - 157	shale/sandstone	Y
198	2013 E Stanley Rd	48	48	38	11	44 - 48	sand	Y
199	2056 E Stanley Rd	280	196	196	78	204 - 280	shale/sandstone/limestone	Y
200	2068 E Stanley Rd	252	190	40/125	80	210 - 252	sandstone/limestone	Y
201	2073 E Stanley Rd	205	150	150	50	157 - 205	shale/sandstone/limestone	Y
202	2160 E Stanley Rd	260	164	18/121	102	185 - 260	sandstone/limestone	Y
203	2176 E Stanley Rd	260	160	20/65	36	175 - 260	shale/sandstone/limestone	Y
204	2177 E Stanley Rd	280	201	33/124	N/A	204 - 280	shale/sandstone	Y
205	2240 E Stanley Rd	300	155	130	90	171 - 300	shale/sandstone	Y
206	2382 E Stanley Rd	240	138	120	40	158 - 240	sandstone	Y
207	2389 E Stanley Rd	280	155	120	70	174 - 280	shale/sandstone/limestone	Y
208	2401 E Stanley Rd	198	153	24/56/8	63	153 - 198	shale/sandstone/limestone	Y
209	2434 E Stanley Rd	225	152	152	42	160 - 225	sandstone/limestone	Y
210	2439 E Stanley Rd	185	130	30/90	36	143 - 185	sandstone	Y
211	2454 E Stanley Rd	205	144	144	47	158 - 205	sandstone/limestone	Y
212	2459 E Stanley Rd	220	140	15/108	60	150 - 220	sandstone/limestone	Y
213	2474 E Stanley Rd	205	140	140	45	149 - 205	sandstone/limestone	Y
214	2477 E Stanley Rd	200	143	4/121	60	146 - 200	shale/sandstone	Y
215	2499 E Stanley Rd	202	140	38/80	40	147 - 202	sandstone/limestone	Y
216	Stanley Rd W of Bray Rd	1503	142	8/32	N/A	N/A	shale/sandstone/limestone	Y

Notes: (1) If more than one thickness is present then multiple clay aquitards exist.
(2) Not Available

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Alex Rothchild
LFR
Sep 30, 2009 09:06

TABLE 5.9

SAMPLE KEY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sample Identification	*Sample Location*	*Date*	*Time*	*Description*	*Parameter*
GW-12636-100802-DD-001	PFW-1	8-Oct-02	10:30	groundwater sample	VOCs, dissolved lead
GW-12636-100802-DD-002	PFW-1	8-Oct-02	21:30	groundwater sample	VOCs, dissolved lead
GW-12636-100902-DD-003	PFW-1	9-Oct-02	09:30	groundwater sample	VOCs, dissolved lead
TB-12636-100902-DD-004				trip blank	VOCs

Notes:
Samples were transported under chain of custody (COC) protocol to Severn Trent Laboratory (STL) located in North Canton, Ohio to be analyzed within a standard two week timeframe.

TABLE 5.10

ANALYTICAL RESULTS SUMMARY
GROUNDWATER NOT IN AN AQUIFER EVALUATION
OCTOBER 2002
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Sample Location:		*PFW-1*	*PFW-1*	*PFW-1*
Groundwater Unit:		*Deep Drift Aquifer*	*Deep Drift Aquifer*	*Deep Drift Aquifer*
Sample ID:		*GW-12636-100802-DD-001*	*GW-12636-100802-DD-002*	*GW-12636-100902-DD-003*
Sample Date:		*10/8/2002*	*10/8/2002*	*10/9/2002*
Metals	***Units***			
Lead (Dissolved)	ug/L	ND (3.0)	ND (3.0)	ND (3.0)
Volatiles				
1,1,1-Trichloroethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,1,2,2-Tetrachloroethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,1,2-Trichloroethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,1-Dichloroethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,1-Dichloroethene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,2,4-Trichlorobenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dibromoethane (Ethylene Dibromide)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dichlorobenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dichloroethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dichloropropane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,3-Dichlorobenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
1,4-Dichlorobenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
2-Butanone (Methyl Ethyl Ketone)	ug/L	ND (10)	ND (10)	ND (10)
2-Hexanone	ug/L	ND (10)	ND (10)	ND (10)
4-Methyl-2-pentanone	ug/L	ND (10)	ND (10)	ND (10)
Acetone	ug/L	ND (10)	ND (10)	ND (10)
Benzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Bromodichloromethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Bromoform	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Bromomethane (Methyl Bromide)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Carbon disulfide	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Carbon tetrachloride	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Chlorobenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Chloroethane	ug/L	ND (2.0)	ND (2.0)	ND (2.0)
Chloroform (Trichloromethane)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Chloromethane (Methyl Chloride)	ug/L	ND (2.0)	ND (2.0)	ND (2.0)
cis-1,2-Dichloroethene	ug/L	ND (0.50)	ND (0.50)	ND (0.50)
cis-1,3-Dichloropropene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Cyclohexane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Dibromochloromethane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Dichlorodifluoromethane (CFC-12)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Ethylbenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Isopropylbenzene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Methyl acetate	ug/L	ND (10)	ND (10)	ND (10)
Methyl cyclohexane	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Methyl Tert Butyl Ether	ug/L	ND (5.0)	ND (5.0)	ND (5.0)
Methylene chloride	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Styrene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Tetrachloroethene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Toluene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
trans-1,2-Dichloroethene	ug/L	ND (0.50)	ND (0.50)	ND (0.50)
trans-1,3-Dichloropropene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Trichloroethene	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Trichlorofluoromethane (CFC-11)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Trifluorotrichloroethane (Freon 113)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Vinyl chloride	ug/L	ND (1.0)	ND (1.0)	ND (1.0)
Xylene (total)	ug/L	ND (1.0)	ND (1.0)	ND (1.0)

Notes:
ND () - Non detect at associated value.

APPENDIX A

MDEQ-WMF STAFF GUIDANCE DOCUMENT
RE: DETERMINING GROUNDWATER NOT IN AN AQUIFER
(MAY 4, 2000)

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Alex Rothchild
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Sep 30, 2009 09:06

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Sep 30, 2009 09:06

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 4, 2000

TO: District and Section Supervisors
Waste Management Division

FROM: Jim Sygo, Chief
Waste Management Division

SUBJECT: Groundwater Not In An Aquifer (GWNIAA) Staff Guidance

A Waste Management Division (WMD) technical committee was put together in October of 1999 with the goal of developing a guidance document that would enable WMD staff to cautiously, thoroughly, and consistently apply a decision process for determining whether groundwater at a site is in an aquifer or not. Attached to this memo is the GWNIAA Staff Guidance developed by that committee.

We have received some requests for GWNIAA determinations in the past and will see more of them in the future. The purpose of this guidance is to consistently apply a review approach throughout the Division. This guidance is a decision-making tool. Please make it available to your geological and other technical staff. The use of this guidance is encouraged, but not demanded. Other approaches of review can be considered on a site-specific basis, but then it is also recommended for technical staff to consult with the WMD, Remedial Action Team.

The Guidance is divided into six sections: Introduction, Definitions, Criteria, Information Requirements, Additional Considerations, and Conclusions. The Criteria section outlines two criteria that need to be met and what can be used to demonstrate compliance with those criteria. The Information Requirements section outlines what information should be included as part of the groundwater study (which is needed as part of the GWNIAA demonstration).

If you or any of your staff should have any questions, comments, or concerns about the GWNIAA Staff Guidance, please contact Ron Stone from WMD's Hazardous Waste Section, at 517-373-7141.

Attachment

cc: George Bruchmann, WMD
Frank Ruswick, WMD
De Montgomery, WMD
Ron Stone, WMD
Pat Brennan, WMD-Jackson

WMD Staff Guidance for Determining Groundwater Not In An Aquifer

MDEQ-WMD **May 1, 2000**

INTRODUCTION

This document is guidance for the use of the Waste Management Division (WMD) staff, to consistently apply the requirements for a Groundwater Not In An Aquifer (GWNIAA) designation for siting criteria, pathway analysis, monitoring requirements, discharge authorizations, remediations, and other pertinent determinations under the following parts of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA): Part 31, Water Resources Protection; Part 111, Hazardous Waste Management; and Part 115, Solid Waste Management. This guidance describes the criteria that should be considered when evaluating whether groundwater encountered in a formation is or is not in an aquifer as well as information that should be used in applying those criteria.

The WMD reserves the right to utilize site-specific data in review of all cases, in order to decide the most appropriate determination for each site or formation. If it becomes necessary to remediate any media within the groundwater, hazardous waste, or solid waste programs of WMD, Part 201, Environmental Remediation, of the NREPA, is utilized. Part 201 requires all exposure routes and receptors at sites of environmental contamination to be evaluated based upon site conditions and characteristics. At a remediation site where it is determined that groundwater ingestion is not a relevant exposure pathway, it still will be necessary to evaluate all other transport mechanisms and exposure pathways that might result in unacceptable exposure. Monitoring of a saturated zone that is "GWNIAA" may still be necessary in relation to other pathways such as groundwater-surface water interface criteria (GSI) or indoor air inhalation.

This guidance does not apply to an area that has been determined by the Part 31 Groundwater Discharge Permit program to be a monitoring zone.

DEFINITIONS

- Aquifer: A geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.
- Crock Well: A well traditionally constructed by excavating or boring a large diameter hole and placing vitrified clay tiles, pre-cast concrete pipe, or stone as casing or side walls to keep the excavation from collapsing.
- Driven Well (or Stab/Point Well): Consists of a well point (screen) that is attached to the bottom of the well casing and is pushed into the ground by hand or mechanical methods.
- Formation: a unique lithologic unit that can be mapped, but does not include a unit composed of material that has been physically or chemically altered, transformed, or used during a manufacturing process, such that they would impact the potable quality of the groundwater.
- Groundwater: Water below the land surface in a zone of saturation.
- Monitoring Zone: Area(s) beneath the subsurface where the hydrogeologic environment allows the movement of groundwater and potentially entrained contaminants and is capable of yielding a representative groundwater sample. A monitoring zone may or may not be naturally saturated and may be influenced by regulated surface activities.

- Owner/Operator: The person who owns the facility, or part of the facility, including the titleholder of the land on which the facility is located or the person responsible for the overall operation of the facility.

- Geologist or qualified groundwater scientist: A scientist or engineer who has received a baccalaureate or postgraduate degree in the natural sciences or engineering and who has sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration, professional certification(s), or completion of accredited university programs, to make sound professional judgments regarding groundwater monitoring, geological conditions, contaminant fate and transport, and corrective action.

- Staff Geologist: the WMD geologist assigned to the project in question.

- Venting: the discharge of groundwater to surface water or the ground surface.

CRITERIA

It is the responsibility of the owner/operator of a site to demonstrate that the groundwater beneath the site is GWNIAA and that the groundwater ingestion exposure pathway does not apply. Both of the following criteria must be met to make this demonstration:

1. The formation yields an insignificant amount of water below the site (considering local and regional hydrogeology). This criterion can be met by any one or a combination of the following:

   a. All site monitoring wells installed in the formation bail or pump dry (at a maximum pumping rate of 0.1 gpm) and do not recharge to within 80 percent of the original well volumes within twenty-four (24) hours. Monitoring wells must be shown to have been installed properly and are presently in good operational condition and the screens must fully penetrate the saturated zone. The staff geologist, on a case-by-case basis, can approve different pumping and recharge rates.

   b. The *in situ* hydraulic conductivity is to be based on a minimum of five (5) site-specific tests, each of which is less than 1.0×10^{-6} centimeters per second (cm/s). The test results are not to be averaged. Well locations must be approved in advance and cover the formation of concern across the site. The exact number of tests will depend on the size and complexity of the site and will need to be approved by the staff geologist. The staff geologist, on a case-by-case basis, can consider different hydraulic conductivity values for use.

   c. A site pumping test[1], designed appropriately to test the formation in question, yields less than 0.1 gallon per minute.

2. The groundwater in question is not in hydraulic communication with groundwater in an aquifer. This criterion can be met through any one or a combination of the following:

   a. Sufficient knowledge is demonstrated concerning the regional geology supplemented with adequate site-specific information (boring/monitoring well logs, geophysical information, etc.) and is approved by the WMD.

   b. A site pumping test[1] demonstrates that any water bearing seams of concern are isolated and are not in communication with an aquifer.

   c. A demonstration that the groundwater is a totally discharging system and is venting to a surface water body (that is not locally recharging an aquifer) can be used to show that the formation in question does not connect to another aquifer laterally. This demonstration must also show that

all GSI criteria are/will be met or that a mixing zone evaluation by the Surface Water Quality Division has been accepted. This demonstration would only eliminate the horizontal concerns with connection to other aquifers. It would still need to be demonstrated that the unit (or the receiving surface water body) in question does not connect to another aquifer vertically. There are many areas along the larger river systems where shallow saturated units with significant quantities of groundwater discharge directly to the river. It would be difficult to comply with both criteria number 1 and number 2 under these conditions, but it may still be possible to eliminate the drinking water pathway.

INFORMATION REQUIREMENTS

The demonstration that groundwater beneath a site is not in an aquifer, does not need to be monitored and, if applicable, that the groundwater ingestion exposure pathway does not apply, is made in a Groundwater/Hydrogeological Investigation (GI) Report and/or Remedial Action Plan (RAP). In order to make this demonstration the GI or RAP must address all of the applicable components identified below. The GI and/or RAP are subject to review and approval by the staff geologist (or other WMD staff), and additional information may be required to support a finding on the criteria described above.

1. Facility boring and well logs and all private water well logs within a minimum of ½ mile of the facility property boundaries. These should substantiate the continuity of the lower, competent confining layer.

2. At least two (2) scaled cross-sectional drawings, one down the centerline axis of the plume or contaminated area (or parallel to groundwater flow if there is no plume) and one perpendicuiar to this axis, showing topography, geology, groundwater, and other pertinent features.

3. Scaled isopach maps showing the thickness of the saturated zone and aquiclude/aquitard across the site.

4. A scaled site map showing all buried utility corridors and other subsurface structures, including wells or drainage tiles, that may act as contaminant migration routes or artificially lower the water table due to their depth or proximity to the groundwater. The depths of all such features should be identified and/or included on the cross-sections listed in point 2, above.

5. A summary of the regional geology and topography. Information to support a conclusion that the groundwater ingestion exposure pathway is not relevant should include a well-documented evaluation of site and regional characteristics.

6. A comparison of the formation groundwater elevations with the local aquifer groundwater elevations to sufficiently demonstrate the lack of hydraulic communication. These should also identify the groundwater flow direction at the site and indicate any seasonal variations.

7. Written response from the local health department indicating (1) whether they were contacted to make a determination whether crock wells or driven wells for any private water usage exist in the vicinity of the facility, (2) what that determination was, and (3) any concerns they may have regarding the site and/or the GWNIAA determination.

8. Written response from the Department of Environmental Quality (DEQ), Drinking Water and Radiological Protection Division (DWRPD) indicating whether they were contacted to determine if the facility is located in an approved Local Wellhead Protection Area (LWPA) and what that determination was (see ***www.deq.state.mi.us/dwrl***).

9. Any available groundwater quality analyses, including conditions upgradient, downgradient, and outside any area of on-site contamination.

10. Documentation of any other characteristics of the site that would assist in making this determination.

ADDITIONAL CONSIDERATIONS

1. When conducting this review as part of a site remediation, some programs may use an evaluation of the relative risk with respect to toxicity, concentration, volume, mass, or quantity of the hazardous substance in determining whether the groundwater poses a threat to the environment or the public health and safety. The staff geologist may request this information as part of the review for a GWNIAA determination.

2. With Michigan's highly variable geology, this decision-making process is often a localized consideration. There are some formations around the state in which groundwater availability is limited, but which may still be used as a water source by the use of crock wells or driven wells. Some of these formations may be used as a drinking water source, while others may be used for other purposes (sprinklers, cooling, swimming pools, etc.). If the site is in an area served by crock wells or driven wells or if the area groundwater is used for drinking water or other purposes, the owner/operator must assess whether the water source(s) may be impacted by site activity and whether sampling such water supplies is warranted. The documentation required to support a determination that the groundwater is not in an aquifer at this type of site would also be more extensive. The assigned staff geologist may require additional information to help in the decision making process for areas of the state where crock or driven wells are used.

3. If the groundwater beneath a site is determined to be not in an aquifer, it may be necessary to place a deed notification or restriction on the property to allow the higher degree of contamination (if existing) to remain. The deed notification or restriction should alert any existing or future owner of the condition of the groundwater, that it has been determined to be unusable, and that it will not impact neighboring properties. The staff geologist and/or the WMD must approve the wording of any deed notification or restriction before it is filed. Proof of filing must be supplied to the WMD. On-site soils that are remediated to levels that do not consider the groundwater pathway must not be removed to a different site where groundwater may be vulnerable.

4. The Owner/Operator must contact the DEQ, DWRPD to determine if the site is located in an approved LWPA (see ***www.deq.state.mi.us/dwr/***). If the site is located in such an area, the need for adequate documentation, data collection and assessment is greatly increased, and comments will be required from the DWRPD before a final decision can be made.

5. Monitoring wells used in this evaluation must be properly constructed, developed, and maintained in accordance with WMD approved methods and approved for use by the staff geologist.

6. Site characteristics vary. Therefore, depending on the characteristics of the specific site, additional information could be submitted to, or requested by, the WMD or the staff geologist. The owner/operator should contact the staff geologist concerning site-specific issues.

7. The formation may be naturally saturated, seasonally saturated, or only saturated due to a regulated discharge. These possibilities should be considered by the owner/operator during their evaluation. The staff geologist must determine whether the formation is a monitoring zone before concluding their evaluation.

CONCLUSIONS

This document is intended to assist the WMD staff to foster consistent application of the NREPA, Parts 31, 111, and 115, regarding designations of GWNIAA. This document is not intended to convey any rights to any parties, nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Responsibility for periodic review and revisions to this document lies with the WMD, Hazardous Waste Program Section, Technical Support Unit.

[1] Pumping tests must be run by an individual qualified to conduct such tests. These tests must be run for sufficient time to determine if boundary conditions (e.g., impermeable boundaries, recharge from leaky confining layers) are encountered. Plotting the drawdown versus time graphs in the field during the pumping test is recommended as a means of determining when the pumping test can be terminated. Wells to be used (or plans for proposed wells) must be approved by the staff geologist, before the test is performed.

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

APPENDIX B

MDEQ-STD OPERATIONAL MEMORANDUM NO. 11
RE: CRITERIA TO ELIMINATE THE POTABLE GROUNDWATER PATHWAY
(AUGUST 25, 1997)

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

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Alex Rothchild
LFR
Sep 30, 2009 09:06

DEQ UNDERGROUND STORAGE TANK DIVISION

SUBJECT: Criteria to Eliminate the Potable Groundwater Pathway	DATE: August 25, 1997	Operational Memorandum No. 11

Introduction

Part 213, Leaking Underground Storage Tanks (LUST), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, requires all exposure pathways and receptors to be evaluated based upon site conditions and characteristics utilizing the Risk-Based Corrective Action (RBCA) process. This document describes the criteria that must be utilized for evaluating site conditions including the quantity of groundwater present in order to eliminate the potable groundwater pathway at a site. The criteria presented in this operational memorandum has been adapted, as appropriate, for the application in the Underground Storage Tank Division's (USTD) RBCA process. This operational memorandum should be filed as Attachment 15 in your Guidance Document for Risk-Based Corrective Action at Leaking Underground Storage Tanks.

Regulatory Definitions

Groundwater: - Under Part 213 "Groundwater means water below the land surface in the zone of saturation."

Aquifer: - Part 201, Environmental Remediation, of Act 451, defines aquifer to mean, "a geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs."

Terminology as used in the Part 213 RBCA Process

Potable Groundwater: - Groundwater that is suitable and in sufficient quantity for human, animal and plant consumption, irrigation, and other uses within the residential, commercial and industrial categories. All potable groundwater must be protected for health based or aesthetic criteria, whichever is more restrictive, unless reliably restricted.

Non-Potable Groundwater: - Groundwater that is deemed unsuitable for the use specified in the potable definition due to naturally occurring elements and/or dissolved salts present in the groundwater. Documentation from the local health department should be provided regarding a determination of non-potability. Non-Potable groundwater may act as a transport mechanism to affect human or other receptors such as surface waters or other environmental areas or species.

Documentation to support the determination of an insufficient quantity of groundwater will require a detailed evaluation and/or documentation of site characteristics by the Qualified Underground Storage Tank Consultant (QC) to verify that the potable groundwater pathway does not exist. Reasonable and adequate subsurface investigations, which may include geophysical activities, must be performed to document that the stated condition exists. A higher degree of

proof will be necessary to support this determination. The results of subsurface investigations and review of published materials should verify a lack of hydraulic communication with another aquifer(s). Conditions may exist in certain areas of the state where the groundwater may be used as a private potable water supply by the use of "crock wells." Such areas include, but are not limited to, parts of the Saginaw Valley and "Thumb" area, Ottawa, Menominee, and Ontonagon counties. The QC should also identify if the site is located within a local wellhead protection program area. Contact should be made with the local health department to identify the areas served by "crock wells", and the Department of Environmental Quality Drinking Water and Radiological Protection Division to determine if sites are located in wellhead protection areas.

Criteria to eliminate the potable groundwater pathway.

In order for the QC to demonstrate that the groundwater present beneath the site is of insufficient quantity to meet the definition of aquifer, the following four (4) criteria must be met:

1. **The groundwater formation below the site must yield an insufficient quantity of water considering local and regional hydrogeology. Any one of the following criteria are acceptable by the Underground Storage Tank Division (USTD) to document that an insufficient quantity of groundwater is present in order to eliminate the potable groundwater pathway.**

   a) All site monitoring wells installed in the native material must bail dry after sustained bailing of less than five (5) gallons (excluding the volume of groundwater initially present in the well casing and filter pack).
   b) The saturated thickness measured in the site monitoring wells must average less than two (2) feet when set at the bottom of the formation. The measurements should account for seasonal groundwater fluctuations.
   c) The average in situ hydraulic conductivity based on at least three (3) site specific slug tests multiplied by 10 must be less than 5.0×10^{-6} centimeters per second, or an aquifer pumping test* that demonstrates a hydraulic conductivity of 5.0×10^{-6}. (Slug tests may underestimate the hydraulic conductivity by an order of magnitude.)
   d) A site aquifer pumping test* demonstrates that the water bearing seams are isolated, and are not in communication with one another.
   e) A site aquifer pumping test* yields less than 0.1 gallons per minute and the contamination will not leave the property above Tier 1 Residential Risk-Based Screening Level (RBSL) unless the off-site property is reliably restricted.
   f) A determination that the well yield (Q) is less than 0.1 gallons per minute based on the use of appropriate hydrogeologic equations that incorporate aquifer condition (confined or unconfined), hydraulic conductivity(k) and saturated thickness (b). These equations must be shown to be applicable to the site hydrogeologic conditions. Estimate of hydraulic conductivity from aquifer slug testing would still need to be multiplied by 10 as a correction factor for use in these equations.
   g) Other site specific Tier 2 evaluations may be proposed for review and approval by the USTD to eliminate the potable groundwater pathway.

*Aquifer pumping tests need to run for sufficient time to determine if boundary conditions (e.g., impermeable boundaries, recharge from leaky confining layers) are encountered. Plotting the drawdown versus time graphs in the field during the aquifer pumping test is recommended as a means of determining when the aquifer pumping test can be terminated.

2. **It must be demonstrated that a continuous confining layer exists across the entire site, and that the saturated zone is not in lateral or vertical communication with a lower adjacent aquifer.**

3. **The QC must provide the following supporting documentation in the Final Assessment Report (FAR) and/or the Closure Report:**

   a) On-site boring logs and area well logs to substantiate the continuity of the lower confining layer, and the absence of communication with an aquifer. Provide a minimum of two (2) scaled cross-sectional drawings, with surface topography, in the FAR or Closure Report; one down the centerline axis of the plume and the other perpendicular to the axis across the plume width.
   b) Documentation that the local health department was contacted to determine if "crock wells" for private potable water supplies exist within 500 ft. of the site and the Department of Environmental Quality Drinking Water and Radiological Protection Division was contacted to determine if the site is located in an approved local wellhead protection area.
   c) Comparison of area surface water elevations with the site groundwater elevations.
   d) Documentation on the local geology and topographical variances.
   e) Document the site relationship to recharge and discharge zones in the area, including a map of paved areas or other surfaces which are impervious to infiltration.
   f) Identify on a site map all buried utility corridors and other subsurface structures that may act as contaminant migration pathways due to their depth or proximity to the groundwater. Identify the depths of all utilities.
   g) Identify if the groundwater elevations across the site can be reasonably predicted, and a groundwater flow direction has been determined. Indicate any seasonal variations in the saturated zone.
   h) A map showing the thickness of the saturated zone across the site.
   i) Identify any subsurface drainage structures that would artificially lower the water table.
   j) Document any other unusual characteristics of the site that would assist in making this determination.

4. **Monitoring wells used in this evaluation must be properly constructed, and developed in accordance with standard operating practices.**

Site characteristics across the state may vary, therefore, additional factors concerning the site should be included or may be requested by the USTD. The QC should contact the USTD project manager or geologist concerning site specific issues not addressed by this memorandum.

NOTE: If the above criteria has been satisfied, the QC will still need to evaluate all other pathways to demonstrate that the groundwater beneath the site will not migrate or act as a transport mechanism to affect other exposure pathways and receptors, such as utilities, surface waters or inhalation.

This memorandum is intended to provide guidance to QCs and USTD staff to foster consistent application of Part 213. This document is not intended to convey any rights to any parties, nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Questions about this memorandum should be directed to the appropriate USTD District Supervisor.

Responsibility for periodic review and revisions to this memorandum lies with the Chief of the Field Operations Section.

Authorization:	Date:

Distribution: Qualified UST Consultants
USTD Mailing List
DEQ Division/Office Chiefs
USTD Supervisors

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

APPENDIX C

MONITORING WELL INFORMATION

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Alex Rothchild
LFR
Sep 30, 2009 09:06

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Alex Rothchild
LFR
Sep 30, 2009 09:06

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: GM REALM
LOCATION: GENESEE TOWNSHIP, MICHIGAN

HOLE DESIGNATION: MW-1-02
DATE COMPLETED: June 27, 2002
DRILLING METHOD: 4-1/4" HSA
FIELD PERSONNEL: D. DEITNER

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	TOP OF RISER GROUND SURFACE	810.90 808.00						
0	SW-SANDS (FILL), with medium grained rounded gravels, trace silts, fine to medium grained, well graded, trace topsoil, dry	807.00	BENTONITE CHIPS					
2	- topsoil not present at 0.5ft BGS CL-SILTY CLAYS (FILL), trace fine grained sands, trace fine to medium grained gravel, stiff, low plasticity, brown, moist		8-1/2" BOREHOLE	1GP				0.0
4	- 1/4" lens sandy silt at 2.5ft BGS	804.00						
6	CL-SILTY CLAYS (NATIVE), trace fine grained sands, trace fine grained subrounded gravel, firm, low plasticity, brown, moist - 1" vertical sand lens, 2mm thick at 4.8ft BGS		2" PVC WELL CASING					
8	- 1" sand/silt lens, slight increase in moisture at 8.1ft BGS		SAND PACK	2GP				0.0
10								
12	- with sand at 11.5ft BGS - trace sand at 11.8ft BGS - trace gray mottling at 12.7ft BGS		2" PVC WELL SCREEN	3GP				0.0
14		793.00						
16	END OF BOREHOLE @ 15.0ft BGS							
18								
20								
22								
24								
26								
28								
30								
32								
34								

WELL DETAILS
Screened interval:
798.00 to 793.00ft
10.00 to 15.00ft BGS
Length: 5ft
Diameter: 2in
Slot Size: 0.010
Material: Schedule 40 PVC
Sand Pack:
800.00 to 793.00ft
8.00 to 15.00ft BGS
Material: Silica Sand

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

OVERBURDEN LOG 12636.GPJ CRA_CORP.GDT 12/2/02

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: GM REALM
LOCATION: GENESEE TOWNSHIP, MICHIGAN

HOLE DESIGNATION: MW-2-02
DATE COMPLETED: June 27, 2002
DRILLING METHOD: 4-1/4" HSA
FIELD PERSONNEL: D. DEITNER

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	TOP OF RISER	810.99
	GROUND SURFACE	807.94
0	TOPSOIL	807.61
2	SW-SANDS (FILL), with medium grained rounded gravel, trace silt, compact, fine to medium grained, well graded, light brown, dry	807.03
	- 2" cobbles at 1.1ft BGS	805.94
4	MH-SILT WITH SANDS (FILL), loose, fine grained, poorly graded, light brown, dry	
	CL-SILTY CLAYS (FILL), trace fine grained sand, trace fine grained rounded gravel, stiff, low plasticity, brown, moist	
6	- 1" lens sandy clay at 3.5ft BGS	
8	CL-SILTY CLAYS (NATIVE), trace fine grained sand, trace fine grained rounded gravels, stiff, low plasticity, grayish brown, moist	799.84
10	- 1.5" lens clayey silt, moist to very moist at 8.8ft BGS	
	- 3" lens silt with clay, trace sand, moist to very moist at 11.1ft BGS	
12	- gray, hard, competent at 13.1ft BGS	
14	- 1.5" lens clayey silt at 13.5ft BGS	792.94
	END OF BOREHOLE @ 15.0ft BGS	
16		
18		
20		
22		
24		
26		
28		
30		
32		
34		

MONITORING WELL

WELL DETAILS
Screened interval:
797.94 to 792.94ft
10.00 to 15.00ft BGS
Length: 5ft
Diameter: 2in
Slot Size: 0.010
Material: Schedule 40 PVC
Sand Pack:
799.94 to 792.94ft
8.00 to 15.00ft BGS
Material: Silica Sand

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1GP				0.0
2GP				0.0
3GP				0.0

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

OVERBURDEN LOG 12636.GPJ CRA_CORP.GDT 12/2/02

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: GM REALM
LOCATION: GENESEE TOWNSHIP, MICHIGAN

HOLE DESIGNATION: MW-3-02
DATE COMPLETED: June 27, 2002
DRILLING METHOD: 4-1/4" HSA
FIELD PERSONNEL: D. DEITNER

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	TOP OF RISER	810.84
	GROUND SURFACE	808.05
0	TOPSOIL	807.72
	SW-SANDS (FILL), and medium grained rounded gravel, trace silts, loose, fine grained, poorly graded, light brown, dry	807.39
2	CL-SILTY CLAYS (FILL), trace to with fine grained sands, trace medium grained rounded gravel, stiff, low plasticity, brown, moist	
4	- trace rootlets at 4.8ft BGS	
6		
		800.55
8	CL-SILTY CLAYS (NATIVE), trace fine grained sand, trace medium grained rounded gravel, stiff, low plasticity, brown, moist	
10	- 2.5" lens clayey silt, moist to very moist at 9.9ft BGS	
12	- 2" lens sandy clay, moist to very moist at 12.2ft BGS	
	- brown, homogeneous at 13.0ft BGS	
14	- gray at 14.2ft BGS	
		793.05
16	END OF BOREHOLE @ 15.0ft BGS	
18		
20		
22		
24		
26		
28		
30		
32		
34		

MONITORING WELL

WELL DETAILS
Screened interval:
798.05 to 793.05ft
10.00 to 15.00ft BGS
Length: 5ft
Diameter: 2in
Slot Size: 0.010
Material: Schedule 40 PVC
Sand Pack:
800.05 to 793.05ft
8.00 to 15.00ft BGS
Material: Silica Sand

SAMPLE NUMBER	SAMPLE INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1GP				0.0
2GP				0.0
3GP				0.0

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

OVERBURDEN LOG 12636.GPJ CRA_CORP.GDT 12/2/02

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: GM REALM
LOCATION: GENESEE TOWNSHIP, MICHIGAN

HOLE DESIGNATION: MW-4-02
DATE COMPLETED: June 27, 2002
DRILLING METHOD: 4-1/4" HSA
FIELD PERSONNEL: D. DEITNER

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	TOP OF RISER	810.63
	GROUND SURFACE	807.91
0	TOPSOIL	807.50
	MH-SANDY SILTS (FILL), loose, fine grained, poorly graded, brown, dry	
2	- 1" cobble at 2.2ft BGS	805.71
	CL-SILTY CLAY (FILL), trace fine grained sands, trace fine and coarse grained subrounded gravel, firm, low plasticity, brown, moist	
4		
	- brown and gray native, trace topsoil, rootlets, 1" cobbles at 3.8ft BGS	802.41
6	CL-SILTY CLAYS (NATIVE), trace fine grained rounded gravels, trace fine grained sands, firm, low plasticity, brown with gray mottling, moist	
8		
	- trace oragnic staining at 9.7ft BGS	
10	- brown at 10.0ft BGS	
	- 3" lens sandy silt, trace clay, moist to very moist at 11.7ft BGS	
12	- stiff, brown, homogeneous at 12.1ft BGS	
14		792.91
	END OF BOREHOLE @ 15.0ft BGS	
16		
18		
20		
22		
24		
26		
28		
30		
32		
34		

MONITORING WELL

WELL DETAILS
Screened interval:
797.91 to 792.91ft
10.00 to 15.00ft BGS
Length: 5ft
Diameter: 2in
Slot Size: 0.010
Material: Schedule 40 PVC
Sand Pack:
799.91 to 792.91ft
8.00 to 15.00ft BGS
Material: Silica Sand

SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
1GP				0.0
2GP				0.0
3GP				0.0

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

OVERBURDEN LOG 12636.GPJ CRA_CORP.GDT 12/2/02

TABLE 1

MONITORING WELL CONSTRUCTION DETAIL SUMMARY
GENERAL MOTORS DELPHI INTERIOR LIGHTING SYSTEMS PLANT
FLINT, MICHIGAN

MONITORING WELL NO.	DEPTH TO WELL BOTTOM (feet bgs)	DEPTH TO TOP OF SCREEN (feet bgs)	DEPTH TO TOP OF SAND PACK (feet bgs)	DEPTH TO TOP OF BENTONITE SEAL (feet bgs)
MW-1	25	15	13	11
MW-2	25	15	13	10.5
MW-3	25	15	13	11
MW-4	25	15	13	11
MW-6	28	18	16	13.5
MW-8	28	18	16	14
MW-9	32	22	20	17.5
MW-10	18	8	6	3.5
MW-11	20	10	8	6
MW-12	25	15	13	10.5
MW-13	25	15	13	10.5
MW-14	25	15	13	11

Note:

bgs = below ground surface

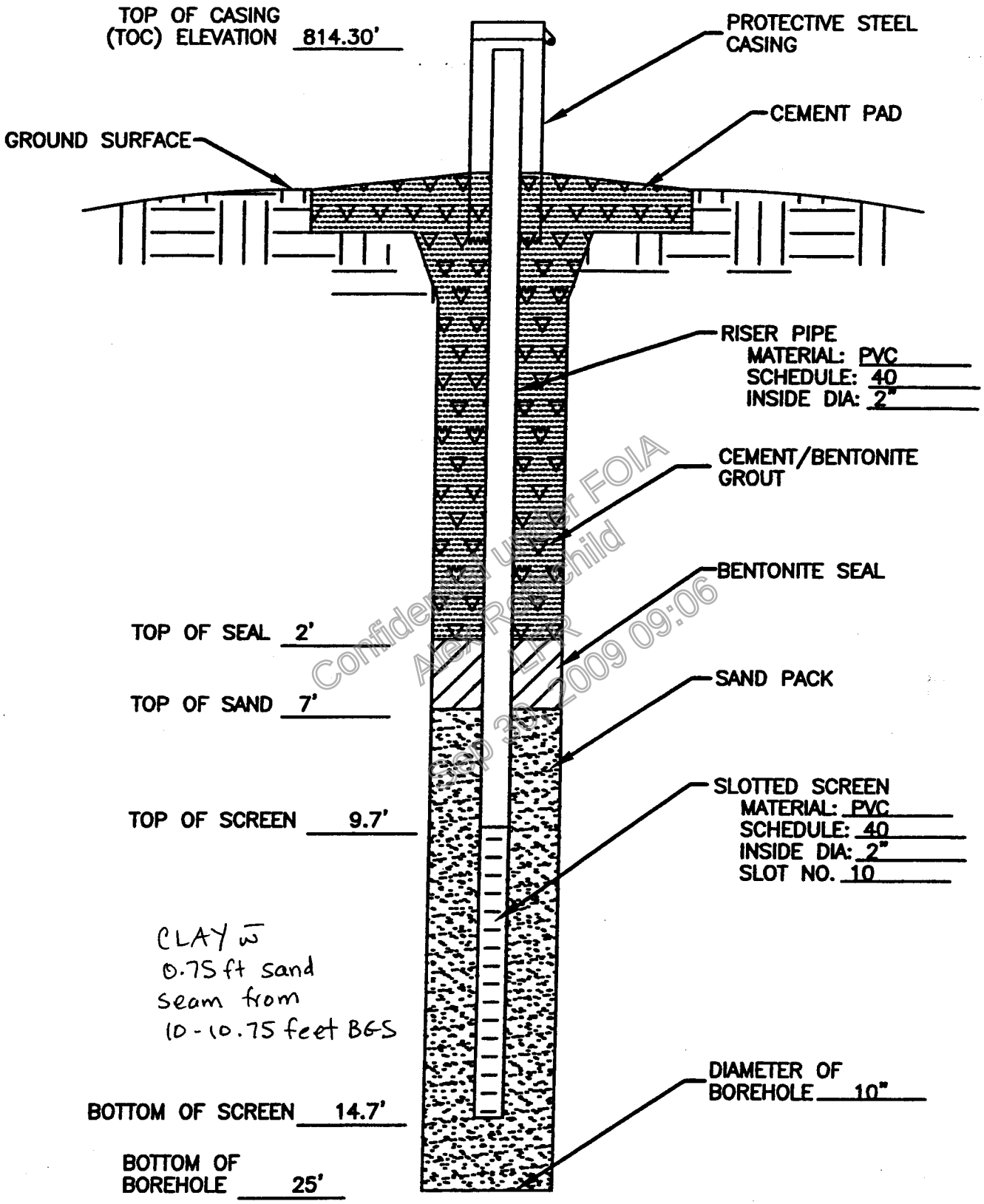
GaiaTech collected soil samples from soil borings installed with a hollow stem auger (HSA) drill rig at the following locations: MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-12, MW-13, MW-14, and SB-9. GaiaTech drilled and installed monitoring wells: MW-1, MW-2, MW-3, MW-4, MW-6, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13 and MW-14. Water was not encountered in soil borings MW-5 and MW-7; therefore, monitoring wells were not installed at these locations.

The monitoring wells were constructed of two-inch diameter PVC riser and well screen. The well screens are 10 foot in length. A sand pack was installed around each well screen from the well bottom to 2 feet above the screen. A bentonite pellet seal, approximately 2 to 2.5 feet thick, was placed on top of the sand pack. A bentonite chip layer was placed on top of the bentonite seal to within a minimum of 1.5 feet bgs and concrete with a flush-mounted well box completed the well to ground surface.

The monitoring wells were installed within a silty clay formation which produced little water. The groundwater entering these monitoring wells should be considered "water not in an aquifer" as defined in Act 451, Part 201.

FROM:
CRA 8692 Memo#4, Dec. 1996

OBRIEN & GERE
ENGINEERS INC.



REALM—Coldwater Road
Flint, Michigan
MONITORING WELL DSA MW—1

MW-OBG

V:\cad\proj\4144.007\DSP\mwdetmw1.dwg

ENVIRONMENTAL AUDIT REPORT
PRIVILEGED DOCUMENT

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. PFW-1
SHEET NO. 1 OF 7

PROJECT NAME PEREGRINE FLINT
LOCATION FLINT, MICHIGAN
CONTRACTOR STEARNS DRILLING CO
DRILLING METHOD 4.25" HSA

PROJECT NO. 4036.05
INSTALLATION 3-13-97
SURFACE ELEV. 99.6
BOREHOLE DIA. 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	17	16	0.6		Asphalt, broken. Fill: well-graded sand with gravel, little silt, little clay, brown, wet.	
2	SS	15	18	0		SANDY LEAN CLAY (CL), little fine to coarse sand, few fine to coarse gravel, slightly plastic, brown 10YR 4/3 with some mottling to grayish brown and yellowish brown, moist, (hard Pp > 4.5) (Glacial Till).	
3	SS	16	24	0		As above (CL), very stiff from 2 to 2.5 ft.	
4	SS	15	24	0	5	As above (CL), fractured, very stiff (Pp=3.4) below 5.7 feet.	
5	SS	22	24	0		As above (CL), becoming mottled brown, dark grayish brown and dark gray 10YR 4/1 - 4/2.	
6	SS	16	24	0	10	As above (CL), wet at sand partings @ 8.5' and 9.1', brown, trace fractures.	

GENERAL NOTES

DATE STARTED 12 MAR 97
DATE COMPLETED 13 MAR 97
RIG CME 750 ATV
CREW CHIEF R. BENNETT
LOGGED DPR CHECKED LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 78.0 ft. bgl
AT COMPLETION ▼
AFTER DRILLING
CAVE-IN: DATE/TIME _____ DEPTH _____
WATER: DATE/TIME _____ DEPTH _____

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	2 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
						As above (CL), stiff to very stiff, (Pp= 1.6 to 2.7).	
7	SS	15	24			As above (CL).	
						WELL-GRADED SAND WITH SILT (SW), fine to medium, trace gravel, few clay, brown 10YR 4/3, moist, pieces of clay till.	
					15	SANDY LEAN CLAY (CL), some fine to coarse sand, few fine to coarse gravel, slightly plastic, brown 10YR 4/3, moist, stiff to very stiff (Glacial Till).	
8	SS	15	24	0		As above (CL), hard (Pp > 4).	
					20		
						As above (CL).	
9	SS	19	24	0			
						LEAN CLAY (CL), gradational areas of	

ENVIRONMENTAL AUDIT REPORT:
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LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	3 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
						clayey silt and sandy silt, slightly plastic, mottled brown, dark yellowish brown, and brownish gray, hard, fractured, friable, (Glacial Till).	
					25	SILTY SAND (SM), fine, brown, wet.	
10	SS	40	24	0		LEAN CLAY (CL), slightly plastic, brown with dark yellowish brown and black precipitate along fractures, mostly dark grayish brown below 29.6', moist to wet along silt partings, very hard, faint lamination (Glaciolacustrine).	
					30		
					35		

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LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	4 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL		RECOVERY		PID			
NO.	TYPE	N	IN		DEPTH		
11	SS	20	0			As above (CL), gray 10YR 5/1 (based on cuttings).	
					40		
12	SS	17	24	0.6		As above (CL), wet along silt partings, very stiff (Pp = 3.2 to 3.7).	
					45	SILT (ML), grading from above clay, nonplastic, gray 10YR 5/1, moist, very stiff.	

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LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	5 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL		RECOVERY		PID			
NO.	TYPE	N	IN		DEPTH		
13	SS	14	24	0.3	50	LEAN CLAY (CL), trace fine gravel, trace fine to coarse sand, medium plastic, gray 10YR 5/1, moist, very stiff (Pp = 2.3 to 2.7), faint lamination (Glaciolacustrine).	
					55		
					60		

LOG OF TEST BORING

F-203 (R 01-87)

RMT

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	6 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
14	SS	16	24	0.2		As above (CL), abundant silt partings.	
					65		
					70	<--- Drillers note change in resistance @ 71 feet.	
15	SS	88	18			POORLY-GRADED SAND (SP), fine, trace silt, light gray 10YR 7/1, moist to dry, faint stratification.	
					75		

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LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	7 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
16	SS	23	18			As above (SP), some medium sand, gray 10YR 6/1, wet.	
					80		
17	SS	40	24			As above (SP), mostly medium grained.	
					85	LEAN CLAY (CL).	
						End of boring at 85 feet.	

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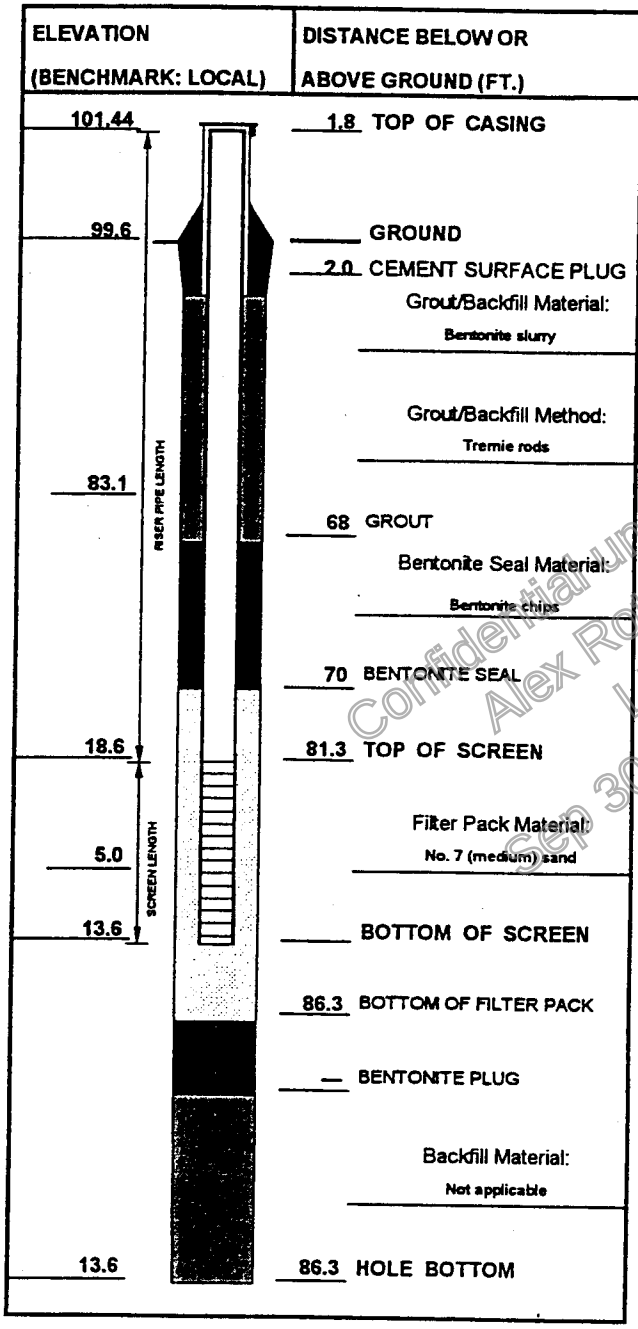
RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-1
PROJ. NO:	4036.05	DATE INSTALLED:	3-13-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 86.3 Ft.
___ In. From ___ To ___ Ft.

F) Surf. Casing Diameter: ___ In. From ___ To ___ Ft.
2nd Surface Casing: ___ In. From ___ To ___ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Surge/pump with Bremer check valve

B) Time Spent Developing: 2.4 Hours

C) Water Removed: 300 Gallons
Added: 10 Gallons

D) Water Clarity Before/After Development:
Before: Opaque, gray
After: Slightly turbid (approximately 50 NTU)

F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: ___ Ft. Below Top Of Casing

B) Other Date/Time: 3-31-97/1358 80.58 Ft.

Other Date/Time: ___ Ft.

Notes: Approximately 10 gallons of clean water were added to eliminate a temporary bridge during filter packing.

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. PFW-2
SHEET NO. 1 OF 2
PROJECT NO. 4036.05
INSTALLATION 3-14-97
SURFACE ELEV. 98.5
BOREHOLE DIA. 8 IN.

PROJECT NAME PEREGRINE FLINT
LOCATION FLINT, MICHIGAN
CONTRACTOR STEARNS DRILLING CO
DRILLING METHOD 4.25" HSA

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	26	18	0		Topsoil, wet.	
						SANDY LEAN CLAY WITH GRAVEL (CL), some fine to coarse sand, little fine to coarse gravel, slightly plastic, brown 10YR 4/3 with some dark yellowish brown mottling, moist, hard (Pp > 4.5).	
2	SS	15	16	0			
						As above (CL), increasing moisture below 3 feet, stiff (Pp = 1.2 to 1.5).	
3	SS	12	16	0			
					5	As above (CL), some brownish gray mottling, some very stiff areas (Pp = 2.5).	
4	SS	5	18	0			
						As above (CL), with gray areas.	
					▽	WELL-GRADED SAND WITH CLAY (SW-SC), fine to medium sand, little coarse sand, few clay, trace gravel, brown 10YR 4/3, wet.	
5	SS	1	18				
						As above (SW-SC), 2" to 4" zone stiff sandy clay.	
6	SS	2	6		10		

GENERAL NOTES

DATE STARTED 14 MAR 97
DATE COMPLETED 14 MAR 97
RIG CME 750 ATV
CREW CHIEF R. BENNETT
LOGGED DPR CHECKED JPC

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 7.3 ft. bgl
AT COMPLETION ▼
AFTER DRILLING
CAVE-IN: DATE/TIME ____ DEPTH ____
WATER: DATE/TIME ____ DEPTH ____

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-2
LOCATION	FLINT, MICHIGAN	SHEET NO.	2 OF 2
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-14-97
		SURFACE ELEV.	98.5
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
7	SS	4	20			As above (SP-SC), trace clay, dark yellowish brown 10YR 4/4.	
						WELL-GRADED SAND (SW), fine to coarse, trace silt, trace clay, dark yellowish brown becoming dark grayish brown @ 13.4' with black steaks, diesel hydrocarbon odor.	
						SANDY LEAN CLAY (CL), some sand, trace fine to coarse gravel, slightly plastic, dark grayish brown, moist, hard (Pp > 4).	
					15	End of boring at 14 feet.	
					20		

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ENVIRONMENTAL AUDIT REPORT
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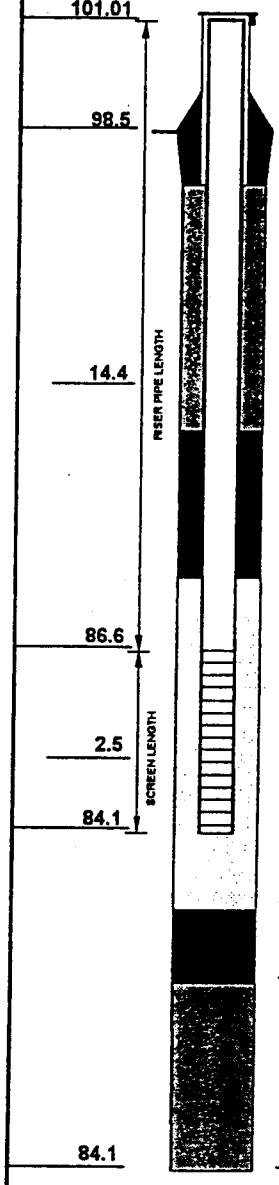
RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-2
PROJ. NO:	4036.05	DATE INSTALLED:	3-14-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 14 Ft.
___ In. From ___ To ___ Ft.

F) Surf. Casing Diameter: ___ In. From ___ To ___ Ft.
2nd Surface Casing: ___ In. From ___ To ___ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Surge/pump with Bremer check valve

B) Time Spent Developing: 1 Hours

C) Water Removed: 27 Gallons
Added: 0 Gallons

D) Water Clarity Before/After Development:
Before: Opaque, brown
After: Slightly turbid (approximately 100 NTU)

F) Odor (Descr. if present) diesel range hydrocarbons

3. WATER LEVEL SUMMARY:

A) After Developing: ___ Ft. Below Top Of Casing

B) Other Date/Time: 3-31-97/0946 6.74 Ft.

Other Date/Time: ___ Ft.

Notes:

ENVIRONMENTAL AUDIT REPORT:
PRIVILEGED DOCUMENT

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME: PEREGRINE FLINT
LOCATION: FLINT, MICHIGAN
CONTRACTOR: STEARNS DRILLING CO
DRILLING METHOD: 4.25" HSA

BORING NO.: PFW-3
SHEET NO.: 1 OF 2
PROJECT NO.: 4036.05
INSTALLATION: 3-17-97
SURFACE ELEV.: 100.3
BOREHOLE DIA.: 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	49	18	0.6		Fill: sand, gravel crushed limestone, upper few inches frozen.	
						SANDY LEAN CLAY (CL), some fine to coarse sand, trace fine gravel, slightly plastic, brown 10YR 4/3 with some gray and dark yellowish brown mottling, moist, hard.	
2	SS	17	16	0.2		WELL-GRADED SAND WITH CLAY (SW-SC), fine to coarse, dark brown 10YR 3/3, moist.	
						SANDY LEAN CLAY WITH GRAVEL (CL), little coarse gravel, dark grayish brown 10YR 4/2, moist, hard.	
3	SS	6	18	0.2		SILTY SAND (SM), fine, brown 10YR 4/3, moist.	
					5	SANDY LEAN CLAY WITH GRAVEL (CL), some fine to coarse sand, little fine to coarse gravel, moderately plastic, dark gray 10YR 4/1, moist, very stiff (Pp = 2.6).	
4	SS	12	20			As above (CL).	
5	SS	14	24			As above (CL), stiff (Pp = 1.3 to 2.0).	
6	SS	12	24		10	As above (CL).	

GENERAL NOTES

DATE STARTED: 17 MAR 97
DATE COMPLETED: 17 MAR 97
RIG: CME LC 60
CREW CHIEF: M. HEFFERAN
LOGGED: DPR CHECKED: LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING: none observed
AT COMPLETION:
AFTER DRILLING
CAVE-IN: DATE/TIME ____ DEPTH ____
WATER: DATE/TIME ____ DEPTH ____

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME: PEREGRINE FLINT
LOCATION: FLINT, MICHIGAN
CONTRACTOR: STEARNS DRILLING CO
DRILLING METHOD: 4.25" HSA

BORING NO.: PFW-3
SHEET NO.: 2 OF 2
PROJECT NO.: 4036.05
INSTALLATION: 3-17-97
SURFACE ELEV.: 100.3
BOREHOLE DIA.: 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
7	SS	14	24				
						POORLY-GRADED SAND WITH SILT (SP-SM), fine, gray, moist.	
8	SS	15	24			SANDY LEAN CLAY (CL), some sand, little fine to coarse gravel, slightly plastic, dark gray 10YR 4/1, moist, stiff.	
					15	As above (CL), medium stiff (Pp = 1.0).	
9	SS	11	24			As above (CL), (Pp = 0.5).	
10	SS	10	24			As above (CL), (Pp = 1.0).	
					20	End of boring at 20 feet.	

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ENVIRONMENTAL AUDIT REPORT:
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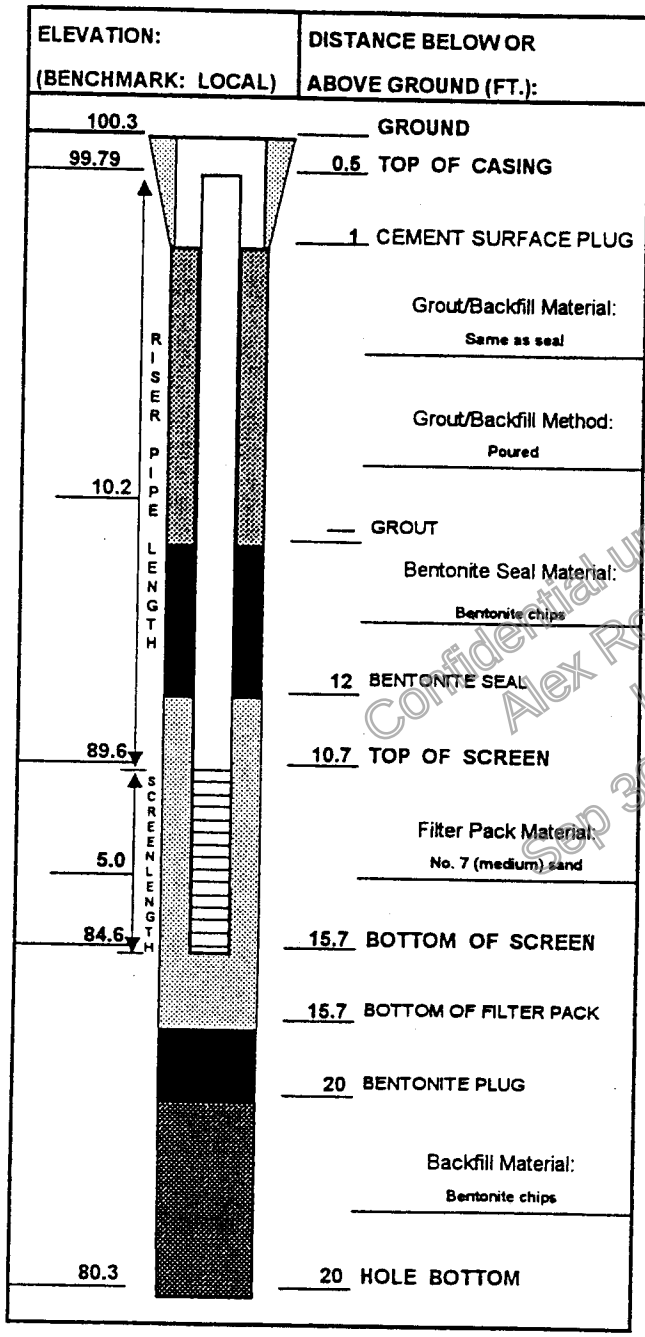
RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-3
PROJ. NO:	4036.05	DATE INSTALLED:	3-17-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 18 Ft.
3 In. From ____ To 20 Ft.

F) Surf. Casing Diameter: ____ In. From ____ To ____ Ft.
2nd Surface Casing: ____ In. From ____ To ____ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: None - dry well

B) Time Spent Developing: ____ Hours

C) Water Removed: ____ Gallons
Added: ____ Gallons

D) Water Clarity Before/After Development:
Before:
After:

F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: ____ Ft. Below Top Of Casing

B) Other Date/Time: ____ Ft.
Other Date/Time: ____ Ft.

Notes:

ENVIRONMENTAL AUDIT REPORT:
PRIVILEGED DOCUMENT

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME: PEREGRINE FLINT
LOCATION: FLINT, MICHIGAN
CONTRACTOR: STEARNS DRILLING CO
DRILLING METHOD: 4.25" HSA

BORING NO.: PFW-5
SHEET NO.: 1 OF 2
PROJECT NO.: 4036.05
INSTALLATION: 3-18-97
SURFACE ELEV.: 98.9
BOREHOLE DIA.: 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	8	20	0.1		Fill: mostly medium sand, little fine to coarse rounded gravel, brown to 15 inches, then dark yellowish brown, no odor, moist.	
2	SS	9	22	0.1		As above.	
						Fill: fine to medium sand, dark yellowish brown, becoming brown and wet @ 3.7 ft.	
3	SS	2	12	0		As above, dark grayish brown.	
					5		
4	SS	1	0			As above (based on blow counts and contents of 8 to 10 ft. sample).	
5	SS	2	20			As above.	
6	SS	10	16		10	SANDY LEAN CLAY (CL), medium plastic, gray.	
						SILT (ML), dark gray, laminated with clayey silt and sandy silt, wet.	

GENERAL NOTES

DATE STARTED: 18 MAR 97
DATE COMPLETED: 18 MAR 97
RIG: CME LC 60
CREW CHIEF: M. HEFFERAN
LOGGED: DPR CHECKED: LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING: ▽ 3.7 ft. bgl
AT COMPLETION: ▼
AFTER DRILLING
CAVE-IN: DATE/TIME _____ DEPTH _____
WATER: DATE/TIME _____ DEPTH _____

ENVIRONMENTAL AUDIT REPORT:
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LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-5
LOCATION	FLINT, MICHIGAN	SHEET NO.	2 OF 2
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-18-97
		SURFACE ELEV.	98.9
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
7	SS	10	18			SANDY LEAN CLAY (CL), some fine to coarse sand, few fine gravel, slightly plastic, dark gray 10YR 4/1, moist, very stiff (Pp = 3.0 to 3.7).	
						As above (CL).	
						End of boring at 14 feet.	
					15		
					20		

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ENVIRONMENTAL AUDIT REPORT:
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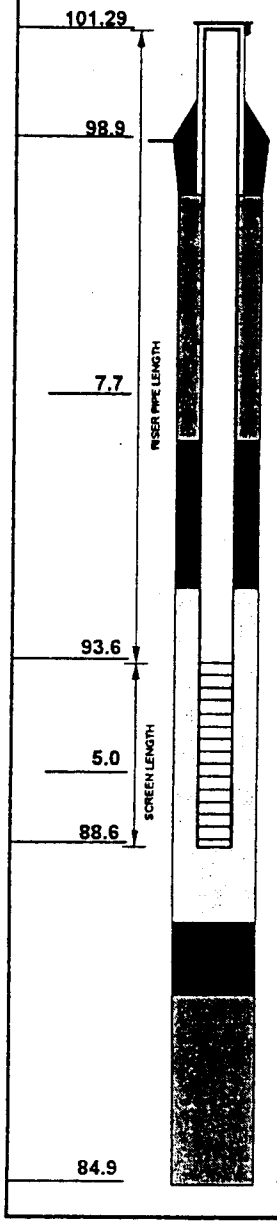
RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-5
PROJ. NO:	4036.05	DATE INSTALLED:	3-18-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 10 Ft.
3 In. From 10 To 14 Ft.

F) Surf. Casing Diameter: ___ In. From ___ To ___ Ft.
2nd Surface Casing: ___ In. From ___ To ___ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Gently bail

B) Time Spent Developing: 1.5 Hours

C) Water Removed: 25 Gallons
Added: 0 Gallons

D) Water Clarity Before/After Development:
Before: Opaque brown
After: Slightly turbid (approximately 100 NTU)

F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: ___ Ft. Below Top Of Casing

B) Other Date/Time: 3-31-97/1305 5.77 Ft.

Other Date/Time: ___ Ft.

Notes:

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. PFW-9
SHEET NO. 1 OF 2
PROJECT NAME PEREGRINE FLINT
PROJECT NO. 4036.05
LOCATION FLINT, MICHIGAN
INSTALLATION 3-19-97
CONTRACTOR STEARNS DRILLING CO
SURFACE ELEV. 98.8
DRILLING METHOD 4.25" HSA
BOREHOLE DIA. 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	7	20	0		SANDY LEAN CLAY (CL), some fine to coarse sand, few fine to coarse gravel, slightly plastic, mottled brown, dark yellowish brown, and gray, moist, very stiff to hard, fractured (Glacial Till).	
2	SS	13	24	0		As above (CL).	
						WELL-GRADED SAND (SW), fine to coarse, trace silt, trace clay, dark yellowish brown 10YR 3/6, moist.	
3	SS	6	20	0		SILT (ML), dark yellowish brown, moist, laminated.	
					▽ 5	WELL-GRADED SAND (SW), fine to coarse, trace silt, trace clay, dark yellowish brown 10Y R3/6, moist.	
4	SS	5	20	0		SANDY LEAN CLAY (CL), few fine to coarse gravel, slightly plastic, brown, moist, stiff (Pp = 1.5), abundant moist to wet sand partings below 5 feet (Glacial Till).	
5	SS	8	19	0		As above (CL), very stiff (Pp = 2.2).	
						PEAT, black humic material, some plant fragments, no odor.	
6	SS	16	24	0	10	SANDY LEAN CLAY (CL), brown 10YR 4/3 with yellowish brown and gray mottling and fractures, moist, hard.	

GENERAL NOTES

DATE STARTED 19 MAR 97
DATE COMPLETED 19 MAR 97
RIG CME LC 60
CREW CHIEF M. HEFFERAN
LOGGED DPR CHECKED LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 5.0 ft. bgl
AT COMPLETION ▼
AFTER DRILLING
CAVE-IN: DATE/TIME ____ DEPTH ____
WATER: DATE/TIME ____ DEPTH ____

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-9
LOCATION	FLINT, MICHIGAN	SHEET NO.	2 OF 2
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-19-97
		SURFACE ELEV.	98.8
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
7	SS	17	24	0		As above (CL), very stiff (Pp = 3.5 to 4.0), olive brown, continued mottling.	
8	SS	37	24	0		As above (CL).	
9	SS	39	24	0	15	As above (CL), hard (Pp > 4.5), mostly brown 10YR 4/3, gray along fractures.	
10	SS	46	24	0		As above (CL), fewer fractures.	
					20	As above (CL).	
						End of boring at 20 feet. Original boring backfilled with bentonite slurry. Moved 5 feet northwest to install well.	

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Sep 30, 2009 09:06

ENVIRONMENTAL AUDIT REPORT.
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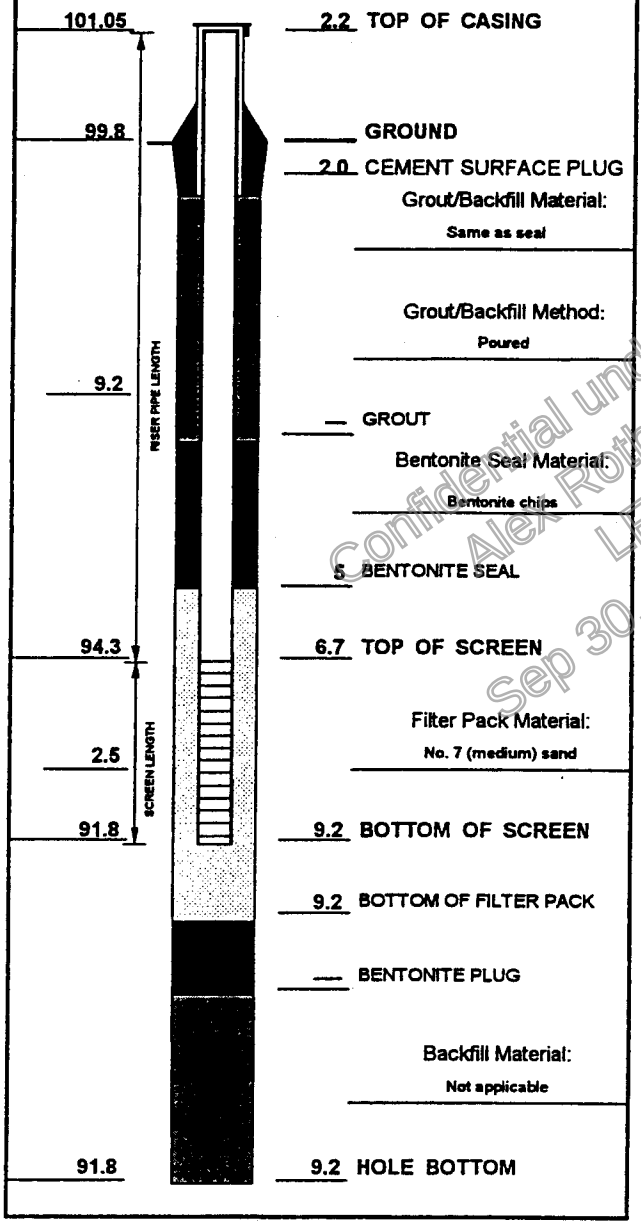
RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-9
PROJ. NO:	4036.05	DATE INSTALLED:	3-19-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 8.5 Ft.
____ In. From ____ To ____ Ft.

F) Surf. Casing Diameter: ____ In. From ____ To ____ Ft.
2nd Surface Casing: ____ In. From ____ To ____ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Gently bail

B) Time Spent Developing: 0.2 Hours

C) Water Removed: 1.5 Gallons
Added: 0 Gallons

D) Water Clarity Before/After Development:
Before: Clear
After: Slightly turbid, light brown

F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: ____ Ft. Below Top Of Casing

B) Other Date/Time: 3-21-97/1515 dry Ft.
Other Date/Time: 3-31-97/0938 8.53 Ft.

Notes:

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-10
LOCATION	FLINT, MICHIGAN	SHEET NO.	1 OF 2
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-20-97
		SURFACE ELEV.	100.5
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	11	15	0.1		Asphalt. Fill: fine to medium sand, little coarse gravel, dark yellowish brown, moist to wet.	
2	SS	12	20	0.2		SANDY LEAN CLAY (CL), some fine to coarse sand, few fine to coarse gravel, slightly plastic, brown 10YR 4/3 with some gray mottling along fractures, moist, hard (Pp > 4.5) (Glacial Till).	
3	SS	18	24	0		As above (CL), very dark gray 10YR 3/1 to olive brown 2.5Y 3/6 to grayish brown 10YR 4/2, stiff to very stiff (Pp = 1.5 to 2.5).	
					5	As above (CL), brown 10YR 4/3, hard (Pp = 4.4) below 5 feet.	
4	SS	29	24	0		As above (CL), less gray mottling below 7 feet.	
5	SS	29	24	0		As above (CL), (Pp = 4.0 to 4.5), fracture from 9.2 to 9.8 ft.	
6	SS	24	24	0	10	As above (CL), fracture 11.5 to 11.8'.	

GENERAL NOTES

DATE STARTED 20 MAR 97
DATE COMPLETED 20 MAR 97
RIG CME LC 60
CREW CHIEF M. HEFFERAN
LOGGED DPR CHECKED LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 13.8 ft. bgl
AT COMPLETION ▼
AFTER DRILLING
CAVE-IN: DATE/TIME _____ DEPTH _____
WATER: DATE/TIME _____ DEPTH _____

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. PFW-10
SHEET NO. 2 OF 2
PROJECT NAME PEREGRINE FLINT
PROJECT NO. 4036.05
LOCATION FLINT, MICHIGAN
INSTALLATION 3-20-97
CONTRACTOR STEARNS DRILLING CO
SURFACE ELEV. 100.5
DRILLING METHOD 4.25" HSA
BOREHOLE DIA. 8 IN.

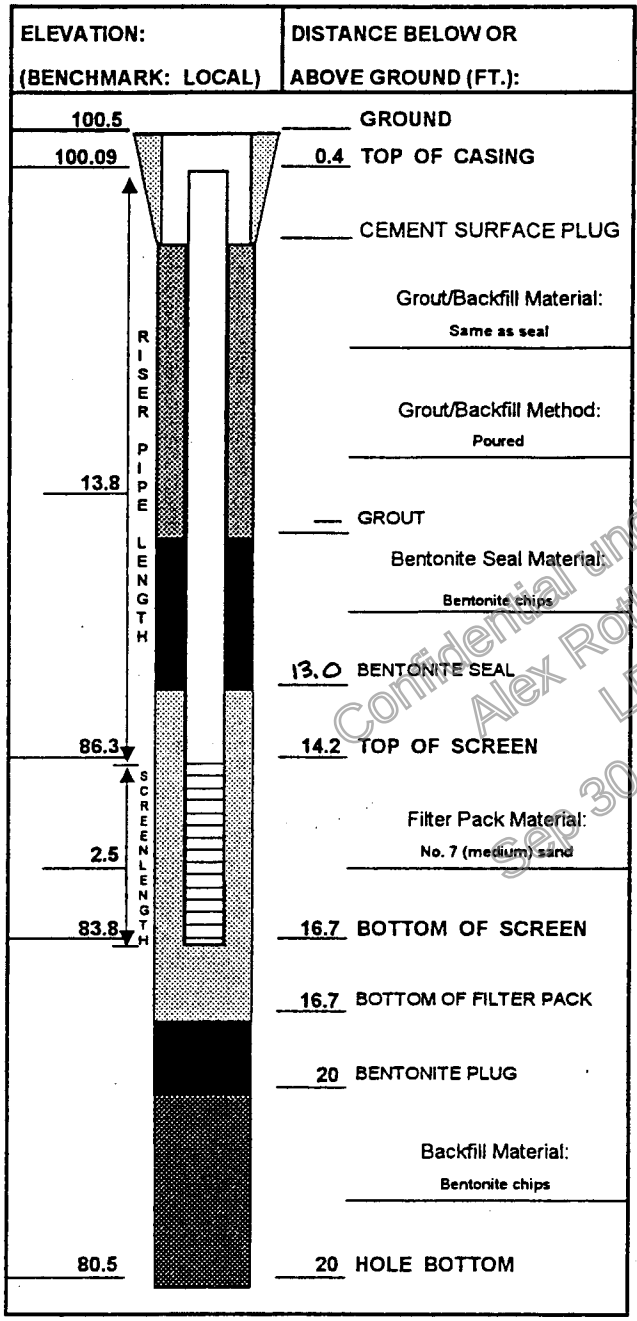
SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
7	SS	24	22	0		As above (CL), areas of dark grayish brown below 12.2 ft, very stiff (Pp = 2.5 to 3.5).	
8	SS	19	24	0		<--- Wet sand parting at 13.8 feet.	
					15	As above (CL), dark gray 10YR 4/1, stiff (Pp = 1.7).	
9	SS	14	24	0		As above (CL).	
10	SS	13	24	0		As above (CL).	
					20	End of boring at 20 feet.	

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-10
PROJ. NO:	4036.05	DATE INSTALLED:	3-20-97	OBSV. BY:	DPR	CHECKED BY:	



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 18 Ft.
3 In. From 18 To 20 Ft.

F) Surf. Casing Diameter: ____ In. From ____ To ____ Ft.
2nd Surface Casing: ____ In. From ____ To ____ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Gently bail

B) Time Spent Developing: 0.2 Hours

C) Water Removed: 1.5 Gallons
Added: 0 Gallons

D) Water Clarity Before/After Development:
Before: Slightly turbid, light brown
After: Clear

F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: ____ Ft. Below Top Of Casing

B) Other Date/Time: 3-20-97/1145 dry Ft.
Other Date/Time: 3-31-97/1410 11.67 Ft.

Notes:

LOG OF TEST BORING

F-203 (R 01-87)

RMT

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-11
LOCATION	FLINT, MICHIGAN	SHEET NO.	1 OF 2
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-20-97
		SURFACE ELEV.	101.3
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
						Asphalt and concrete.	
1	SS	19	18	0		Fill: medium sand, dark yellowish brown, moist.	
						SANDY LEAN CLAY (CL), some fine to coarse sand, few fine to coarse gravel, slightly plastic, brown 10YR 4/3 with some yellowish brown mottling and gray along fractures, moist, hard (Pp > 4.5) (Glacial Till).	
2	SS	23	24	0			
3	SS	24	24	0		As above (CL).	
					5	SILT (ML), dark yellowish brown, moist, stratified.	
						LEAN CLAY (CL), dark grayish brown, hard, moist, laminated.	
						SILT (ML), brown, moist, laminated.	

GENERAL NOTES

DATE STARTED	20 MAR 97
DATE COMPLETED	20 MAR 97
RIG	CME LC 60
CREW CHIEF	M. HEFFERAN
LOGGED	DPR CHECKED LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING	6.9 ft. bgl
AT COMPLETION	
AFTER DRILLING	
CAVE-IN: DATE/TIME	DEPTH
WATER: DATE/TIME	DEPTH

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME: PEREGRINE FLINT
LOCATION: FLINT, MICHIGAN
CONTRACTOR: STEARNS DRILLING CO
DRILLING METHOD: 4.25" HSA

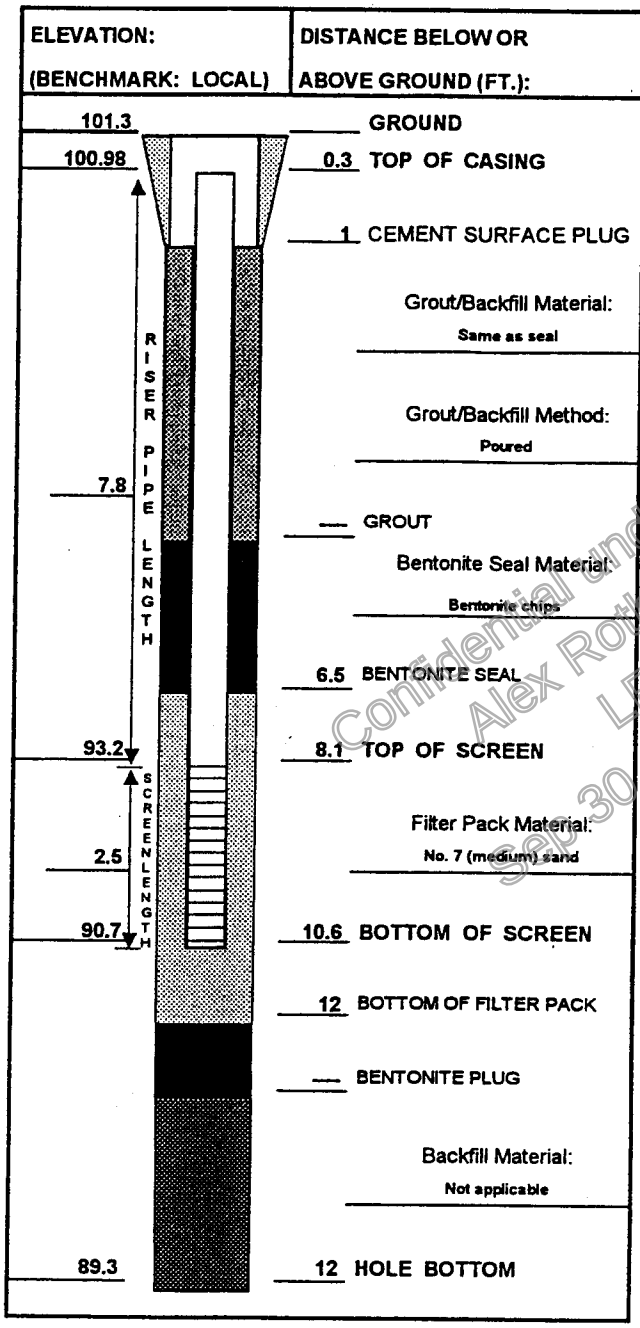
BORING NO.: PFW-11
SHEET NO.: 2 OF 2
PROJECT NO.: 4036.05
INSTALLATION: 3-20-97
SURFACE ELEV.: 101.3
BOREHOLE DIA.: 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
4	SS	19	20	0		SILTY SAND (SM), fine, very pale brown 10YR 7/3, moist.	
						SANDY LEAN CLAY (CL), gray 10YR 5/1, moist, very stiff.	
					▽	SANDY SILT (ML), little fine sand, gray 10YR 5/1, moist to wet, stratified and laminated.	
5	SS	21	24			As above (ML).	
						POORLY-GRADED SAND (SP), wet.	
						SANDY SILT (ML), wet.	
						POORLY-GRADED SAND (SP), wet.	
						SILT (ML), wet.	
6	SS	14	20		10	SANDY SILT (ML), wet.	
						POORLY-GRADED SAND (SP), wet.	
						SANDY SILT (ML), wet.	
						SANDY LEAN CLAY (CL), some fine to coarse sand, few fine to coarse gravel, slightly plastic, dark gray 10YR 4/1, moist, very stiff (Pp = 3.3).	
						End of boring at 12 feet.	

RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-11
PROJ. NO:	4036.05	DATE INSTALLED:	3-20-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 11 Ft.
3 In. From 11 To 12 Ft.

F) Surf. Casing Diameter: ____ In. From ____ To ____ Ft.
2nd Surface Casing: ____ In. From ____ To ____ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Gently bail

B) Time Spent Developing: 0.3 Hours

C) Water Removed: 1.6 Gallons
Added: 0 Gallons

D) Water Clarity Before/After Development:
Before: Slightly turbid, light brown
After: Moderately turbid, light brown

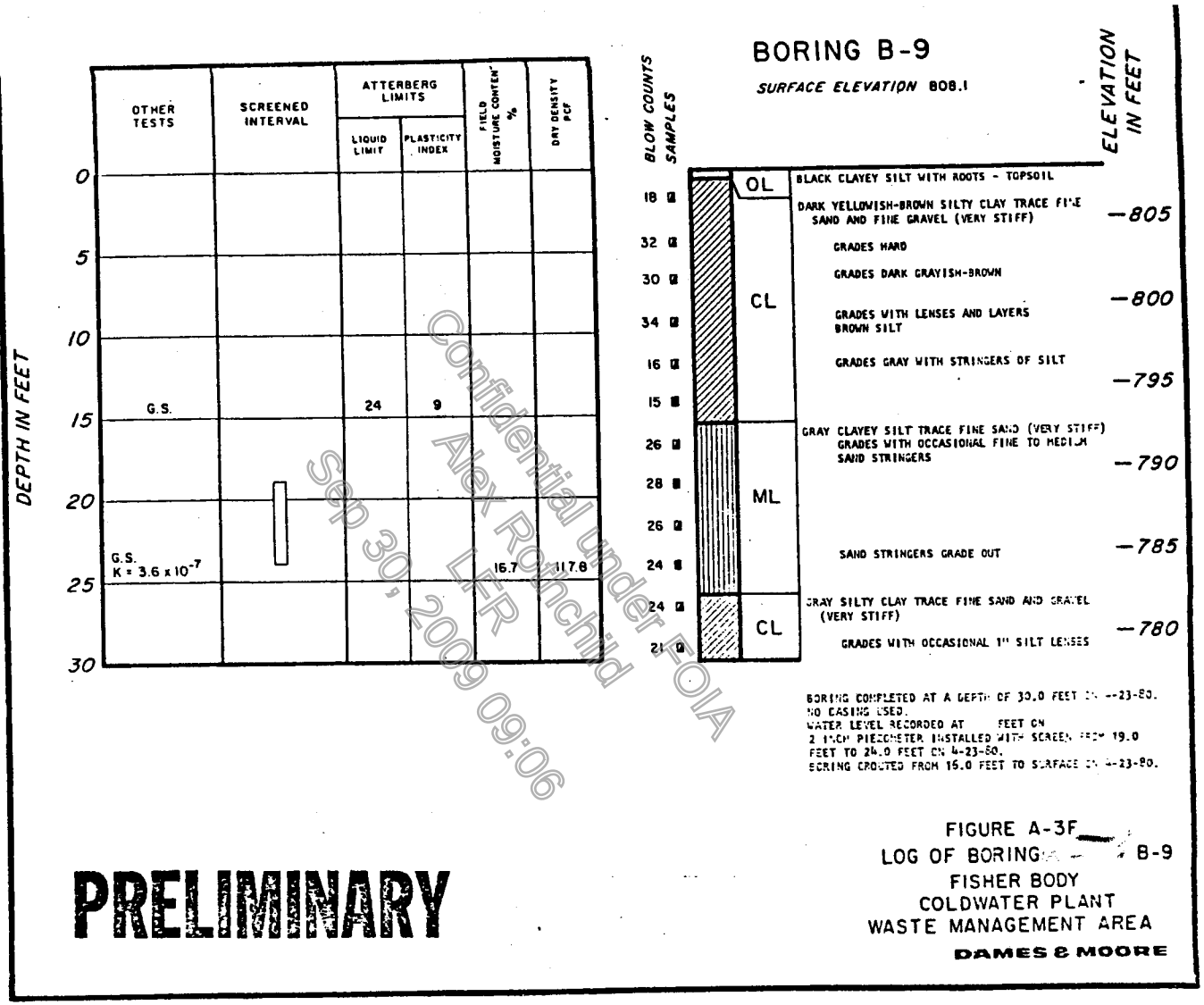
F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: (dry) Ft. Below Top Of Casing

B) Other Date/Time: 3-20-97/1400 7.2 Ft.
Other Date/Time: 3-31-97/1406 1.57 Ft.

Notes:



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PRELIMINARY

FIGURE A-3F
LOG OF BORING B-9
FISHER BODY
COLDWATER PLANT
WASTE MANAGEMENT AREA
DAMES & MOORE

BORING NO. B-14

THE CHESTER ENGINEERS
CORAOPOLIS, PENNSYLVANIA
TEST BORING RECORD

PROJECT General Motors, Coldwater Plant LOCATION Flint, MI GROUND ELEVATION 809.45
FEATURE
DATE STARTED 7-2-85 TYPE OF SAMPLER 2" Splitspoon DIAMETER OF AUGER I.D. = 3.25 GROUND WATER 0 HRS 24 HRS
DATE COMPLETED 7-2-85 SAMP. SIZE WEIGHT OF HAMMER 140# FALL 30"
WEATHER Hot, Dry CASING SIZE I.D. = 2" WEIGHT OF HAMMER FALL
O.D. = 2.25"

DEPTH OF STRATUM	DESCRIPTION OF STRATUM	COLOR	MOISTURE CONDITION	DENSITY CONSISTENCY, HDNESS	BLOW CNT OR RECVY*	% REC.	SMPL. OR RUN NO.	SMPL. OR RUN INTVL	ROD LENGTH	% ROD	CAS. BLOWS
0.0-1.0	Silty, sandy soil	Brown									
1.0-3.0	Clay with some sand and silt	Brown-Gray to Gray	Moist								
3.0-5.0	Silt, trace of clay	Gray	Moist to Dry								
5.0-8.5	Silt and clay	Brown	Moist								
8.5-18.0	Clay, some gravel-sized rock and coal fragments, minor silt	Gray	Moist		4-4-7		S-1	8.5-10.0			
18.0-18.5	Coarse-grained quartz sand		Wet								
18.5-20.0	Clay in upper 1.0' then clay with some small gravel-sized to coarse sand-sized rock fragments, trace of cobble-sized black shale fragments on bottom	Gray	Moist		4-4-5		S-2				

*NOTE: Blow Count indicates number of blows required to drive sampler 6 inches using 140 pound hammer falling 30 inches.

DRILLING COMPANY Mateco Drilling Co. DRILLER Randy Lemke INSPECTOR Gloria A. DePaolis

BORING NO. B-14

THE CHESTER ENGINEERS
COraOPOLIS, PENNSYLVANIA
TEST BORING RECORD

PROJECT General Motors, Coldwater Plant LOCATION Flint, MI GROUND ELEVATION

FEATURE

DATE STARTED 7-2-85 TYPE OF SAMPLER 2" Splitspoon DIAMETER OF AUGER GROUND WATER 0 HRS 24 HRS

DATE COMPLETED 7-2-85 SAMP. SIZE WEIGHT OF HAMMER 140# FALL 30"

WEATHER CASING SIZE WEIGHT OF HAMMER FALL

DEPTH OF STRATUM	DESCRIPTION OF STRATUM	COLOR	MOISTURE CONDITION	DENSITY CONSISTENCY, HONESS	BLOW CNT OR RECVY*	% REC.	SMPL.OR RUN NO.	SMPL. OR RUN INTVL	ROD LENGTH	% ROD	CAS. BLOWS
20.0-45.0	Silty clay and some coarse sand-sized black and gray rock fragments; large gravel-sized to small cobbles of claystone, at 30.0'	Gray Clay, Blue-Gray Claystone, Black and Gray Rock Fragments	Moist Wet Below 39.0'		6-8-8 4-6-6		S-3 S-4	28.5-30.0 38.5-40.0			
45.0-46.5	Total Depth Silty, sandy clay, with some coarse gravel-sized to fine cobble-sized black, brown, and gray rock fragments, some rounded.	Gray	Moist		6-7-9		S-5				
	Screen: 37.0 -27.0 Sand: 27.0 - 10.5 Bentonite: 10.5 - 8.5										

*NOTE: Blow Count indicates number of blows required to drive sampler 6 inches using 140 pound hammer falling 30 inches.

DRILLING COMPANY Mareco Drilling Co DRILLER Randy Lemke INSPECTOR Gloria A. DePaolis

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-22D SHEET 1 OF 5
General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE: NA DEPTH: NA ELEVATION: NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"

O'BRIEN & GERE GEOLOGIST: Anthony J. Finch
BORING CO.: Carlo Environmental Technologies
FOREMAN: Paul Libby

BORING LOCATION: Southeast area of landfill
GROUND ELEVATION: N/A
DATES: STARTED: 4/24/95 ENDED: 5/3/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	R S"
0	1	0'-2'	1	24"/24"	8	Moderate yellowish brown, damp silty CLAY, mottled						
			3									
			5									
			6									
	2	2'-4'	2	24"/24"	8	Moderate yellowish brown, damp silty CLAY, mottled						
			3									
			5									
			6									
	3	4'-6'	3	24"/24"	10	Dark yellowish brown, damp silty CLAY, trace of fine sand						
			3									
5			7									
			7									
	4	6'-8'	2	24"/24"	7	Dark yellowish brown, damp silty CLAY, trace of fine sand						
			2									
			5									
			6									
	5	8'-10'	1	24"/12"	10	Mottled, damp, silty sandy CLAY, little fine gravel						
			2									
			8									
			7									
10	6	10'-12'	2	24"/24"	6	Dark yellowish brown silty SAND, grades to silt	10'					
			3									
			3									
			5									
	7	12'-14'	2	24"/24"	7	Mottled, moist, SILT, little sand	12'					
			3									
			4									
			4									
	8	14'-16'	6	24"/12"	15	Mottled, moist, fine to medium GRAVEL and SAND	14'					
			7									
15			8									
			7									
	9	16'-18'	7	24"/18"	13	Mottled, moist, fine to medium GRAVEL and SAND						
			7			Moderate yellowish brown, wet SILT	16'6"					
			6									
			5									
	10	18'-20'	3	24"/12"	9	Moderate yellowish brown, wet SILT						
			4									
			5									
			5									
20	11	20'-22'	2	24"/18"	10							
			5			Medium grey silty CLAY	20'6"					
			5									
			5									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed with 10 inch diameter steel casing set to 32 fbg, well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 91' to 96'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER MW B-22D SHEET 2 OF 5
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE / DEPTH / ELEVATION NA / NA / NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 24" splitspoon HAMMER: 140 lbs.
O'BRIEN & GERE GEOLOGIST: Anthony J. Finch BORING CO.: Carlo Environmental Technologies FOREMAN: Paul Libby	BORING LOCATION: Southeast area of landfill GROUND ELEVATION: N/A DATES: STARTED: 4/26/95	ENDED: 5/2/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	RMKS
	12	22'-24'	2	24"/20"	10	Medium grey, damp silty CLAY, trace of fine to medium gravel						
			4									
			6									
			8									
	13	24'-26'	2	24"/24"	9	Medium grey, damp silty CLAY, trace of fine to medium gravel						
			3									
25			6									
			7			Medium grey, wet SILT, trace of fine sand	25'6"					
	14	26'-28'	4	24"/24"	9	Medium grey, wet SILT, trace of fine sand						
			4			Medium grey, damp, CLAY, some silt, trace of fine to medium gravel	26'6"					
			5									
			7									
	15	28'-30'	2	24"/24"	7	Medium grey, damp CLAY, some silt, trace of fine to medium gravel						
			3									
			4									
			6									
30	16	30'-32'	3	24"/24"	11	Medium grey, damp CLAY, some silt, trace of fine to medium gravel						
			5									
			6									
			9									
	17	32'-34'	3	24"/24"	10							
			4									
			6									
			8									
	18	34'-36'	2	24"/24"	9							
			4									
35			5									
			7									
	19	36'-38'	2	24"/24"	9							
			4									
			5									
			7									
	20	38'-40'	2	24"/24"	6							
			2									
			4									
			6									
40	21	40'-42'	1	24"/24"	7	Medium grey, damp CLAY, some silt, trace of fine to medium gravel						
			3									
			4									
			7									
	22	42'-44'	2	24"/24"	5							
			2									
			3									
			5									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed with 10 inch diameter steel casing set to 32 fbg, well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 91' to 96'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-22D SHEET 3 OF 5
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE / DEPTH / ELEVATION NA / NA / NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"

O'BRIEN & GERE GEOLOGIST: Anthony J. Finch
BORING CO.: Carlo Environmental Technologies
FOREMAN: Paul Libby

BORING LOCATION: Southeast area of landfill
GROUND ELEVATION: N/A
DATES: STARTED: 4/28/95 ENDED: 5/1/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	R M K
	23	44'-46'	1	24"/24"	7	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			3									
45			4									
			5									
	24	46'-48'	2	24"/24"	8	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			4									
			6									
	25	48'-50'	2	24"/24"	10	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			6									
			7									
50	26	50'-52'	2	24"/24"	10	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			6									
			8									
	27	52'-54'	2	24"/24"	8	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			3									
			5									
			7									
	28	54'-56'	2	24"/24"	10	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
55			6									
			9									
	29	56'-58'	3	24"/24"	9	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			5									
			7									
	30	58'-60'	2	24"/24"	10	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			6									
			7									
60	31	60'-62'	2	24"/24"	10	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			6									
			7									
	32	62'-64'	2	24"/24"	10	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			3									
			7									
			8									
	33	64'-66'	2	24"/24"	9	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			5									
65			6									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed with 10 inch diameter steel casing set to 32 fbg, well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 91' to 96'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-22D SHEET 4 OF 5
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE / DEPTH / ELEVATION NA / NA / NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"
O'BRIEN & GERE GEOLOGIST: Anthony J. Finch BORING CO.: Carlo Environmental Technologies FOREMAN: Paul Libby	BORING LOCATION: Southeast area of landfill GROUND ELEVATION: N/A DATES: STARTED: 4/28/95	ENDED: 5/1/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	REMARK
	34	66'-68'	3	24"/24"	9	Medium grey, damp, CLAY, some silt, trace of fine to medium gravel						
			4									
			5									
			7									
	35	68'-70'	2	24"/24"	9	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			4									
			5									
			7									
70	36	70'-72'	4	24"/24"	11	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			5									
			6									
			7									
	37	72'-74'	3	24"/24"	10	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			4									
			6									
			7									
	38	74'-76'	2	24"/24"	8	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			3									
75			5									
			7									
	39	76'-78'	2	24"/24"	7	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			3									
			4									
			8									
	40	78'-80'	3	24"/24"	11	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			5									
			6									
			9									
80	41	80'-82'	2	24"/24"	11	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			4									
			7									
			9									
	42	82'-84'	1	24"/24"	16	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel 2" damp silt lens						
			6									
			10									
			11									
	43	84'-86'	2	24"/24"	13	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			5									
85			8									
			9									
	44	86'-88'	2	24"/24"	16	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			7									
			9									
			9									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed with 10 inch diameter steel casing set to 32 fbg, well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 91' to 96'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-22D SHEET 5 OF 5
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE: NA DEPTH: NA ELEVATION: NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"

O'BRIEN & GERE GEOLOGIST: Anthony J. Finch
BORING CO.: Carlo Environmental Technologies
FOREMAN: Paul Libby

BORING LOCATION: East side of landfill
GROUND ELEVATION: N/A
DATES: STARTED: 4/28/95 ENDED: 5/1/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	R I
	45	88'-90'	4	24"/24"	12	Medium grey to dark grey, damp silty CLAY trace of fine to medium gravel						
			5									
			7									
			9									
90	46	90'-92'	5	24"/24"	20							
			8									
			12			Medium grey, wet SILT, some fine to very fine sand	91'					
			13									
	47	92'-94'	2	24"/24"	6	Grades to fine to very fine SAND, some silt	92'					
			3									
			3									
			4									
						E.O.B. @ 94 fbg						

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed with 10 inch diameter steel casing set to 32 fbg, well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 91' to 96'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-23D SHEET 1 OF 4
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE / DEPTH / ELEVATION NA / NA / NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"

O'BRIEN & GERE GEOLOGIST: Anthony J. Finch
BORING CO.: Carlo Environmental Technologies
FOREMAN: Paul Libby

BORING LOCATION: South of landfill
GROUND ELEVATION: N/A
DATES: STARTED: 4/20/95 ENDED: 4/23/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	REMARKS
0	1	0'-2'	3	24"/24"	12	Moderate yellowish brown, wet SAND and gravel FILL						
			5									
			7			Moderate yellowish brown, damp CLAY, little silt	6"					
			7									
	2	2'-4'	2	24"/24"	12	Moderate yellowish brown, damp CLAY, little silt						
			4									
			6									
			6									
	3	4'-6'	1	24"/24"	9	Medium grey, damp CLAY, some silt						
			4									
5			5									
			6			Moderate yellowish brown, moist SILT, little clay	5'10"					
	4	6'-8'	3	24"/24"	9	Medium grey, damp silty CLAY	6'					
			4									
			5									
			5									
	5	8'-10'	2	24"/24"	8	Medium grey, damp silty CLAY						
			4									
			4			Moist, fine to medium GRAVEL	9'6"					
			5			Medium grey, damp, silty CLAY	9'10"					
10	6	10'-12'	3	24"/24"	9	Medium grey, damp, silty CLAY						
			4									
			5									
			7									
	7	12'-14'	2	24"/24"	11	Medium grey, damp, silty CLAY						
			4									
			7									
			11			Medium grey, damp SILT, little clay	13'6"					
	8	14'-16'	3	24"/24"	10	Medium grey, damp SILT, little clay						
			4									
15			6									
			7									
	9	16'-18'	5	24"/24"	13	Medium grey, damp SILT trace of damp to moist clay						
			8									
			5									
			8									
	10	18'-20'	3	24"/24"	9	Medium grey, wet SILT, little clay						
			4									
			5									
			7									
20	11	20'-22'	2	24"/24"	8	Medium grey, damp, silty CLAY	20'					
			3									
			5									
			7									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 76' to 81'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER MW B-23D SHEET 2 OF 4
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE / DEPTH / ELEVATION NA / NA / NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 24" splitspoon HAMMER: 140 lbs.

O'BRIEN & GERE GEOLOGIST: Anthony J. Finch
BORING CO.: Carlo Environmental Technologies
FOREMAN: Paul Libby

BORING LOCATION: South of landfill
GROUND ELEVATION: N/A
DATES: STARTED: 4/20/95 ENDED: 4/23/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	R I S
		22'-24'	3	24"/24"	11	Medium grey, damp, silty CLAY						
			5									
			6									
			9									
		24'-26'	5	24"/24"	12	Medium grey, damp, silty CLAY						
			6									
25			6									
			8									
		26'-28'	4	24"/24"	10	Medium grey, damp, silty CLAY trace of fine gravel						
			4									
			6									
			8									
		28'-30'	2	24"/24"	10	Medium grey, damp SILT and CLAY	28'					
			4									
			6									
			7			Medium grey, moist SILT, trace of clay	29'6"					
30		30'-32'	4	24"/24"	9	Medium grey, damp, silty CLAY	30'					
			4									
			5									
			6									
		32'-34'	3	24"/24"	9	Medium grey damp silty CLAY, trace of fine gravel						
			4									
			5									
			6									
		34'-36'	4	24"/24"	11	Medium grey, damp, silty CLAY						
			5									
35			6									
			6									
		36'-38'	6	24"/24"	13	Medium grey, damp, silty CLAY, trace of fine sand						
			6									
			7									
			9									
		38'-40'	5	24"/24"	13	Medium grey, damp, silty CLAY						
			6									
			7									
			9									
40		40'-42'	2	24"/24"	15	Stiff, medium grey, damp, silty CLAY						
			7									
			8									
			11									
		42'-44'	3	24"/24"	13	Medium grey, damp, silty CLAY						
			6									
			7									
			9									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 76' to 81'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-23D SHEET 3 OF 4
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE: NA DEPTH: NA ELEVATION: NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"
O'BRIEN & GERE GEOLOGIST: Anthony J. Finch BORING CO.: Carlo Environmental Technologies FOREMAN: Paul Libby	BORING LOCATION: South of landfill GROUND ELEVATION: N/A DATES: STARTED: 4/20/95	ENDED: 4/23/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	REMK
		44'-46'	2	24"/24"	7	Medium grey, silty CLAY, trace of fine gravel						
			2									
45			5									
			7									
		46'-48'	3	24"/24"	9	Medium grey, damp, silty CLAY						
			4									
			5									
			8									
		48'-50'	5	24"/24"	16	Medium grey, damp, silty CLAY						
			7									
			9									
			12									
50		50'-52'	4	24"/24"	14	Medium grey, damp, silty CLAY						
			6									
			8									
			10									
		52'-54'	4	24"/24"	13	Medium grey, damp, silty CLAY						
			6									
			7									
			10									
		54'-56'	4	24"/24"	16	Medium grey, damp, silty CLAY, trace of fine gravel						
			6									
55			10									
			11									
		56'-58'	8	24"/18"	21	Medium grey, damp, silty CLAY, trace of fine gravel						
			10									
			11									
			14									
		58'-60'	5	24"/24"	19	Medium grey, damp, silty CLAY, trace of fine gravel						
			8									
			11									
			14									
0		60'-62'	3	24"/24"	11	Medium grey, damp, silty CLAY, trace of fine gravel						
			5									
			6									
			9									
		62'-64'	3	24"/24"	13	Medium grey, damp, silty CLAY, trace of fine gravel						
			4									
			9									
			10									
		64'-66'	3	24"/24"	14	Medium grey, damp, silty CLAY, trace of fine gravel						
			6									
65			8									
			8									

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 76' to 81'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: MW B-23D SHEET 4 OF 4
CLIENT General Motors Corporation PROJECT LOCATION GM Delphi Coldwater Facility Flint, Michigan	GROUND WATER DATE: NA DEPTH: NA ELEVATION: NA	FILE No.:4144.006 DRILLING METHOD: Hollow stem auger SAMPLER TYPE: 2" Splitpoon HAMMER: 140 lbs. FALL: 30"
O'BRIEN & GERE GEOLOGIST: Anthony J. Finch BORING CO.: Carlo Environmental Technologies FOREMAN: Paul Libby	BORING LOCATION: South of landfill GROUND ELEVATION: N/A DATES: STARTED: 4/20/95	ENDED: 4/23/95

DEPTH	SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING SP. COND	FIELD TESTING PID	R M K
		66'-68'	4	24"/24"	13	Medium grey, damp, silty CLAY, trace of fine to medium gravel						
			6									
			7									
			8									
		68'-70'	4	24"/24"	10	Medium grey, damp, silty CLAY, trace of fine to medium gravel						
			5									
			5									
			7									
70		70'-72'	4	24"/24"	9	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			4									
			5									
			6									
		72'-74'	4	24"/24"	11	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel and sand						
			7									
			11									
			15									
		74'-76'	4	24"/24"	14	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			6									
75			8									
			9									
		76'-78'	8	24"/24"	31	Medium to dark grey, damp, silty, CLAY trace of fine to medium gravel						
			13									
			18									
			17			Medium grey, wet SILT	77'6"					
		78'-80'	5	24"/24"	14	Greyish brown, wet SILT, trace of clay						
			7									
			7									
			12									
80		80'-82'	5	24"/	16	Medium grey, wet SILT						
			8									
			8			Medium grey, wet fine SAND and SILT	81'					
			11									
						E.O.B. @ 82 fbg						

Notes:

1. "NA" denotes information not available.
2. Monitoring well constructed of 2 inch diameter, schedule 40 PVC well casing with 5 feet of 0.010 inch slot well screen extending from 76' to 81'.

APPENDIX D

SINGLE WELL RESPONSE TEST DATA

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Single Well Response Test - Data Analysis Input for Aqtesolv

Location	Volume Removed (L)	Calc. Initial (Ho) Drawdown	Static Height of Water (H)	Casing Radius (r_c)	Borehole/Well Radius (r_w)	Screen/Sand Pack Length	SWL in Screen?	Effective Screen Length	Assumed Pack Porosity	apply rcEFF Correction?
MW1-02	4.92	2.43	0.72	0.025	0.10	1.52	yes	0.72	0.3	yes
MW2-02	20.82	10.27	1.82	0.025	0.10	1.52	no	1.52	0.3	no
MW3-02	13.25	6.54	1.54	0.025	0.10	1.52	no	1.52	0.3	no
MW4-02	9.46	4.67	1.29	0.025	0.10	1.52	yes	1.29	0.3	yes
MW-3	6.62	3.27	1.91	0.025	0.10	3.05	yes	1.91	0.3	yes
PFW-9	0.38	0.19	0.32	0.025	0.10	0.76	yes	0.32	0.3	yes
PFW-10	7.57	3.74	3.36	0.025	0.10	0.76	no	0.76	0.3	no
MW-OBG	18.93	9.34	2.70	0.025 assumed	0.10 assumed	1.52 assumed	no	1.52 assumed	0.3	no

All units in this table are in S.I. Units (i.e. feet have been converted to metres)

use the static height of water as the initial Ho, since the calculated estimates based on the volume of water removed result in a greater drawdown than that available

NOTES:

FOR VOLUME REMOVED: Ho = (Volume Removed)/(pi * $(r_c)^2$)

STATIC HEIGHT OF WATER: H = water column length as difference between well bottom and static water level

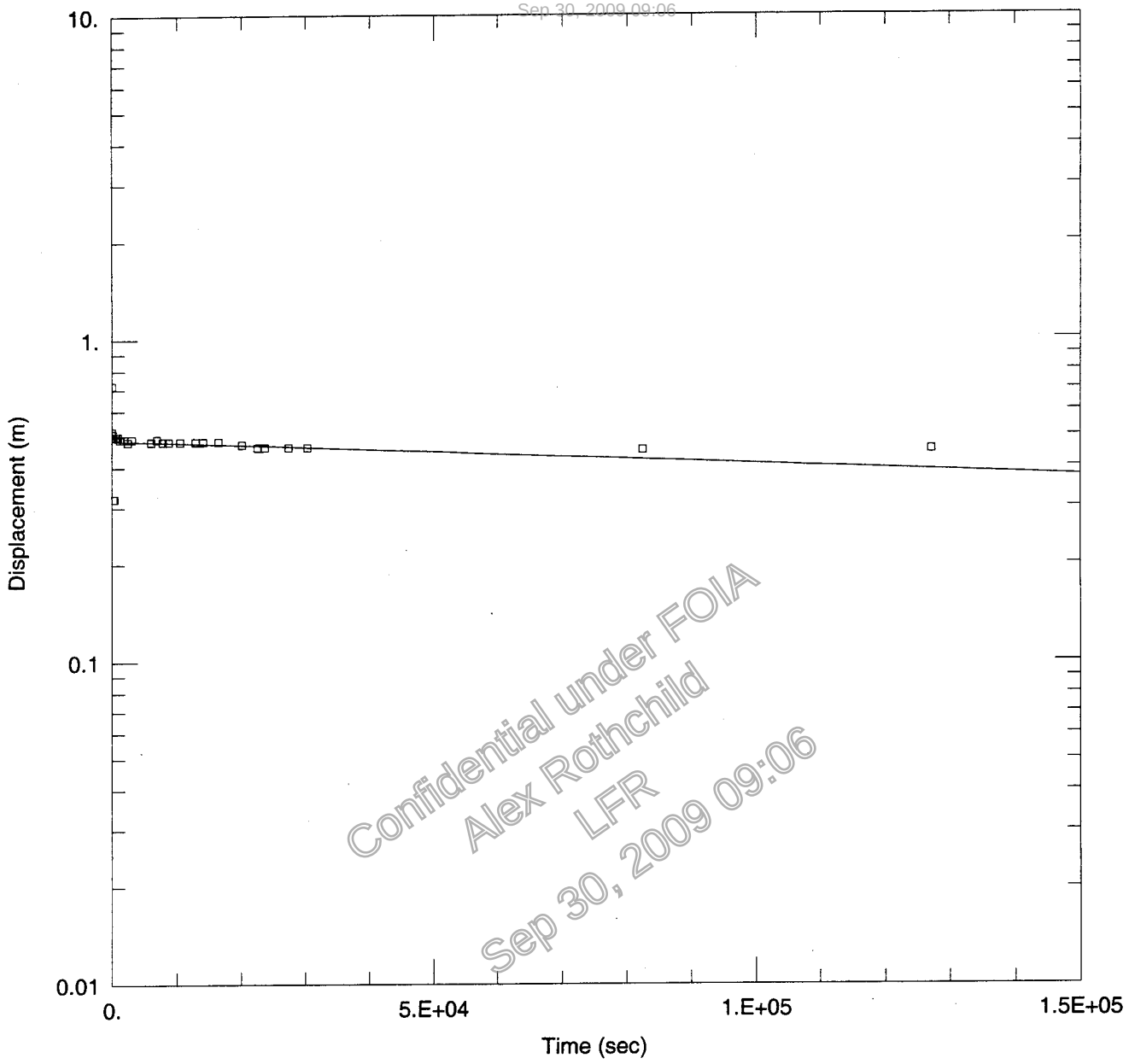
FOR UNCONFINED AQUIFER: b = H; H = distance SWL to bottom of well, b = saturated thickness of aquifer unit

SCREEN LENGTH: Screen Length must be less than or equal to saturated thickness

STATIC WATER LEVEL IN SCREEN: If yes, then correction option to be choosen in Aqutesolv

EFFECTIVE CASING RADIUS (SAND PACK CORRECTION): rcEFF = $[r_c^2 + n*(r_w^2-r_c^2)]^{0.5}$ where: n = sand pack porosity use 30% = 0.30.

Aqtesolv will auto calc if correction option choosen



RISING HEAD (BAIL) TEST @ MW1-02

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (MW1-02)

Initial Displacement: 0.72 m
Wellbore Radius: 0.1 m
Screen Length: 0.72 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 0.72 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 4.868E-07 cm/sec

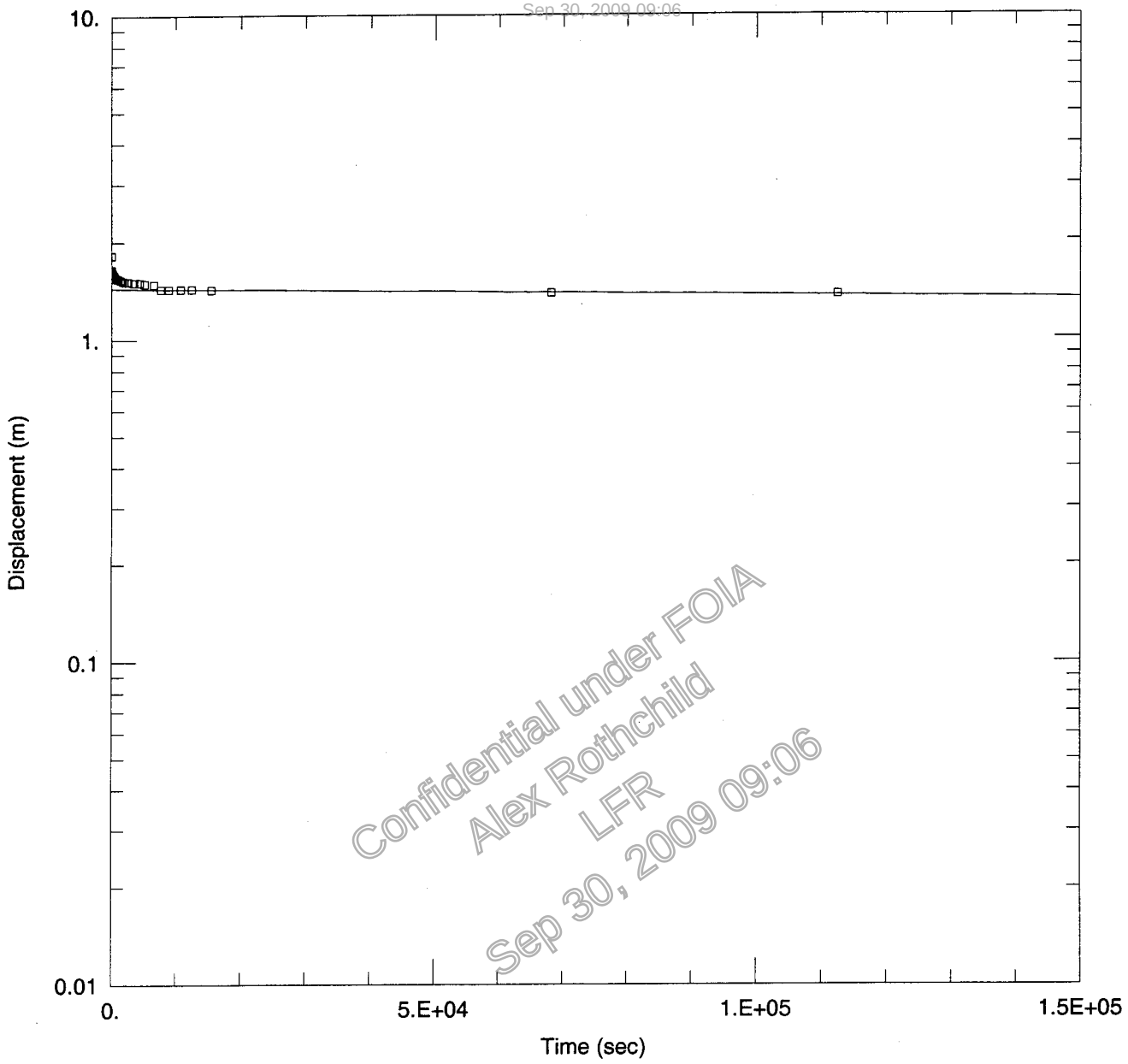
y0 = 0.4857 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = ~ 17.3 feet BTOR
Static Water Level = 14.95 feet BTOR
Volume Removed = 1.3 gallons
Volume Removed = 4.92 litres

Single Well Response Test
MW1-02

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 9:00:00	0.0		--		
10/15/02 9:00:10	0.2	10	16.60	1.65	0.50
10/15/02 9:00:20	0.3	20	16.64	1.69	0.52
10/15/02 9:00:30	0.5	30	16.64	1.69	0.52
10/15/02 9:00:40	0.7	40	16.63	1.68	0.51
10/15/02 9:00:50	0.8	50	16.63	1.68	0.51
10/15/02 9:01:00	1.0	60	16.62	1.67	0.51
10/15/02 9:01:10	1.2	70	16.62	1.67	0.51
10/15/02 9:01:20	1.3	80	16.62	1.67	0.51
10/15/02 9:01:30	1.5	90	16.61	1.66	0.51
10/15/02 9:01:40	1.7	100	16.61	1.66	0.51
10/15/02 9:02:10	2.2	130	16.61	1.66	0.51
10/15/02 9:02:40	2.7	160	16.61	1.66	0.51
10/15/02 9:03:40	3.7	220	16.60	1.65	0.50
10/15/02 9:04:40	4.7	280	16.00	1.05	0.32
10/15/02 9:05:40	5.7	340	16.00	1.05	0.32
10/15/02 9:06:40	6.7	400	16.00	1.05	0.32
10/15/02 9:08:40	8.7	520	16.59	1.64	0.50
10/15/02 9:10:40	10.7	640	16.58	1.63	0.50
10/15/02 9:15:40	15.7	940	16.58	1.63	0.50
10/15/02 9:20:40	20.7	1240	16.57	1.62	0.49
10/15/02 9:30:40	30.7	1840	16.56	1.61	0.49
10/15/02 9:40:40	40.7	2440	16.53	1.58	0.48
10/15/02 9:50:40	50.7	3040	16.55	1.60	0.49
10/15/02 10:40:40	100.7	6040	16.54	1.59	0.48
10/15/02 10:55:40	115.7	6940	16.55	1.60	0.49
10/15/02 11:10:40	130.7	7840	16.52	1.57	0.48
10/15/02 11:25:40	145.7	8740	16.52	1.57	0.48
10/15/02 11:55:40	175.7	10540	16.52	1.57	0.48
10/15/02 12:35:40	215.7	12940	16.52	1.57	0.48
10/15/02 12:55:40	235.7	14140	16.52	1.57	0.48
10/15/02 13:34:40	274.7	16480	16.51	1.56	0.48
10/15/02 14:35:00	335.0	20100	16.49	1.54	0.47
10/15/02 15:15:00	375.0	22500	16.47	1.52	0.46
10/15/02 15:34:00	394.0	23640	16.47	1.52	0.46
10/15/02 16:36:00	456.0	27360	16.47	1.52	0.46
10/15/02 17:25:00	505.0	30300	16.47	1.52	0.46
10/16/02 7:55:08	1375.1	82508	16.44	1.49	0.45
10/16/02 20:20:02	2120.0	127202	16.44	1.49	0.45



RISING HEAD (BAIL) TEST @ MW2-02

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (MW2-02)

Initial Displacement: 1.82 m
Wellbore Radius: 0.1 m
Screen Length: 1.52 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 1.82 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 2.376E-08 cm/sec

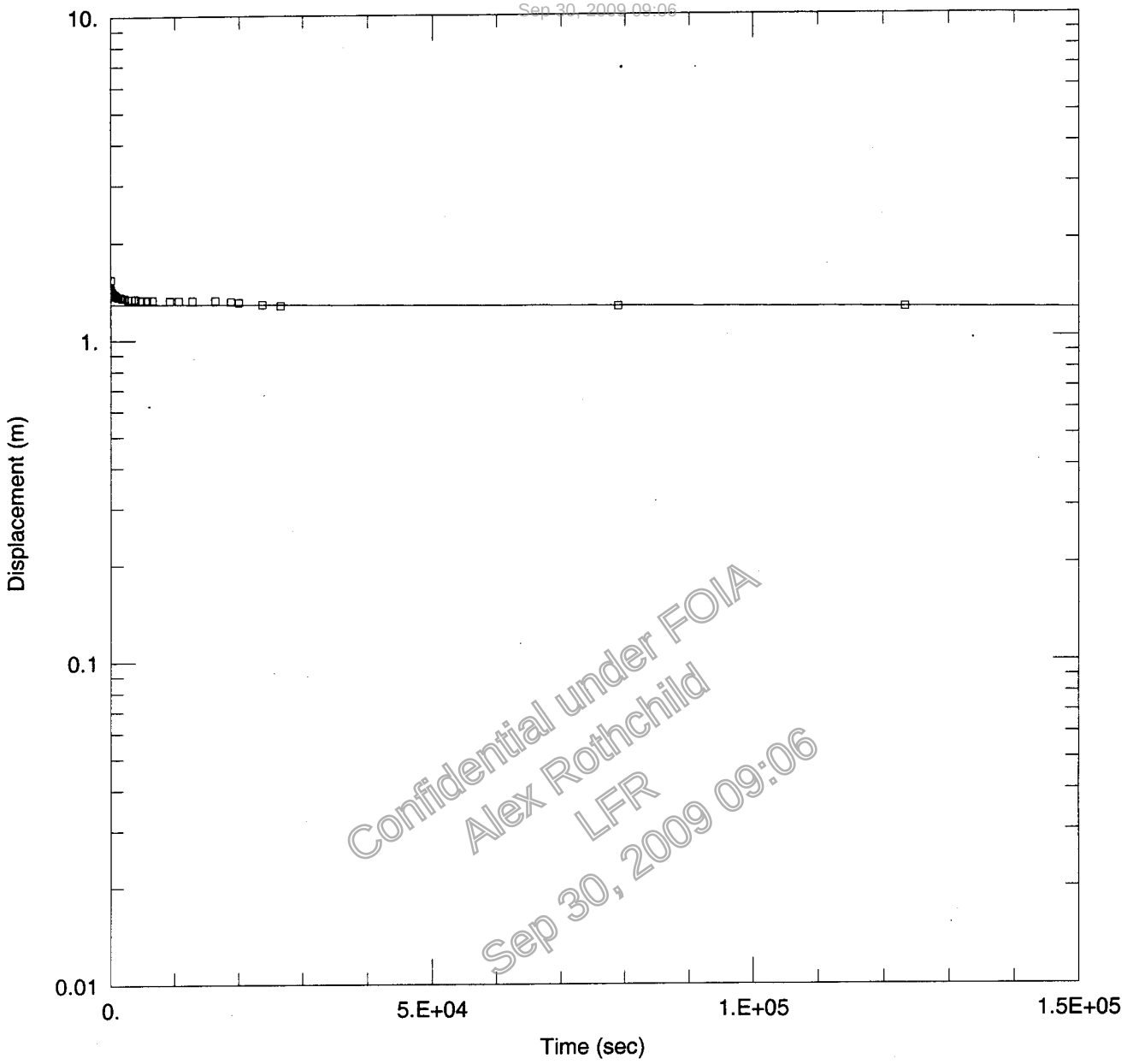
y0 = 1.439 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = ~ 17.3 feet BTOR
Static Water Level = 11.34 feet BTOR
Volume Removed = 5.5 gallons
Volume Removed = 20.82 litres

Single Well Response Test
MW2-02

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 13:02:30	0.0		--		
10/15/02 13:03:00	0.5	30	16.75	5.41	1.65
10/15/02 13:03:10	0.7	40	16.74	5.40	1.65
10/15/02 13:03:20	0.8	50	16.71	5.37	1.64
10/15/02 13:03:30	1.0	60	16.70	5.36	1.63
10/15/02 13:03:40	1.2	70	16.69	5.35	1.63
10/15/02 13:03:50	1.3	80	16.67	5.33	1.62
10/15/02 13:04:00	1.5	90	16.66	5.32	1.62
10/15/02 13:04:10	1.7	100	16.65	5.31	1.62
10/15/02 13:04:20	1.8	110	16.64	5.30	1.62
10/15/02 13:04:30	2.0	120	16.63	5.29	1.61
10/15/02 13:05:00	2.5	150	16.61	5.27	1.61
10/15/02 13:05:30	3.0	180	16.59	5.25	1.60
10/15/02 13:06:00	3.5	210	16.57	5.23	1.59
10/15/02 13:06:30	4.0	240	16.56	5.22	1.59
10/15/02 13:07:00	4.5	270	16.55	5.21	1.59
10/15/02 13:07:30	5.0	300	16.53	5.19	1.58
10/15/02 13:08:30	6.0	360	16.52	5.18	1.58
10/15/02 13:09:00	6.5	390	16.51	5.17	1.58
10/15/02 13:10:00	7.5	450	16.50	5.16	1.57
10/15/02 13:11:00	8.5	510	16.48	5.14	1.57
10/15/02 13:12:00	9.5	570	16.46	5.12	1.56
10/15/02 13:13:00	10.5	630	16.44	5.10	1.55
10/15/02 13:14:00	11.5	690	16.44	5.10	1.55
10/15/02 13:16:00	13.5	810	16.41	5.07	1.55
10/15/02 13:18:00	15.5	930	16.39	5.05	1.54
10/15/02 13:20:00	17.5	1050	16.38	5.04	1.54
10/15/02 13:26:00	23.5	1410	16.35	5.01	1.53
10/15/02 13:31:00	28.5	1710	16.33	4.99	1.52
10/15/02 13:36:00	33.5	2010	16.31	4.97	1.51
10/15/02 13:46:00	43.5	2610	16.29	4.95	1.51
10/15/02 14:01:00	58.5	3510	16.26	4.92	1.50
10/15/02 14:16:00	73.5	4410	16.25	4.91	1.50
10/15/02 14:29:00	86.5	5190	16.23	4.89	1.49
10/15/02 14:53:00	110.5	6630	16.18	4.84	1.48
10/15/02 15:11:00	128.5	7710	16.04	4.70	1.43
10/15/02 15:32:00	149.5	8970	16.03	4.69	1.43
10/15/02 16:02:00	179.5	10770	16.02	4.68	1.43
10/15/02 16:31:00	208.5	12510	16.02	4.68	1.43
10/15/02 17:21:00	258.5	15510	16.01	4.67	1.42
10/16/02 7:58:22	1135.9	68152	15.88	4.54	1.38
10/16/02 20:17:39	1875.1	112509	15.81	4.47	1.36



RISING HEAD (BAIL) TEST @ MW3-02

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (MW3-02)

Initial Displacement: 1.54 m
Wellbore Radius: 0.1 m
Screen Length: 1.52 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 1.54 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.606E-08 cm/sec

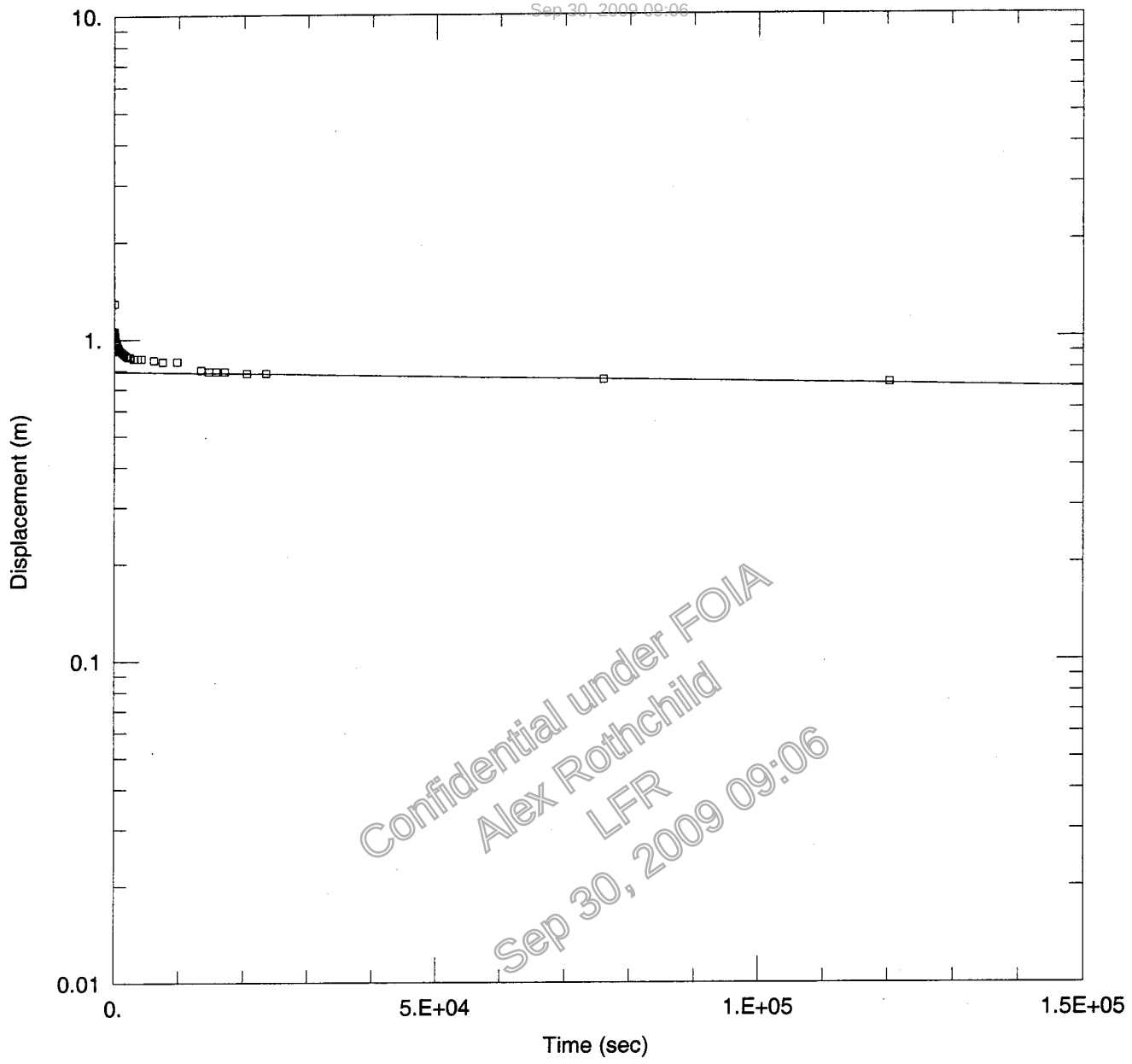
y0 = 1.293 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = ~ 17.3 feet BTOR
Static Water Level = 12.25 feet BTOR
Volume Removed = 3.5 gallons
Volume Removed = 13.25 litres

Single Well Response Test
MW3-02

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 10:00:00	0.0		--		
10/15/02 10:00:10	0.2	10	17.00	4.75	1.45
10/15/02 10:00:20	0.3	20	16.98	4.73	1.44
10/15/02 10:00:30	0.5	30	16.97	4.72	1.44
10/15/02 10:00:40	0.7	40	16.95	4.70	1.43
10/15/02 10:00:50	0.8	50	16.95	4.70	1.43
10/15/02 10:01:00	1.0	60	16.94	4.69	1.43
10/15/02 10:01:30	1.5	90	16.92	4.67	1.42
10/15/02 10:02:00	2.0	120	16.91	4.66	1.42
10/15/02 10:02:30	2.5	150	16.90	4.65	1.42
10/15/02 10:03:00	3.0	180	16.89	4.64	1.41
10/15/02 10:03:30	3.5	210	16.88	4.63	1.41
10/15/02 10:04:00	4.0	240	16.87	4.62	1.41
10/15/02 10:04:30	4.5	270	16.85	4.60	1.40
10/15/02 10:05:00	5.0	300	16.84	4.59	1.40
10/15/02 10:07:00	7.0	420	16.82	4.57	1.39
10/15/02 10:08:00	8.0	480	16.81	4.56	1.39
10/15/02 10:10:00	10.0	600	16.80	4.55	1.39
10/15/02 10:12:00	12.0	720	16.78	4.53	1.38
10/15/02 10:13:00	13.0	780	16.78	4.53	1.38
10/15/02 10:15:00	15.0	900	16.76	4.51	1.37
10/15/02 10:20:00	20.0	1200	16.72	4.47	1.36
10/15/02 10:25:00	25.0	1500	16.70	4.45	1.36
10/15/02 10:30:00	30.0	1800	16.69	4.44	1.35
10/15/02 10:35:00	35.0	2100	16.68	4.43	1.35
10/15/02 10:45:00	45.0	2700	16.66	4.41	1.34
10/15/02 10:55:00	55.0	3300	16.64	4.39	1.34
10/15/02 11:05:00	65.0	3900	16.64	4.39	1.34
10/15/02 11:20:00	80.0	4800	16.62	4.37	1.33
10/15/02 11:35:00	95.0	5700	16.61	4.36	1.33
10/15/02 11:50:00	110.0	6600	16.61	4.36	1.33
10/15/02 12:34:00	154.0	9240	16.59	4.34	1.32
10/15/02 12:57:00	177.0	10620	16.59	4.34	1.32
10/15/02 13:32:00	212.0	12720	16.58	4.33	1.32
10/15/02 14:31:00	271.0	16260	16.58	4.33	1.32
10/15/02 15:12:00	312.0	18720	16.56	4.31	1.31
10/15/02 15:33:00	333.0	19980	16.52	4.27	1.30
10/15/02 16:34:00	394.0	23640	16.45	4.20	1.28
10/15/02 17:23:00	443.0	26580	16.43	4.18	1.27
10/16/02 7:56:18	1316.3	78978	16.35	4.10	1.25
10/16/02 20:15:34	2055.6	123334	16.30	4.05	1.23



RISING HEAD (BAIL) TEST @ MW4-02

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (MW4-02)

Initial Displacement: 1.29 m
Wellbore Radius: 0.1 m
Screen Length: 1.29 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 1.29 m

SOLUTION

Aquifer Model: Unconfined

K = 2.155E-07 cm/sec

Solution Method: Bouwer-Rice

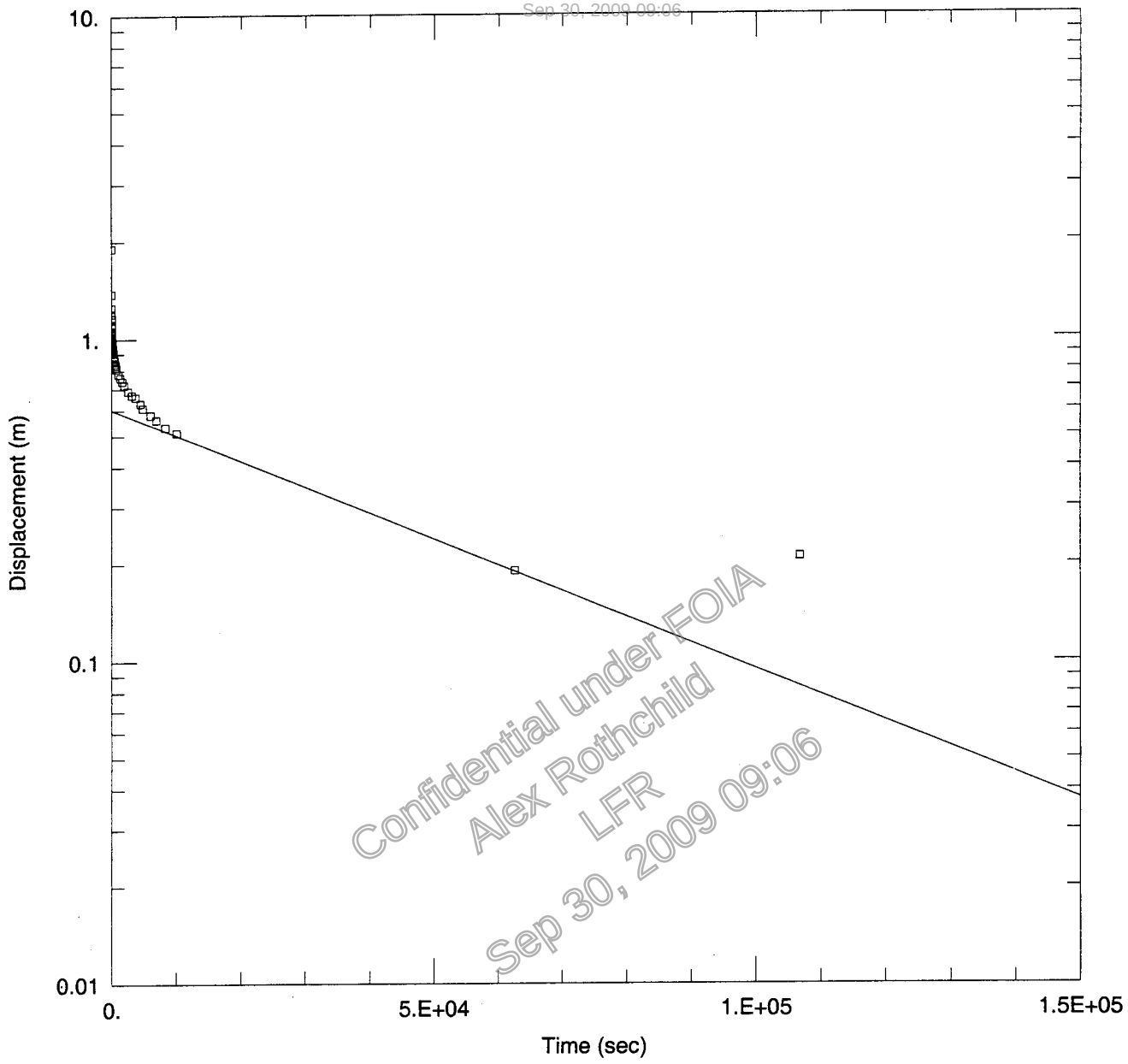
y0 = 0.7942 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = 17.42 feet BTOR
Static Water Level = 13.18 feet BTOR
Volume Removed = 2.5 gallons
Volume Removed = 9.46 litres

Single Well Response Test
MW4-02

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 10:51:00	0.0		--		
10/15/02 10:51:30	0.5	30	16.67	3.49	1.06
10/15/02 10:51:40	0.7	40	16.64	3.46	1.05
10/15/02 10:51:50	0.8	50	16.61	3.43	1.05
10/15/02 10:52:00	1.0	60	16.58	3.40	1.04
10/15/02 10:52:10	1.2	70	16.55	3.37	1.03
10/15/02 10:52:20	1.3	80	16.53	3.35	1.02
10/15/02 10:52:30	1.5	90	16.52	3.34	1.02
10/15/02 10:52:40	1.7	100	16.51	3.33	1.01
10/15/02 10:53:10	2.2	130	16.47	3.29	1.00
10/15/02 10:53:40	2.7	160	16.45	3.27	1.00
10/15/02 10:54:10	3.2	190	16.42	3.24	0.99
10/15/02 10:54:40	3.7	220	16.41	3.23	0.98
10/15/02 10:56:00	5.0	300	16.37	3.19	0.97
10/15/02 10:57:00	6.0	360	16.36	3.18	0.97
10/15/02 10:58:00	7.0	420	16.32	3.14	0.96
10/15/02 10:59:00	8.0	480	16.29	3.11	0.95
10/15/02 11:00:00	9.0	540	16.27	3.09	0.94
10/15/02 11:01:00	10.0	600	16.26	3.08	0.94
10/15/02 11:02:00	11.0	660	16.24	3.06	0.93
10/15/02 11:03:00	12.0	720	16.22	3.04	0.93
10/15/02 11:04:00	13.0	780	16.21	3.03	0.92
10/15/02 11:05:00	14.0	840	16.20	3.02	0.92
10/15/02 11:06:00	15.0	900	16.20	3.02	0.92
10/15/02 11:11:00	20.0	1200	16.15	2.97	0.91
10/15/02 11:16:00	25.0	1500	16.12	2.94	0.90
10/15/02 11:21:00	30.0	1800	16.10	2.92	0.89
10/15/02 11:26:00	35.0	2100	16.08	2.90	0.88
10/15/02 11:31:00	40.0	2400	16.07	2.89	0.88
10/15/02 11:41:00	50.0	3000	16.04	2.86	0.87
10/15/02 11:51:00	60.0	3600	16.02	2.84	0.87
10/15/02 12:01:00	70.0	4200	16.02	2.84	0.87
10/15/02 12:33:00	102.0	6120	15.99	2.81	0.86
10/15/02 12:56:00	125.0	7500	15.98	2.80	0.85
10/15/02 13:33:00	162.0	9720	15.96	2.78	0.85
10/15/02 14:34:00	223.0	13380	15.79	2.61	0.80
10/15/02 14:54:00	243.0	14580	15.77	2.59	0.79
10/15/02 15:13:00	262.0	15720	15.76	2.58	0.79
10/15/02 15:35:00	284.0	17040	15.76	2.58	0.79
10/15/02 16:32:00	341.0	20460	15.75	2.57	0.78
10/15/02 17:22:00	391.0	23460	15.74	2.56	0.78
10/16/02 7:57:23	1266.4	75983	15.61	2.43	0.74
10/16/02 20:16:42	2005.7	120342	15.54	2.36	0.72



RISING HEAD (BAIL) TEST @ MW-3

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (MW-3)

Initial Displacement: 1.91 m
Wellbore Radius: 0.1 m
Screen Length: 1.91 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 1.91 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 3.642E-06 cm/sec

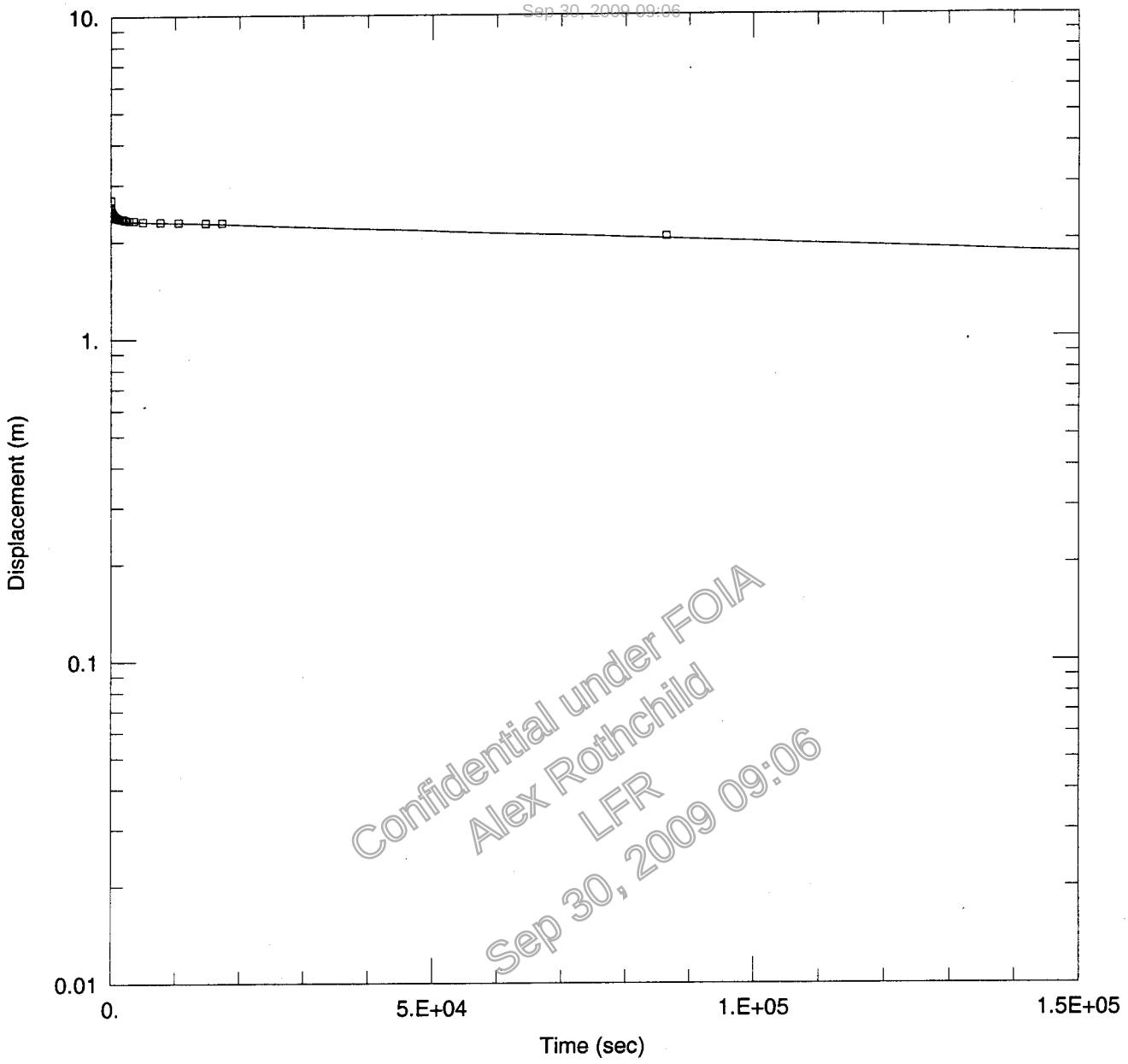
y0 = 0.6042 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = 13.17 feet BTOR
Static Water Level = 6.91 feet BTOR
Volume Removed = 1.8 gallons
Volume Removed = 6.62 litres

Single Well Response Test
MW-3

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 14:42:30	0.0		--		
10/15/02 14:42:50	0.3	20	11.45	4.54	1.38
10/15/02 14:43:00	0.5	30	11.00	4.09	1.25
10/15/02 14:43:10	0.7	40	10.85	3.94	1.20
10/15/02 14:43:20	0.8	50	10.70	3.79	1.16
10/15/02 14:43:30	1.0	60	10.56	3.65	1.11
10/15/02 14:43:40	1.2	70	10.48	3.57	1.09
10/15/02 14:43:50	1.3	80	10.40	3.49	1.06
10/15/02 14:44:00	1.5	90	10.35	3.44	1.05
10/15/02 14:44:10	1.7	100	10.31	3.40	1.04
10/15/02 14:44:20	1.8	110	10.26	3.35	1.02
10/15/02 14:44:30	2.0	120	10.22	3.31	1.01
10/15/02 14:45:00	2.5	150	10.13	3.22	0.98
10/15/02 14:45:30	3.0	180	10.08	3.17	0.97
10/15/02 14:46:00	3.5	210	10.02	3.11	0.95
10/15/02 14:46:30	4.0	240	9.98	3.07	0.94
10/15/02 14:47:00	4.5	270	9.94	3.03	0.92
10/15/02 14:47:30	5.0	300	9.89	2.98	0.91
10/15/02 14:48:30	6.0	360	9.84	2.93	0.89
10/15/02 14:49:30	7.0	420	9.80	2.89	0.88
10/15/02 14:50:30	8.0	480	9.72	2.81	0.86
10/15/02 14:51:30	9.0	540	9.68	2.77	0.84
10/15/02 14:52:30	10.0	600	9.66	2.75	0.84
10/15/02 14:53:30	11.0	660	9.62	2.71	0.83
10/15/02 14:54:30	12.0	720	9.60	2.69	0.82
10/15/02 14:55:30	13.0	780	9.58	2.67	0.81
10/15/02 15:00:30	18.0	1080	9.48	2.57	0.78
10/15/02 15:05:30	23.0	1380	9.40	2.49	0.76
10/15/02 15:10:30	28.0	1680	9.33	2.42	0.74
10/15/02 15:15:30	33.0	1980	9.27	2.36	0.72
10/15/02 15:25:30	43.0	2580	9.16	2.25	0.69
10/15/02 15:35:30	53.0	3180	9.12	2.21	0.67
10/15/02 15:45:30	63.0	3780	9.08	2.17	0.66
10/15/02 15:58:00	75.5	4530	8.97	2.06	0.63
10/15/02 16:04:00	81.5	4890	8.92	2.01	0.61
10/15/02 16:24:00	101.5	6090	8.81	1.90	0.58
10/15/02 16:39:00	116.5	6990	8.76	1.85	0.56
10/15/02 17:02:00	139.5	8370	8.66	1.75	0.53
10/15/02 17:31:00	168.5	10110	8.58	1.67	0.51
10/16/02 8:05:17	1042.8	62567	7.54	0.63	0.19
10/16/02 20:22:11	1779.7	106781	7.59	0.68	0.21



RISING HEAD (BAIL) TEST @ MW-OBG

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (MW-OBG)

Initial Displacement: 2.7 m
Wellbore Radius: 0.1 m
Screen Length: 1.52 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 2.7 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 7.814E-08 cm/sec

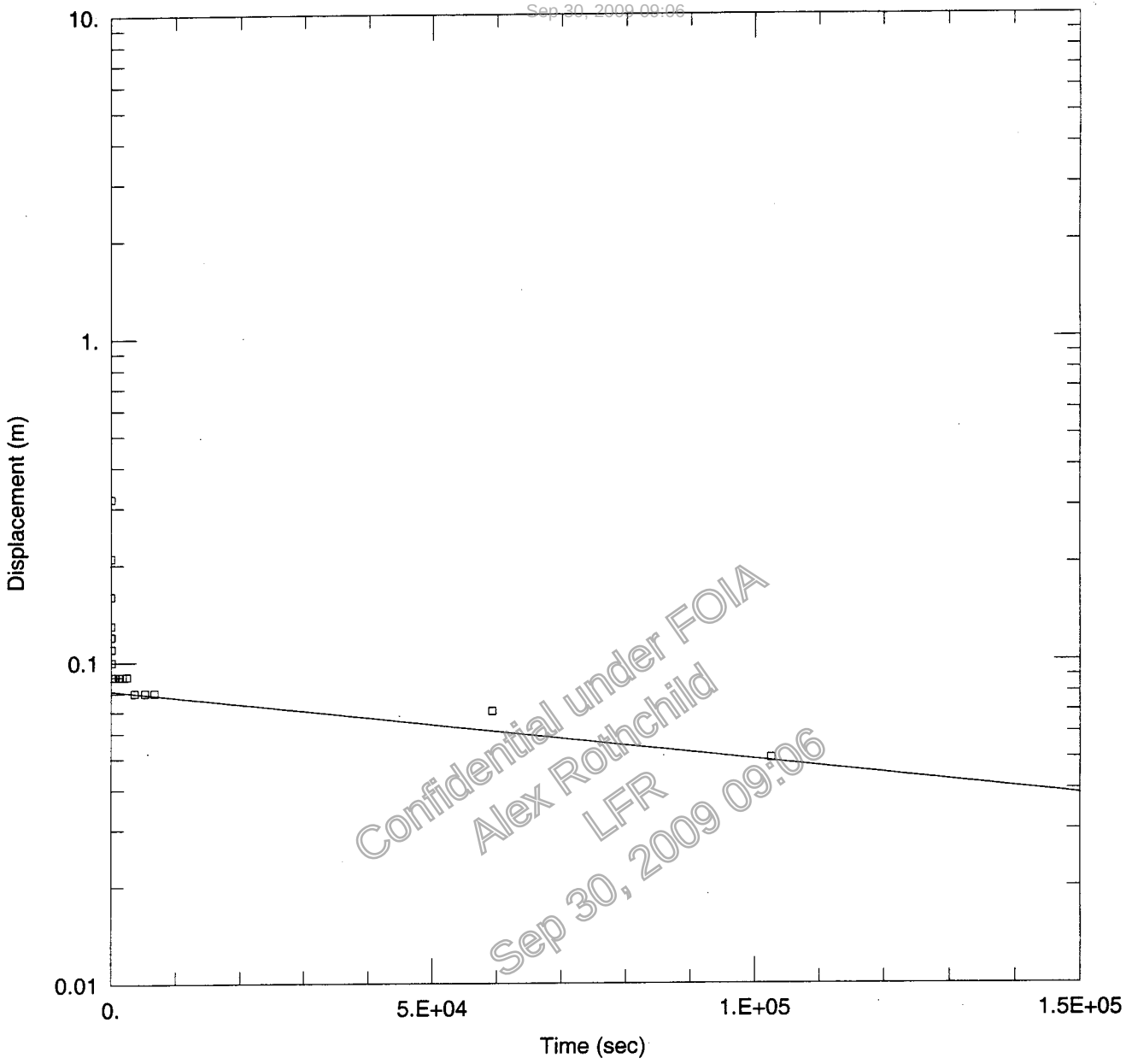
y0 = 2.325 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = ~ 17.3 feet BTOR
Static Water Level = 8.43 feet BTOR
Volume Removed = 5.0 gallons
Volume Removed = 18.93 litres

Single Well Response Test
MW-OBG

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/17/02 7:54:45	0.0		--		
10/17/02 7:55:15	0.5	30	16.81	8.38	2.55
10/17/02 7:55:40	0.9	55	16.72	8.29	2.53
10/17/02 7:56:00	1.2	75	16.64	8.21	2.50
10/17/02 7:56:45	2.0	120	16.60	8.17	2.49
10/17/02 7:57:15	2.5	150	16.56	8.13	2.48
10/17/02 7:57:45	3.0	180	16.53	8.10	2.47
10/17/02 7:58:15	3.5	210	16.51	8.08	2.46
10/17/02 7:58:45	4.0	240	16.49	8.06	2.46
10/17/02 7:59:15	4.5	270	16.47	8.04	2.45
10/17/02 7:59:45	5.0	300	16.45	8.02	2.44
10/17/02 8:00:15	5.5	330	16.43	8.00	2.44
10/17/02 8:00:45	6.0	360	16.41	7.98	2.43
10/17/02 8:01:15	6.5	390	16.40	7.97	2.43
10/17/02 8:01:45	7.0	420	16.39	7.96	2.43
10/17/02 8:02:45	8.0	480	16.37	7.94	2.42
10/17/02 8:03:45	9.0	540	16.34	7.91	2.41
10/17/02 8:04:45	10.0	600	16.32	7.89	2.40
10/17/02 8:05:45	11.0	660	16.31	7.88	2.40
10/17/02 8:06:45	12.0	720	16.30	7.87	2.40
10/17/02 8:08:45	14.0	840	16.27	7.84	2.39
10/17/02 8:10:45	16.0	960	16.23	7.80	2.38
10/17/02 8:12:45	18.0	1080	16.21	7.78	2.37
10/17/02 8:17:45	23.0	1380	16.18	7.75	2.36
10/17/02 8:22:45	28.0	1680	16.16	7.73	2.36
10/17/02 8:27:45	33.0	1980	16.13	7.70	2.35
10/17/02 8:32:45	38.0	2280	16.11	7.68	2.34
10/17/02 8:42:45	48.0	2880	16.08	7.65	2.33
10/17/02 8:54:45	60.0	3600	16.06	7.63	2.33
10/17/02 9:18:45	84.0	5040	16.02	7.59	2.31
10/17/02 10:03:45	129.0	7740	15.99	7.56	2.30
10/17/02 10:50:45	176.0	10560	15.95	7.52	2.29
10/17/02 12:00:45	246.0	14760	15.91	7.48	2.28
10/17/02 12:43:45	289.0	17340	15.90	7.47	2.28
10/18/02 7:55:00	1440.2	86415	15.15	6.72	2.05



RISING HEAD (BAIL) TEST @ PFW-9

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (PFW-9)

Initial Displacement: 0.32 m
Wellbore Radius: 0.1 m
Screen Length: 0.32 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 0.32 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.645E-06 cm/sec

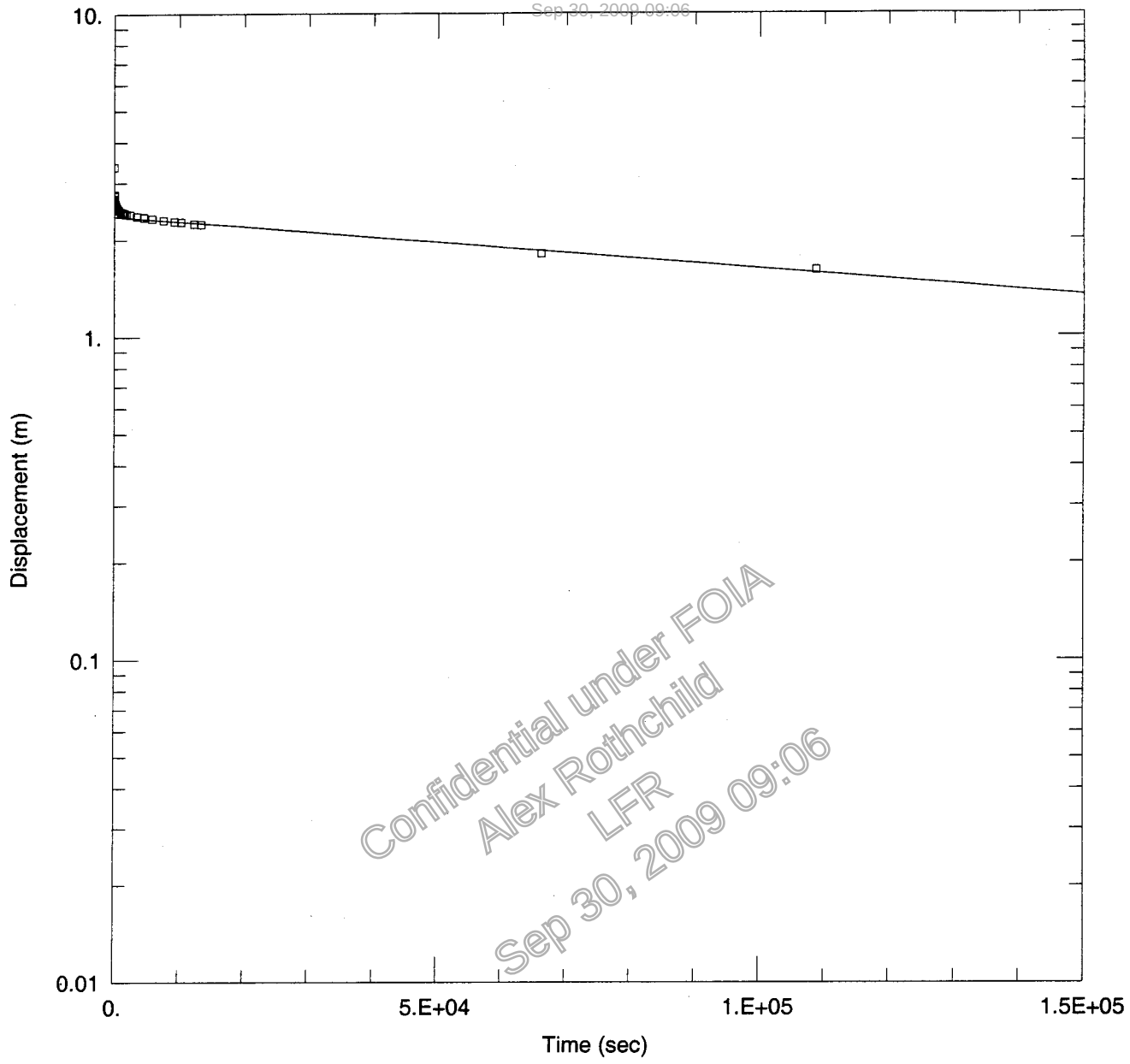
y0 = 0.08133 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = 11.27 feet BTOR
Static Water Level = 10.21 feet BTOR
Volume Removed = 0.1 gallons
Volume Removed = 0.38 litres

Single Well Response Test
PFW-9

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 15:40:00	0.0		--		
10/15/02 15:40:10	0.2	10	10.90	0.69	0.21
10/15/02 15:40:20	0.3	20	10.72	0.51	0.16
10/15/02 15:40:30	0.5	30	10.65	0.44	0.13
10/15/02 15:40:40	0.7	40	10.62	0.41	0.12
10/15/02 15:40:50	0.8	50	10.60	0.39	0.12
10/15/02 15:41:00	1.0	60	10.58	0.37	0.11
10/15/02 15:41:10	1.2	70	10.57	0.36	0.11
10/15/02 15:41:20	1.3	80	10.56	0.35	0.11
10/15/02 15:41:30	1.5	90	10.55	0.34	0.10
10/15/02 15:41:40	1.7	100	10.54	0.33	0.10
10/15/02 15:41:50	1.8	110	10.54	0.33	0.10
10/15/02 15:42:00	2.0	120	10.53	0.32	0.10
10/15/02 15:43:00	3.0	180	10.52	0.31	0.09
10/15/02 15:44:00	4.0	240	10.52	0.31	0.09
10/15/02 15:45:00	5.0	300	10.51	0.30	0.09
10/15/02 15:50:00	10.0	600	10.51	0.30	0.09
10/15/02 16:00:00	20.0	1200	10.50	0.29	0.09
10/15/02 16:10:00	30.0	1800	10.50	0.29	0.09
10/15/02 16:21:00	41.0	2460	10.50	0.29	0.09
10/15/02 16:41:00	61.0	3660	10.48	0.27	0.08
10/15/02 17:08:00	88.0	5280	10.47	0.26	0.08
10/15/02 17:32:00	112.0	6720	10.47	0.26	0.08
10/16/02 8:08:41	988.7	59321	10.44	0.23	0.07
10/16/02 20:09:50	1709.8	102590	10.39	0.18	0.05



RISING HEAD (BAIL) TEST @ PFW-10

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates
Client: Former Peregrine (US) Inc.
Project: 12636-40
Test Location: Genesee Township, Michigan
Test Date: October 2002

WELL DATA (PFW-10)

Initial Displacement: 3.36 m
Wellbore Radius: 0.1 m
Screen Length: 0.76 m
Gravel Pack Porosity: 0.3

Casing Radius: 0.025 m
Well Skin Radius: 0.1 m
Total Well Penetration Depth: 3.36 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 3.374E-07 cm/sec

y0 = 2.364 m

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Sounded Well Depth = 16.07 feet BTOR
Static Water Level = 5.05 feet BTOR
Volume Removed = 2.0 gallons
Volume Removed = 7.57 litres

Single Well Response Test
PFW-10

Calendar Date/Time	*Elasped Time (min.)*	*Elasped Time (sec)*	*Water Level (feet BTOR)*	*WL Change (feet)*	*WL Change (metres)*
10/15/02 13:52:30	0.0		--		
10/15/02 13:53:30	1.0	60	14.15	9.10	2.77
10/15/02 13:53:40	1.2	70	14.05	9.00	2.74
10/15/02 13:53:50	1.3	80	13.87	8.82	2.69
10/15/02 13:54:00	1.5	90	13.78	8.73	2.66
10/15/02 13:54:10	1.7	100	13.72	8.67	2.64
10/15/02 13:54:20	1.8	110	13.70	8.65	2.64
10/15/02 13:54:30	2.0	120	13.68	8.63	2.63
10/15/02 13:54:40	2.2	130	13.65	8.60	2.62
10/15/02 13:54:50	2.3	140	13.62	8.57	2.61
10/15/02 13:55:00	2.5	150	13.61	8.56	2.61
10/15/02 13:55:10	2.7	160	13.59	8.54	2.60
10/15/02 13:55:20	2.8	170	13.57	8.52	2.60
10/15/02 13:55:30	3.0	180	13.56	8.51	2.59
10/15/02 13:56:00	3.5	210	13.50	8.45	2.58
10/15/02 13:56:30	4.0	240	13.48	8.43	2.57
10/15/02 13:57:00	4.5	270	13.45	8.40	2.56
10/15/02 13:57:30	5.0	300	13.42	8.37	2.55
10/15/02 13:58:00	5.5	330	13.40	8.35	2.55
10/15/02 13:59:00	6.5	390	13.35	8.30	2.53
10/15/02 14:00:00	7.5	450	13.31	8.26	2.52
10/15/02 14:01:00	8.5	510	13.26	8.21	2.50
10/15/02 14:02:00	9.5	570	13.23	8.18	2.49
10/15/02 14:03:00	10.5	630	13.20	8.15	2.48
10/15/02 14:04:00	11.5	690	13.19	8.14	2.48
10/15/02 14:09:00	16.5	990	13.09	8.04	2.45
10/15/02 14:14:00	21.5	1290	13.04	7.99	2.44
10/15/02 14:19:00	26.5	1590	13.00	7.95	2.42
10/15/02 14:24:00	31.5	1890	12.96	7.91	2.41
10/15/02 14:34:00	41.5	2490	12.91	7.86	2.40
10/15/02 14:51:00	58.5	3510	12.82	7.77	2.37
10/15/02 15:09:00	76.5	4590	12.75	7.70	2.35
10/15/02 15:30:00	97.5	5850	12.69	7.64	2.33
10/15/02 15:59:00	126.5	7590	12.60	7.55	2.30
10/15/02 16:27:00	154.5	9270	12.53	7.48	2.28
10/15/02 16:44:00	171.5	10290	12.49	7.44	2.27
10/15/02 17:17:00	204.5	12270	12.41	7.36	2.24
10/15/02 17:35:00	222.5	13350	12.37	7.32	2.23
10/16/02 8:14:52	1102.4	66142	10.95	5.90	1.80
10/16/02 20:04:07	1811.6	108697	10.30	5.25	1.60

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APPENDIX E

STEP-RATE PUMPING TEST DATA

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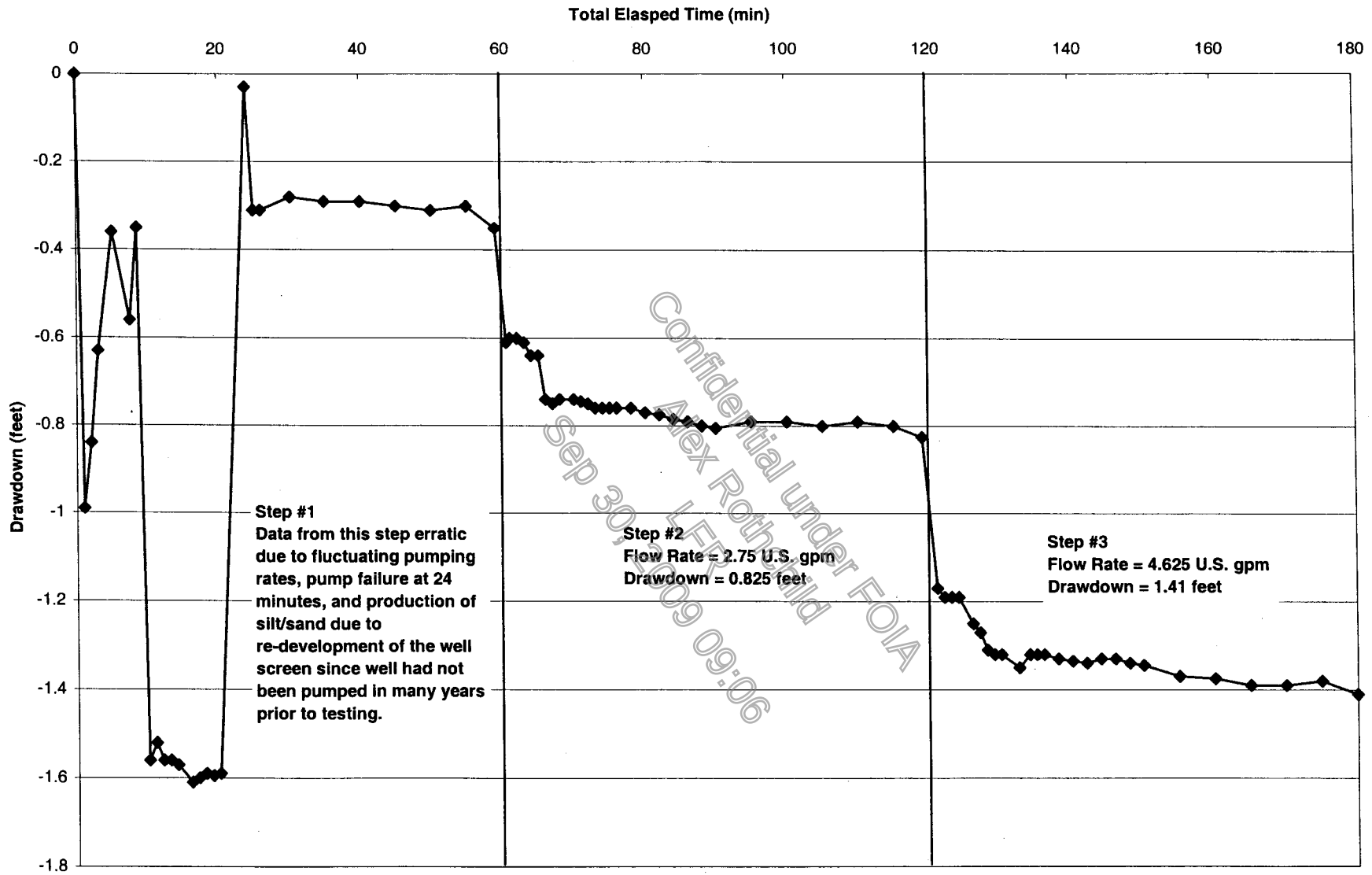

STEP-RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Step Test PFW-1 graph]

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GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Step-Rate Pumping Test Analysis
Tested Well: PFW-1

1) CALCULATION OF ACTUAL SPECIFIC CAPACITY FROM STEP-TEST DATA:

Step # (60 min each)	Cummulative Drawdown S (feet)	Cummulative Drawdown S (metres)	Discharge Rate Q (US gpm)	Discharge Rate Q (L/s)	Specific Drawdown S/Q (m/(L/s))	Specific Capacity Q/S (L/s/m)
0	0	0	0	0		
1	0.350	0.107	1	0.06	1.69	0.59
2	0.825	0.251	2.75	0.17	1.45	0.69
3	1.410	0.430	4.625	0.29	1.47	0.68

2) CALCULATION OF THEORETICAL CAPACITY BASED ON LINEAR GRAPHICAL RELATIONSHIP:

determination of available drawdown:

Casing Stick-up =	1.76	feet			
Static Water Level =	81.94	feet BTOR			
Static Water Level =	80.18	feet BGS			
Depth to bottom of Screen =	85	feet BGS			
Depth to top of Screen =	80	feet BGS			
Available Drawdown =	4.82	feet	=	1.47	m to bottom of screen
Available Drawdown =	-0.18	feet	=	-0.05	m to top of screen

establishing the equation describing relationship:

Specific Drawdown = $S/Q = \alpha Q + \beta$ [m/(L/s)]

where:

α = slope of Discharge (X) vs. Specific Drawdown (Y) line (absolute value) [m/(L/s)^2]

Q = Discharge Rate [L/s]

β = "Y-intercept" of Discharge (X) vs. Specific Drawdown (Y) line [m/(L/s)]

S = Available Drawdown in Well [m]

solving the quadratic equation to determine maximum rate (using linear regression algorithum):

$S/Q = \alpha Q + \beta \longrightarrow 0 = ax^2 + bx - c$

$0 = Q^2\alpha + Q\beta - S \longrightarrow x = -b + -((b^2-4ac)^{1/2})/2a$

therefore:

$a = \alpha =$	0.198684239	[m/(L/s)^2]
$b = \beta =$	1.415	[m/(L/s)]
$c = -S =$	-1.469136	[m]

b^2-4ac	3.16948
$(b^2-4ac)^{1/2}$	1.7803
$2a$	0.39737
$-b+((b^2-4ac)^{1/2})/2a$	0.91959
$-b-((b^2-4ac)^{1/2})/2a$	-8.04088

3) THEORETICAL MAXIMUM PUMPING RATE:

Using theorectical specific capacity:	**0.92**	**L/sec**
	14.58	**U.S.gpm**
Using measured specific capacity:	**1.00**	**L/sec**
	15.81	**U.S.gpm**

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Step-Rate Pumping Test Data
Tested Well: PFW-1

Date	Elasped Time (HH:MM:SS)	Cummulative Time (min)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
7-Oct-02	0:00:00	0	81.940	727.740	0.000		STATIC LEVEL
	0:01:00	1	82.930	726.750	-0.990	4	STEP #1
	0:01:30	1.5	nm	nm	nm	3	
	0:02:00	2	82.780	726.900	-0.840		
	0:02:15	2.25	nm	nm	nm	2	
	0:03:00	3	82.570	727.110	-0.630		
	0:03:45	3.75	nm	nm	nm	1.25	
	0:05:00	5	82.300	727.380	-0.360		
	0:06:00	6	nm	nm	nm	0.75	
	0:07:30	7.5	82.500	727.180	-0.560		
	0:08:00	8	nm	nm	nm	1	
	0:08:30	8.5	82.290	727.390	-0.350		
	0:10:00	10	83.500	726.180	-1.560		
	0:11:00	11	83.460	726.220	-1.520		
	0:12:00	12	83.500	726.180	-1.560		
	0:13:00	13	83.500	726.180	-1.560		
	0:14:00	14	83.510	726.170	-1.570	0.875	
	0:16:00	16	83.550	726.130	-1.610		
	0:17:00	17	83.540	726.140	-1.600		
	0:18:00	18	83.530	726.150	-1.590		
	0:19:00	19	83.535	726.145	-1.595		
	0:20:00	20	83.530	726.150	-1.590		
	0:24:00	24	81.970	727.710	-0.030		
	0:25:00	25	82.250	727.430	-0.310		
	0:26:00	26	82.250	727.430	-0.310		
	0:30:15	30.25	82.220	727.460	-0.280	0.9375	
	0:35:00	35	82.230	727.450	-0.290	0.875	
	0:40:00	40	82.230	727.450	-0.290	0.875	
	0:45:00	45	82.240	727.440	-0.300	1	
	0:50:00	50	82.250	727.430	-0.310	1	
	0:55:00	55	82.240	727.440	-0.300	1	
	0:59:00	59	82.290	727.390	-0.350		

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

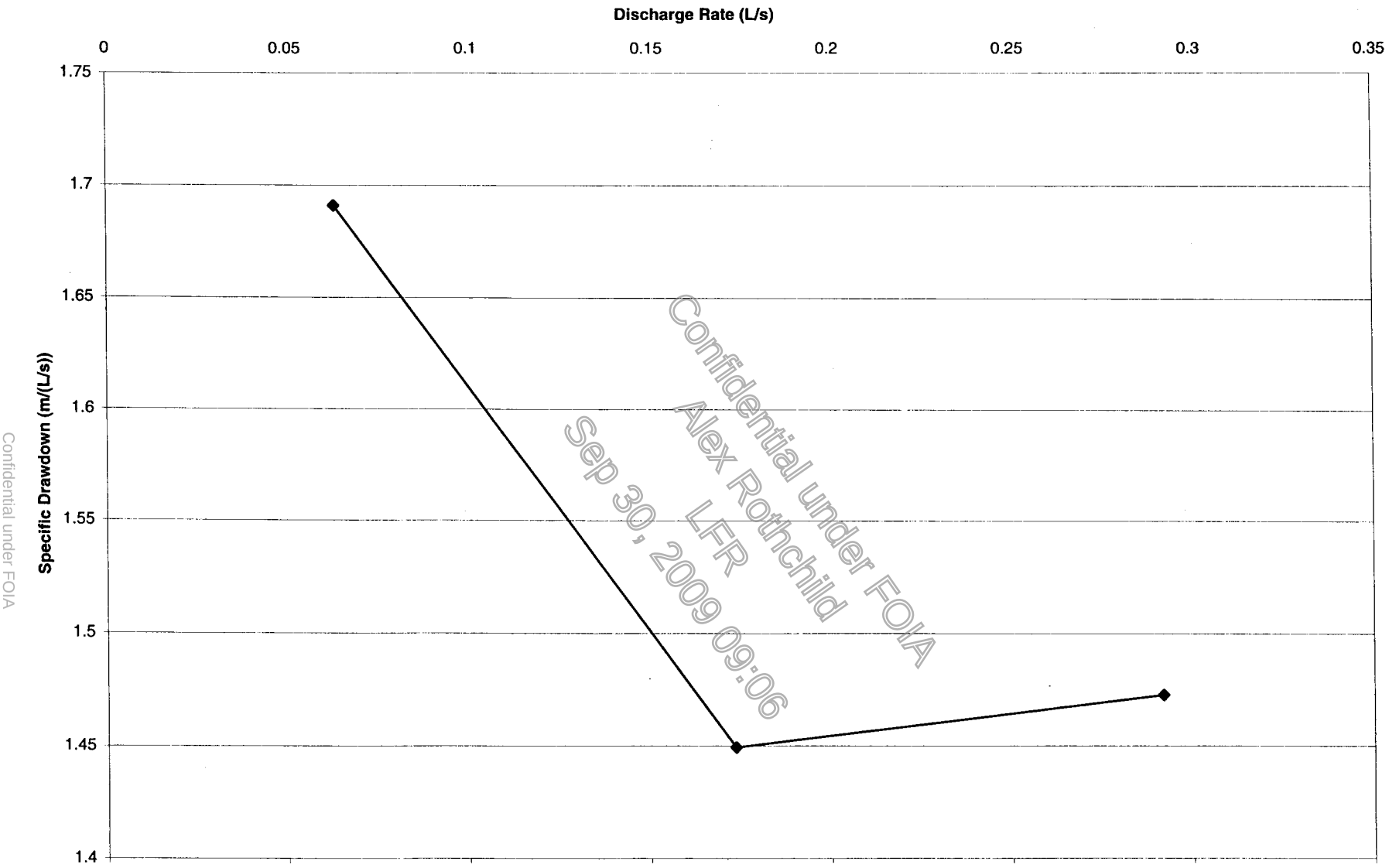
Step-Rate Pumping Test Data
Tested Well: PFW-1

Date	Elasped Time (HH:MM:SS)	Cummulative Time (min)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
	1:00:00	60	nm	nm	nm		STEP #2
	0:00:30	60.5	82.550	727.130	-0.610		
	0:01:00	61	82.540	727.140	-0.600	2.25	
	0:02:00	62	82.540	727.140	-0.600		
	0:03:00	63	82.550	727.130	-0.610		
	0:04:00	64	82.580	727.100	-0.640	2.25	
	0:05:00	65	82.580	727.100	-0.640	2.75	
	0:06:00	66	82.680	727.000	-0.740	2.75	
	0:07:00	67	82.690	726.990	-0.750		
	0:08:00	68	82.680	727.000	-0.740	2.75	
	0:10:00	70	82.680	727.000	-0.740		
	0:11:00	71	82.685	726.995	-0.745		
	0:12:00	72	82.690	726.990	-0.750	2.75	
	0:13:00	73	82.700	726.980	-0.760		
	0:14:00	74	82.700	726.980	-0.760		
	0:15:00	75	82.700	726.980	-0.760	2.75	
	0:16:00	76	82.700	726.980	-0.760		
	0:18:00	78	82.700	726.980	-0.760		
	0:20:00	80	82.710	726.970	-0.770	2.75	
	0:22:00	82	82.715	726.965	-0.775		
	0:24:00	84	82.725	726.955	-0.785	2.75	
	0:26:00	86	82.730	726.950	-0.790		
	0:28:00	88	82.740	726.940	-0.800		
	0:30:00	90	82.745	726.935	-0.805		
	0:35:00	95	82.730	726.950	-0.790	2.75	
	0:40:00	100	82.730	726.950	-0.790	2.75	
	0:45:00	105	82.740	726.940	-0.800		
	0:50:00	110	82.730	726.950	-0.790	2.75	
	0:55:00	115	82.740	726.940	-0.800	2.75	
	0:59:00	119	82.765	726.915	-0.825		

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Step-Rate Pumping Test Data
Tested Well: PFW-1

Date	Elasped Time (HH:MM:SS)	Cummulative Time (min)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
	1:00:00	120	nm	nm	nm		STEP #3
	0:01:00	121	83.110	726.570	-1.170		
	0:02:00	122	83.130	726.550	-1.190		
	0:03:00	123	83.130	726.550	-1.190		
	0:04:00	124	83.130	726.550	-1.190	4.25	
	0:05:00	125	83.150	726.530	-1.210		
	0:06:00	126	83.190	726.490	-1.250		
	0:07:00	127	83.210	726.470	-1.270		
	0:08:00	128	83.250	726.430	-1.310		
	0:09:00	129	83.260	726.420	-1.320		
	0:10:00	130	83.260	726.420	-1.320	4.75	
	0:11:00	131	nm	nm	nm		
	0:12:30	132.5	83.290	726.390	-1.350		
	0:13:00	133	nm	nm	nm	4.75	
	0:14:00	134	83.260	726.420	-1.320		
	0:15:00	135	83.260	726.420	-1.320		
	0:16:00	136	83.260	726.420	-1.320	4.75	
	0:18:00	138	83.270	726.410	-1.330		
	0:20:00	140	83.275	726.405	-1.335	4.625	
	0:22:00	142	83.280	726.400	-1.340		
	0:24:00	144	83.270	726.410	-1.330		
	0:26:00	146	83.270	726.410	-1.330		
	0:28:00	148	83.280	726.400	-1.340		
	0:30:00	150	83.285	726.395	-1.345		
	0:35:00	155	83.310	726.370	-1.370		
	0:40:00	160	83.315	726.365	-1.375		
	0:45:00	165	83.330	726.350	-1.390	4.625	
	0:50:00	170	83.330	726.350	-1.390	4.625	
	0:55:00	175	83.320	726.360	-1.380		
	1:00:00	180	83.350	726.330	-1.410		



DISCHARGE VERSUS DRAWDOWN DURING STEP TEST
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [12636-25-AppE (Step Test) discharge vs. drawdown]

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APPENDIX E

STEP-RATE PUMPING TEST DATA

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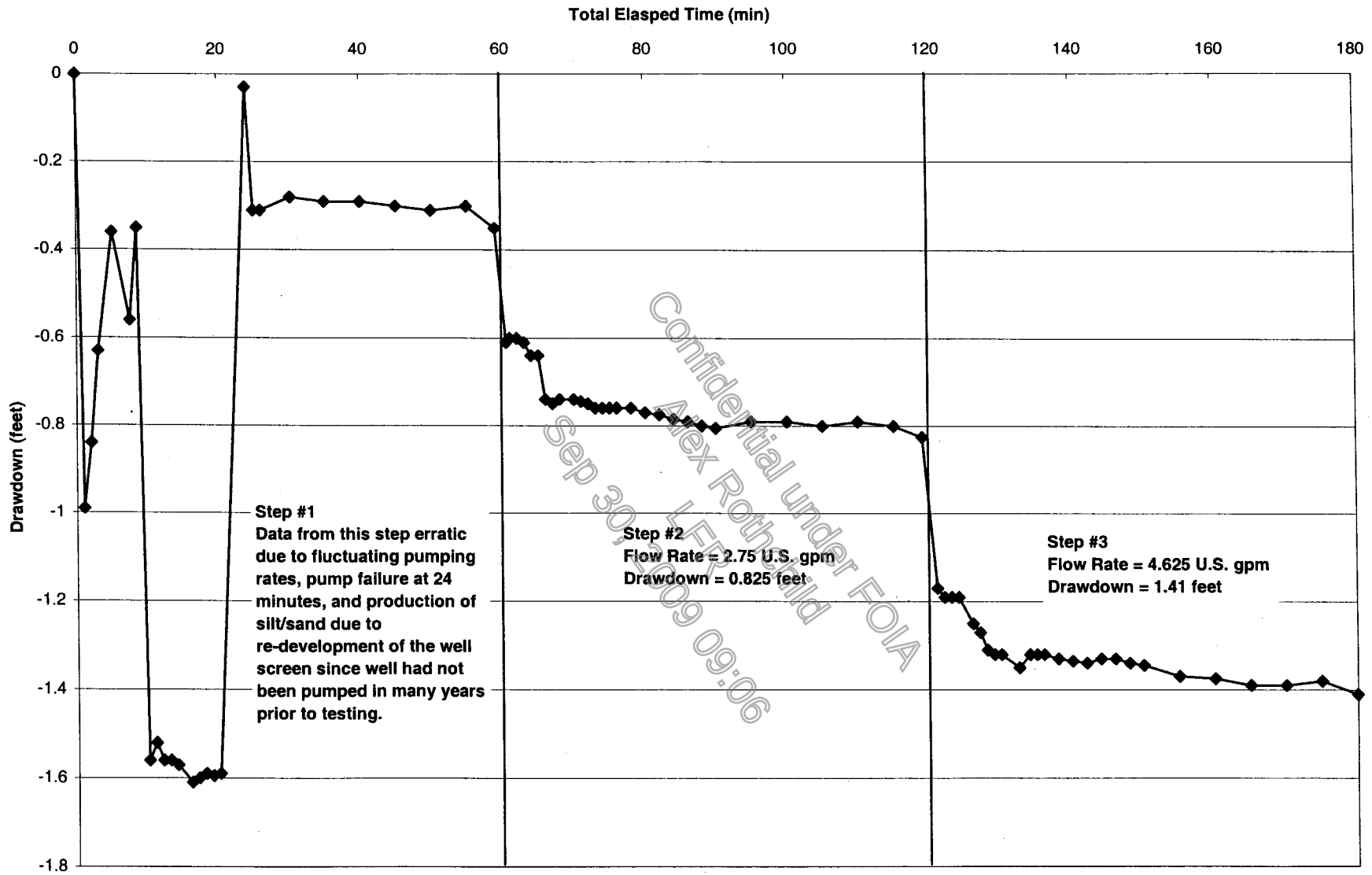

STEP-RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Step Test PFW-1 graph]

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GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Step-Rate Pumping Test Analysis
Tested Well: PFW-1

1) CALCULATION OF ACTUAL SPECIFIC CAPACITY FROM STEP-TEST DATA:

Step # (60 min each)	Cummulative Drawdown S (feet)	Cummulative Drawdown S (metres)	Discharge Rate Q (US gpm)	Discharge Rate Q (L/s)	Specific Drawdown S/Q (m/(L/s))	Specific Capacity Q/S (L/s/m)
0	0	0	0	0		
1	0.350	0.107	1	0.06	1.69	0.59
2	0.825	0.251	2.75	0.17	1.45	0.69
3	1.410	0.430	4.625	0.29	1.47	0.68

2) CALCULATION OF THEORETICAL CAPACITY BASED ON LINEAR GRAPHICAL RELATIONSHIP:

determination of available drawdown:

Casing Stick-up =	1.76	feet			
Static Water Level =	81.94	feet BTOR			
Static Water Level =	80.18	feet BGS			
Depth to bottom of Screen =	85	feet BGS			
Depth to top of Screen =	80	feet BGS			
Available Drawdown =	4.82	feet	=	1.47	m to bottom of screen
Available Drawdown =	-0.18	feet	=	-0.05	m to top of screen

establishing the equation describing relationship:

Specific Drawdown = $S/Q = \alpha Q + \beta$ [m/(L/s)]

where:

α = slope of Discharge (X) vs. Specific Drawdown (Y) line (absolute value) [m/(L/s)^2]

Q = Discharge Rate [L/s]

β = "Y-intercept" of Discharge (X) vs. Specific Drawdown (Y) line [m/(L/s)]

S = Available Drawdown in Well [m]

solving the quadratic equation to determine maximum rate (using linear regression algorithum):

$S/Q = \alpha Q + \beta \longrightarrow 0 = ax^2 + bx - c$

$0 = Q^2\alpha + Q\beta - S \longrightarrow x = -b + -((b^2-4ac)^{1/2})/2a$

therefore:

$a = \alpha =$	0.198684239	[m/(L/s)^2]
$b = \beta =$	1.415	[m/(L/s)]
$c = -S =$	-1.469136	[m]

b^2-4ac	3.16948
$(b^2-4ac)^{1/2}$	1.7803
$2a$	0.39737
$-b+((b^2-4ac)^{1/2})/2a$	0.91959
$-b-((b^2-4ac)^{1/2})/2a$	-8.04088

3) THEORETICAL MAXIMUM PUMPING RATE:

Using theorectical specific capacity:	**0.92**	**L/sec**
	14.58	**U.S.gpm**
Using measured specific capacity:	**1.00**	**L/sec**
	15.81	**U.S.gpm**

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Step-Rate Pumping Test Data
Tested Well: PFW-1

Date	Elasped Time (HH:MM:SS)	Cummulative Time (min)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
7-Oct-02	0:00:00	0	81.940	727.740	0.000		STATIC LEVEL
	0:01:00	1	82.930	726.750	-0.990	4	STEP #1
	0:01:30	1.5	nm	nm	nm	3	
	0:02:00	2	82.780	726.900	-0.840		
	0:02:15	2.25	nm	nm	nm	2	
	0:03:00	3	82.570	727.110	-0.630		
	0:03:45	3.75	nm	nm	nm	1.25	
	0:05:00	5	82.300	727.380	-0.360		
	0:06:00	6	nm	nm	nm	0.75	
	0:07:30	7.5	82.500	727.180	-0.560		
	0:08:00	8	nm	nm	nm	1	
	0:08:30	8.5	82.290	727.390	-0.350		
	0:10:00	10	83.500	726.180	-1.560		
	0:11:00	11	83.460	726.220	-1.520		
	0:12:00	12	83.500	726.180	-1.560		
	0:13:00	13	83.500	726.180	-1.560		
	0:14:00	14	83.510	726.170	-1.570	0.875	
	0:16:00	16	83.550	726.130	-1.610		
	0:17:00	17	83.540	726.140	-1.600		
	0:18:00	18	83.530	726.150	-1.590		
	0:19:00	19	83.535	726.145	-1.595		
	0:20:00	20	83.530	726.150	-1.590		
	0:24:00	24	81.970	727.710	-0.030		
	0:25:00	25	82.250	727.430	-0.310		
	0:26:00	26	82.250	727.430	-0.310		
	0:30:15	30.25	82.220	727.460	-0.280	0.9375	
	0:35:00	35	82.230	727.450	-0.290	0.875	
	0:40:00	40	82.230	727.450	-0.290	0.875	
	0:45:00	45	82.240	727.440	-0.300	1	
	0:50:00	50	82.250	727.430	-0.310	1	
	0:55:00	55	82.240	727.440	-0.300	1	
	0:59:00	59	82.290	727.390	-0.350		

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

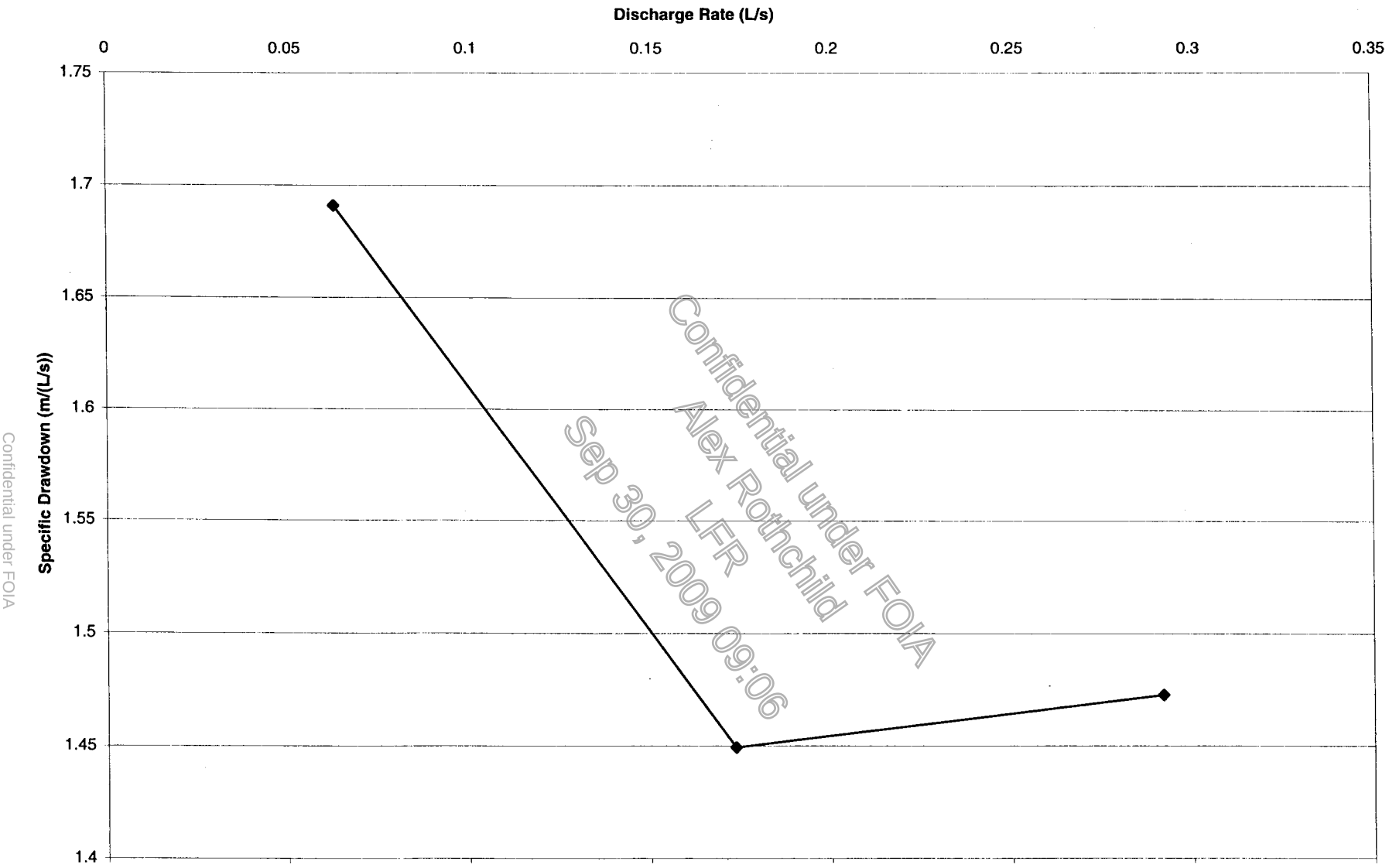
Step-Rate Pumping Test Data
Tested Well: PFW-1

Date	Elasped Time (HH:MM:SS)	Cummulative Time (min)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
	1:00:00	60	nm	nm	nm		STEP #2
	0:00:30	60.5	82.550	727.130	-0.610		
	0:01:00	61	82.540	727.140	-0.600	2.25	
	0:02:00	62	82.540	727.140	-0.600		
	0:03:00	63	82.550	727.130	-0.610		
	0:04:00	64	82.580	727.100	-0.640	2.25	
	0:05:00	65	82.580	727.100	-0.640	2.75	
	0:06:00	66	82.680	727.000	-0.740	2.75	
	0:07:00	67	82.690	726.990	-0.750		
	0:08:00	68	82.680	727.000	-0.740	2.75	
	0:10:00	70	82.680	727.000	-0.740		
	0:11:00	71	82.685	726.995	-0.745		
	0:12:00	72	82.690	726.990	-0.750	2.75	
	0:13:00	73	82.700	726.980	-0.760		
	0:14:00	74	82.700	726.980	-0.760		
	0:15:00	75	82.700	726.980	-0.760	2.75	
	0:16:00	76	82.700	726.980	-0.760		
	0:18:00	78	82.700	726.980	-0.760		
	0:20:00	80	82.710	726.970	-0.770	2.75	
	0:22:00	82	82.715	726.965	-0.775		
	0:24:00	84	82.725	726.955	-0.785	2.75	
	0:26:00	86	82.730	726.950	-0.790		
	0:28:00	88	82.740	726.940	-0.800		
	0:30:00	90	82.745	726.935	-0.805		
	0:35:00	95	82.730	726.950	-0.790	2.75	
	0:40:00	100	82.730	726.950	-0.790	2.75	
	0:45:00	105	82.740	726.940	-0.800		
	0:50:00	110	82.730	726.950	-0.790	2.75	
	0:55:00	115	82.740	726.940	-0.800	2.75	
	0:59:00	119	82.765	726.915	-0.825		

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Step-Rate Pumping Test Data
Tested Well: PFW-1

Date	Elasped Time (HH:MM:SS)	Cummulative Time (min)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
	1:00:00	120	nm	nm	nm		STEP #3
	0:01:00	121	83.110	726.570	-1.170		
	0:02:00	122	83.130	726.550	-1.190		
	0:03:00	123	83.130	726.550	-1.190		
	0:04:00	124	83.130	726.550	-1.190	4.25	
	0:05:00	125	83.150	726.530	-1.210		
	0:06:00	126	83.190	726.490	-1.250		
	0:07:00	127	83.210	726.470	-1.270		
	0:08:00	128	83.250	726.430	-1.310		
	0:09:00	129	83.260	726.420	-1.320		
	0:10:00	130	83.260	726.420	-1.320	4.75	
	0:11:00	131	nm	nm	nm		
	0:12:30	132.5	83.290	726.390	-1.350		
	0:13:00	133	nm	nm	nm	4.75	
	0:14:00	134	83.260	726.420	-1.320		
	0:15:00	135	83.260	726.420	-1.320		
	0:16:00	136	83.260	726.420	-1.320	4.75	
	0:18:00	138	83.270	726.410	-1.330		
	0:20:00	140	83.275	726.405	-1.335	4.625	
	0:22:00	142	83.280	726.400	-1.340		
	0:24:00	144	83.270	726.410	-1.330		
	0:26:00	146	83.270	726.410	-1.330		
	0:28:00	148	83.280	726.400	-1.340		
	0:30:00	150	83.285	726.395	-1.345		
	0:35:00	155	83.310	726.370	-1.370		
	0:40:00	160	83.315	726.365	-1.375		
	0:45:00	165	83.330	726.350	-1.390	4.625	
	0:50:00	170	83.330	726.350	-1.390	4.625	
	0:55:00	175	83.320	726.360	-1.380		
	1:00:00	180	83.350	726.330	-1.410		



DISCHARGE VERSUS DRAWDOWN DURING STEP TEST
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [12636-25-AppE (Step Test) discharge vs. drawdown]

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LFR
Sep 30, 2009 09:06

APPENDIX F

CONSTANT-RATE PUMPING TEST DATA

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LFR
Sep 30, 2009 09:06

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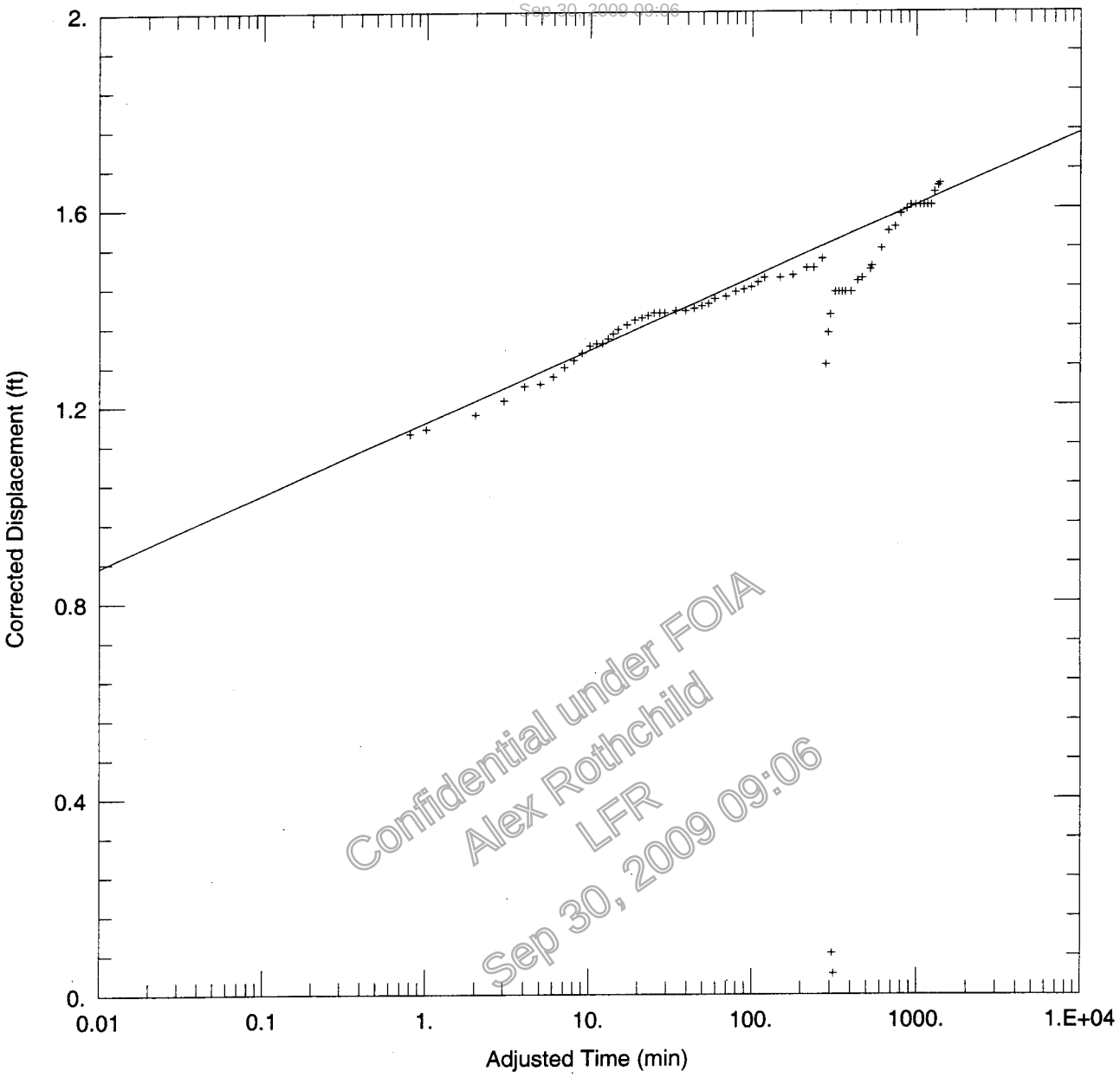
Alex Rothchild
LFR
Sep 30, 2009 09:06



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\cstewart\Desktop\PFW1-DD.aqt
Date: 12/20/02 Time: 16:35:02

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates

AQUIFER DATA

Saturated Thickness: 14. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PFW-1	0	0

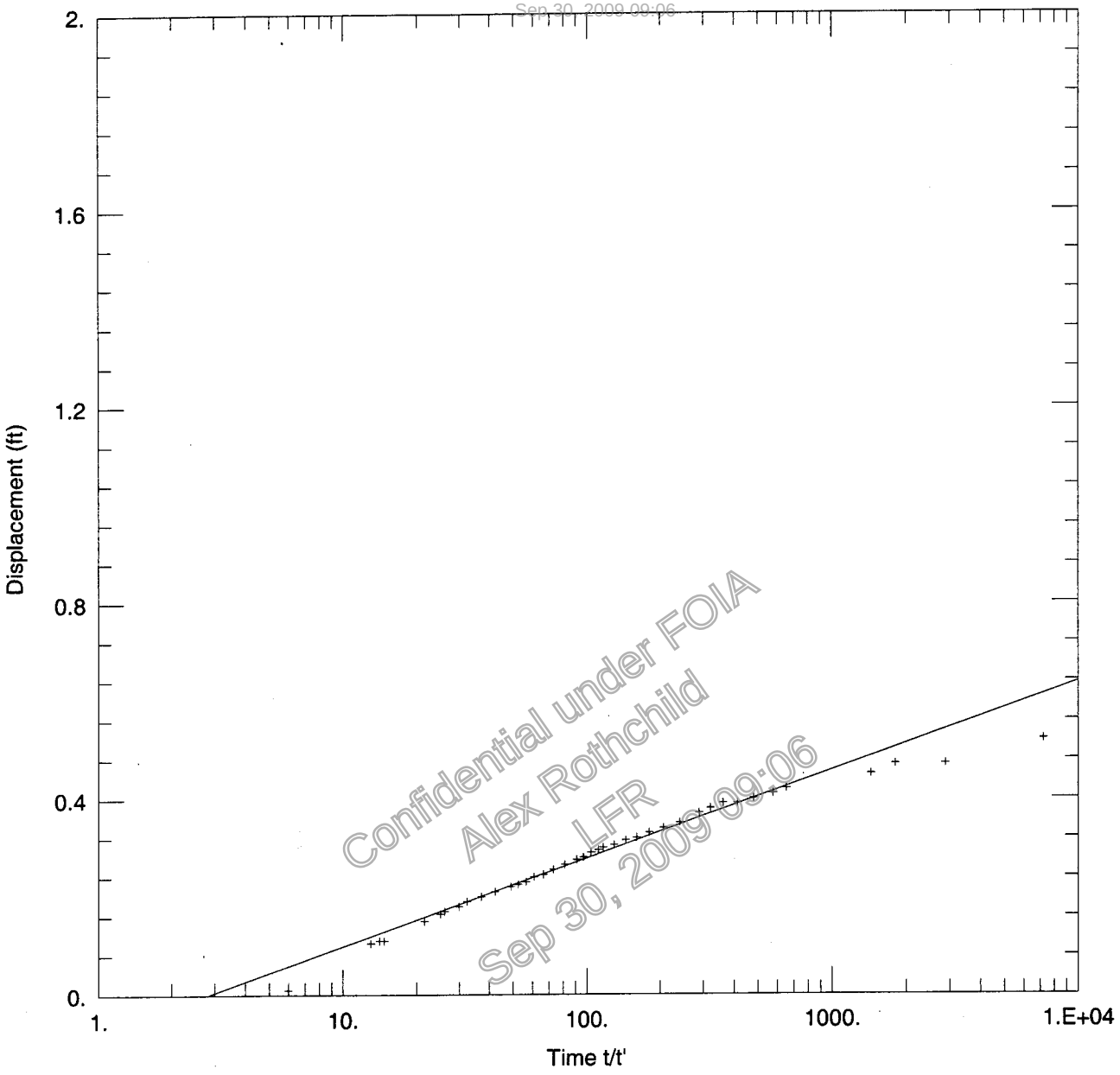
Observation Wells

Well Name	X (ft)	Y (ft)
+ PFW-1 DD	1	1

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 12.61 cm^2/sec S = 1.02E-08



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\cstewart\Desktop\PFW1-REC.aqt
Date: 12/20/02 Time: 16:47:04

PROJECT INFORMATION

Company: Conestoga-Rovers & Associates

AQUIFER DATA

Saturated Thickness: 14. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PFW-1	0	0

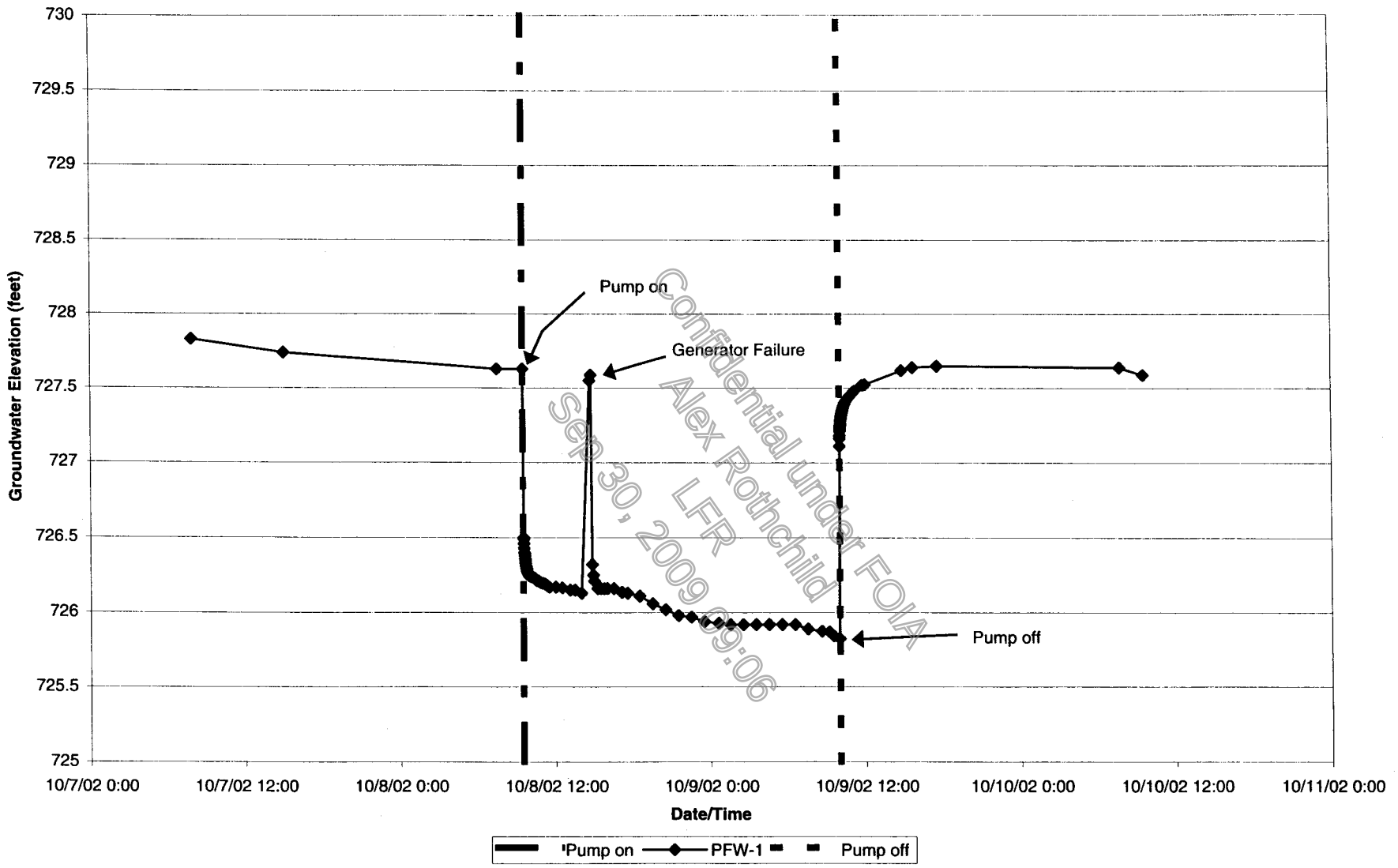
Observation Wells

Well Name	X (ft)	Y (ft)
+ PFW-1 REC	1	1

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 10.32 cm^2/sec S' = 2.806



WATER LEVEL HYDROGRAPH FOR PFW-1
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test PFW-1 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: PFW-1

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
10/7/02 7:51:00	-1539.0	81.850	727.830	-0.200		
10/7/02 15:00:00	-1110.0	81.940	727.740	-0.110		
10/8/02 7:30:00	-120.0	82.050	727.630	0.000		
10/8/02 9:30:00	0.0	82.050	727.630	0.000		Test Static
10/8/02 9:31:45	1.8	83.180	726.500	1.130		
10/8/02 9:32:00	2.0	83.190	726.490	1.140	4.625	352.7 Hz
10/8/02 9:33:00	3.0	83.220	726.460	1.170		
10/8/02 9:34:00	4.0	83.250	726.430	1.200		
10/8/02 9:35:00	5.0	83.280	726.400	1.230	4.625	352.7 Hz
10/8/02 9:36:00	6.0	83.285	726.395	1.235		
10/8/02 9:37:00	7.0	83.300	726.380	1.250		
10/8/02 9:38:00	8.0	83.320	726.360	1.270		
10/8/02 9:39:00	9.0	83.335	726.345	1.285		
10/8/02 9:40:00	10.0	83.350	726.330	1.300		
10/8/02 9:41:00	11.0	83.365	726.315	1.315		
10/8/02 9:42:00	12.0	83.370	726.310	1.320		
10/8/02 9:43:00	13.0	83.370	726.310	1.320		
10/8/02 9:44:00	14.0	83.380	726.300	1.330		
10/8/02 9:45:00	15.0	83.390	726.290	1.340	4.625	352.7 Hz
10/8/02 9:46:00	16.0	83.400	726.280	1.350		
10/8/02 9:48:00	18.0	83.410	726.270	1.360		
10/8/02 9:50:00	20.0	83.420	726.260	1.370	4.625	352.7 Hz
10/8/02 9:52:00	22.0	83.425	726.255	1.375		
10/8/02 9:54:00	24.0	83.430	726.250	1.380		
10/8/02 9:56:00	26.0	83.435	726.245	1.385	4.625	352.7 Hz
10/8/02 9:58:00	28.0	83.435	726.245	1.385		
10/8/02 10:00:00	30.0	83.435	726.245	1.385	4.625	
10/8/02 10:05:00	35.0	83.440	726.240	1.390	4.625	
10/8/02 10:10:00	40.0	83.440	726.240	1.390	4.625	
10/8/02 10:15:00	45.0	83.445	726.235	1.395		
10/8/02 10:20:00	50.0	83.450	726.230	1.400	4.625	
10/8/02 10:25:00	55.0	83.455	726.225	1.405		
10/8/02 10:30:00	60.0	83.465	726.215	1.415	4.625	
10/8/02 10:40:00	70.0	83.470	726.210	1.420		
10/8/02 10:50:00	80.0	83.480	726.200	1.430	4.625	
10/8/02 11:00:00	90.0	83.485	726.195	1.435		
10/8/02 11:10:00	100.0	83.490	726.190	1.440		
10/8/02 11:20:00	110.0	83.500	726.180	1.450	4.625	
10/8/02 11:30:00	120.0	83.510	726.170	1.460		
10/8/02 12:00:00	150.0	83.510	726.170	1.460	4.625	
10/8/02 12:30:00	180.0	83.515	726.165	1.465		
10/8/02 13:07:00	217.0	83.530	726.150	1.480	4.625	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

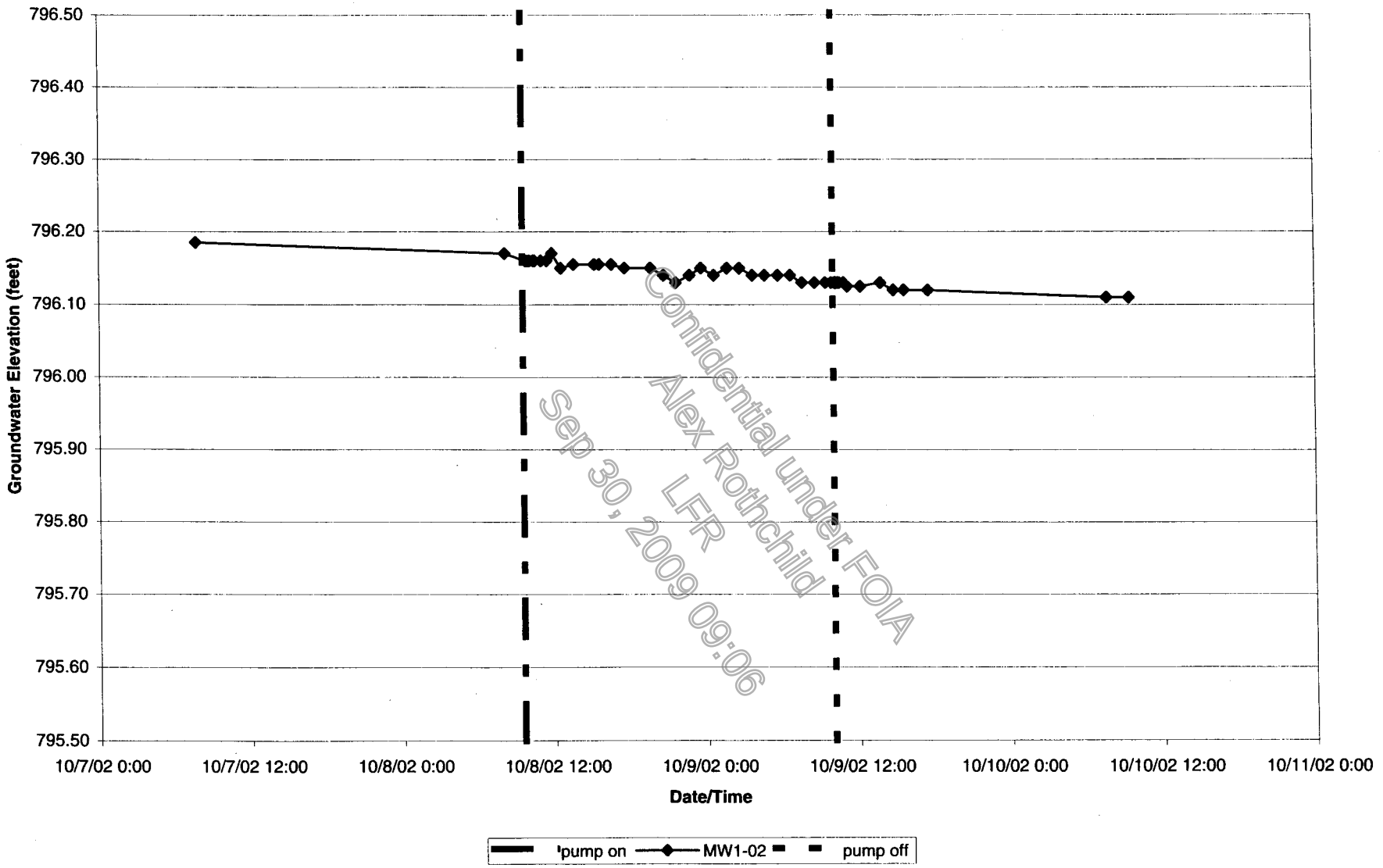
Constant Rate Pumping Test @ PFW-1
Monitor: PFW-1

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
10/8/02 13:30:00	240.0	83.530	726.150	1.480		
10/8/02 14:00:00	270.0	83.550	726.130	1.500	4.625	
10/8/02 14:00:00	270.0	83.550	726.130	1.500	0.000	Generator out of gas (gas leak)
10/8/02 14:41:00	311.0	82.130	727.550	0.080	0.000	from after 14:00 to 14:47
10/8/02 14:47:00	317.0	82.090	727.590	0.040	0.000	
10/8/02 14:47:00	317.0	82.090	727.590	0.040	~4.75	Restarted generator/pump
10/8/02 14:50:30	320.5	83.360	726.320	1.310		352.7 hz
10/8/02 14:55:00	325.0	83.430	726.250	1.380		
10/8/02 15:00:00	330.0	83.470	726.210	1.420		Pump off for 10 sec at 15:04 (overload)
10/8/02 15:15:00	345.0	83.520	726.160	1.470		
10/8/02 15:30:00	360.0	83.520	726.160	1.470	4.750	352.6 hz
10/8/02 15:45:00	375.0	83.520	726.160	1.470		352.6/7 hz
10/8/02 16:00:00	390.0	83.520	726.160	1.470	4.750	352.3 hz
10/8/02 16:30:00	420.0	83.520	726.160	1.470		
10/8/02 17:07:00	457.0	83.545	726.135	1.495		
10/8/02 17:34:00	484.0	83.550	726.130	1.500	4.750	
10/8/02 18:30:00	540.0	83.570	726.110	1.520	4.750	
10/8/02 19:10:00	580.0	nm	--	--	~4.75	Switched generators due to gas leak
10/8/02 19:10:00	580.0	nm	--	--	~4.88	
10/8/02 19:30:00	600.0	83.620	726.060	1.570		
10/8/02 20:30:00	660.0	83.660	726.020	1.610	4.875	
10/8/02 21:30:00	720.0	83.700	725.980	1.650	4.875	
10/8/02 22:30:00	780.0	83.710	725.970	1.660	4.875	
10/8/02 23:30:00	840.0	83.740	725.940	1.690	4.875	
10/9/02 0:36:00	906.0	83.750	725.930	1.700	4.875	
10/9/02 1:30:00	960.0	83.760	725.920	1.710	4.875	
10/9/02 2:30:00	1020.0	83.760	725.920	1.710	4.750	
10/9/02 3:30:00	1080.0	83.760	725.920	1.710	4.750	
10/9/02 4:30:00	1140.0	83.760	725.920	1.710	4.750	
10/9/02 5:30:00	1200.0	83.760	725.920	1.710	4.750	
10/9/02 6:30:00	1260.0	83.760	725.920	1.710	4.875	
10/9/02 7:30:00	1320.0	83.790	725.890	1.740	4.875	352.7 hz
10/9/02 8:35:00	1385.0	83.805	725.875	1.755	4.875	352.6/7 hz
10/9/02 9:10:00	1420.0	83.810	725.870	1.760	4.875	
10/9/02 9:29:00	1439.0	83.835	725.845	1.785		
10/9/02 9:58:00	1468.0	83.855	725.825	1.805		
10/9/02 10:00:15	1470.2	82.570	727.110	0.520	0	Pump off - Recovery
10/9/02 10:00:31	1470.5	82.520	727.160	0.470	0	
10/9/02 10:00:45	1470.8	82.520	727.160	0.470	0	
10/9/02 10:01:00	1471.0	82.500	727.180	0.450	0	
10/9/02 10:02:10	1472.2	82.470	727.210	0.420	0	
10/9/02 10:02:30	1472.5	82.460	727.220	0.410	0	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: PFW-1

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Pumping Rate (US gpm)	Notes
10/9/02 10:03:00	1473.0	82.450	727.230	0.400	0	
10/9/02 10:03:30	1473.5	82.440	727.240	0.390	0	
10/9/02 10:04:00	1474.0	82.440	727.240	0.390	0	
10/9/02 10:04:30	1474.5	82.430	727.250	0.380	0	
10/9/02 10:05:00	1475.0	82.420	727.260	0.370	0	
10/9/02 10:06:00	1476.0	82.400	727.280	0.350	0	
10/9/02 10:07:00	1477.0	82.390	727.290	0.340	0	
10/9/02 10:08:00	1478.0	82.380	727.300	0.330	0	
10/9/02 10:09:00	1479.0	82.370	727.310	0.320	0	
10/9/02 10:10:00	1480.0	82.365	727.315	0.315	0	
10/9/02 10:11:15	1481.2	82.355	727.325	0.305	0	
10/9/02 10:12:23	1482.4	82.350	727.330	0.300	0	
10/9/02 10:13:00	1483.0	82.345	727.335	0.295	0	
10/9/02 10:14:00	1484.0	82.340	727.340	0.290	0	
10/9/02 10:15:00	1485.0	82.330	727.350	0.280	0	
10/9/02 10:16:00	1486.0	82.325	727.355	0.275	0	
10/9/02 10:18:00	1488.0	82.315	727.365	0.265	0	
10/9/02 10:20:00	1490.0	82.305	727.375	0.255	0	
10/9/02 10:22:00	1492.0	82.295	727.385	0.245	0	
10/9/02 10:24:00	1494.0	82.290	727.390	0.240	0	
10/9/02 10:26:00	1496.0	82.280	727.400	0.230	0	
10/9/02 10:28:00	1498.0	82.275	727.405	0.225	0	
10/9/02 10:30:00	1500.0	82.270	727.410	0.220	0	
10/9/02 10:35:00	1505.0	82.260	727.420	0.210	0	
10/9/02 10:40:00	1510.0	82.250	727.430	0.200	0	
10/9/02 10:46:00	1516.0	82.240	727.440	0.190	0	
10/9/02 10:50:00	1520.0	82.230	727.450	0.180	0	
10/9/02 10:57:30	1527.5	82.220	727.460	0.170	0	
10/9/02 11:00:00	1530.0	82.215	727.465	0.165	0	
10/9/02 11:10:00	1540.0	82.200	727.480	0.150	0	
10/9/02 11:20:00	1550.0	nm	--	--	0	
10/9/02 11:30:00	1560.0	nm	--	--	0	
10/9/02 11:45:00	1575.0	82.160	727.520	0.110	0	
10/9/02 11:50:00	1580.0	82.160	727.520	0.110	0	
10/9/02 12:00:00	1590.0	82.155	727.525	0.105	0	
10/9/02 14:50:00	1760.0	82.060	727.620	0.010	0	
10/9/02 15:41:00	1811.0	82.040	727.640	-0.010	0	
10/9/02 17:35:00	1925.0	82.030	727.650	-0.020	0	
10/10/02 7:43:00	2773.0	82.040	727.640	-0.010	0	
10/10/02 9:32:00	2882.0	82.090	727.590	0.040	0	



WATER LEVEL HYDROGRAPH FOR MW1-02
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test MW1-02 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW1-02

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 7:40:00	-1550.0	14.715	796.185	-0.015	
10/8/02 8:05:00	-85.0	14.730	796.170	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 9:43:00	13.0	14.740	796.160	0.010	
10/8/02 9:52:00	22.0	14.740	796.160	0.010	
10/8/02 10:02:00	32.0	14.740	796.160	0.010	
10/8/02 10:19:00	49.0	14.740	796.160	0.010	
10/8/02 10:27:00	57.0	14.740	796.160	0.010	
10/8/02 10:57:00	87.0	14.740	796.160	0.010	
10/8/02 11:24:00	114.0	14.740	796.160	0.010	
10/8/02 11:49:00	139.0	14.730	796.170	0.000	
10/8/02 12:32:00	182.0	14.750	796.150	0.020	
10/8/02 13:32:00	242.0	14.745	796.155	0.015	
10/8/02 15:10:00	340.0	14.745	796.155	0.015	
10/8/02 15:33:00	363.0	14.745	796.155	0.015	
10/8/02 16:31:00	421.0	14.745	796.155	0.015	
10/8/02 17:33:30	483.5	14.750	796.150	0.020	
10/8/02 19:35:30	605.5	14.750	796.150	0.020	
10/8/02 20:37:00	667.0	14.760	796.140	0.030	
10/8/02 21:35:00	725.0	14.770	796.130	0.040	
10/8/02 22:40:00	790.0	14.760	796.140	0.030	
10/8/02 23:35:00	845.0	14.750	796.150	0.020	
10/9/02 0:36:00	906.0	14.760	796.140	0.030	
10/9/02 1:39:00	969.0	14.750	796.150	0.020	
10/9/02 2:38:00	1028.0	14.750	796.150	0.020	
10/9/02 3:39:00	1089.0	14.760	796.140	0.030	
10/9/02 4:37:00	1147.0	14.760	796.140	0.030	
10/9/02 5:39:00	1209.0	14.760	796.140	0.030	
10/9/02 6:38:00	1268.0	14.760	796.140	0.030	
10/9/02 7:34:00	1324.0	14.770	796.130	0.040	
10/9/02 8:34:00	1384.0	14.770	796.130	0.040	
10/9/02 9:25:00	1435.0	14.770	796.130	0.040	
10/9/02 9:52:00	1462.0	14.770	796.130	0.040	
10/9/02 10:00:00	1470.0	nm	--	0.000	Pump off - Recovery
10/9/02 10:07:50	1477.8	14.770	796.130	0.040	
10/9/02 10:10:30	1480.5	14.770	796.130	0.040	
10/9/02 10:13:10	1483.2	14.770	796.130	0.040	
10/9/02 10:16:10	1486.2	14.770	796.130	0.040	
10/9/02 10:19:00	1489.0	14.770	796.130	0.040	
10/9/02 10:21:50	1491.8	14.770	796.130	0.040	
10/9/02 10:24:30	1494.5	14.770	796.130	0.040	
10/9/02 10:27:00	1497.0	14.770	796.130	0.040	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW1-02

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/9/02 10:29:45	1499.8	14.770	796.130	0.040	
10/9/02 10:51:00	1521.0	14.770	796.130	0.040	
10/9/02 11:08:00	1538.0	14.775	796.125	0.045	
10/9/02 12:10:00	1600.0	14.775	796.125	0.045	
10/9/02 13:45:00	1695.0	14.770	796.130	0.040	
10/9/02 14:46:00	1756.0	14.780	796.120	0.050	
10/9/02 15:36:00	1806.0	14.780	796.120	0.050	
10/9/02 17:30:00	1920.0	14.780	796.120	0.050	
10/10/02 7:38:00	2768.0	14.790	796.110	0.060	
10/10/02 9:24:00	2874.0	14.790	796.110	0.060	

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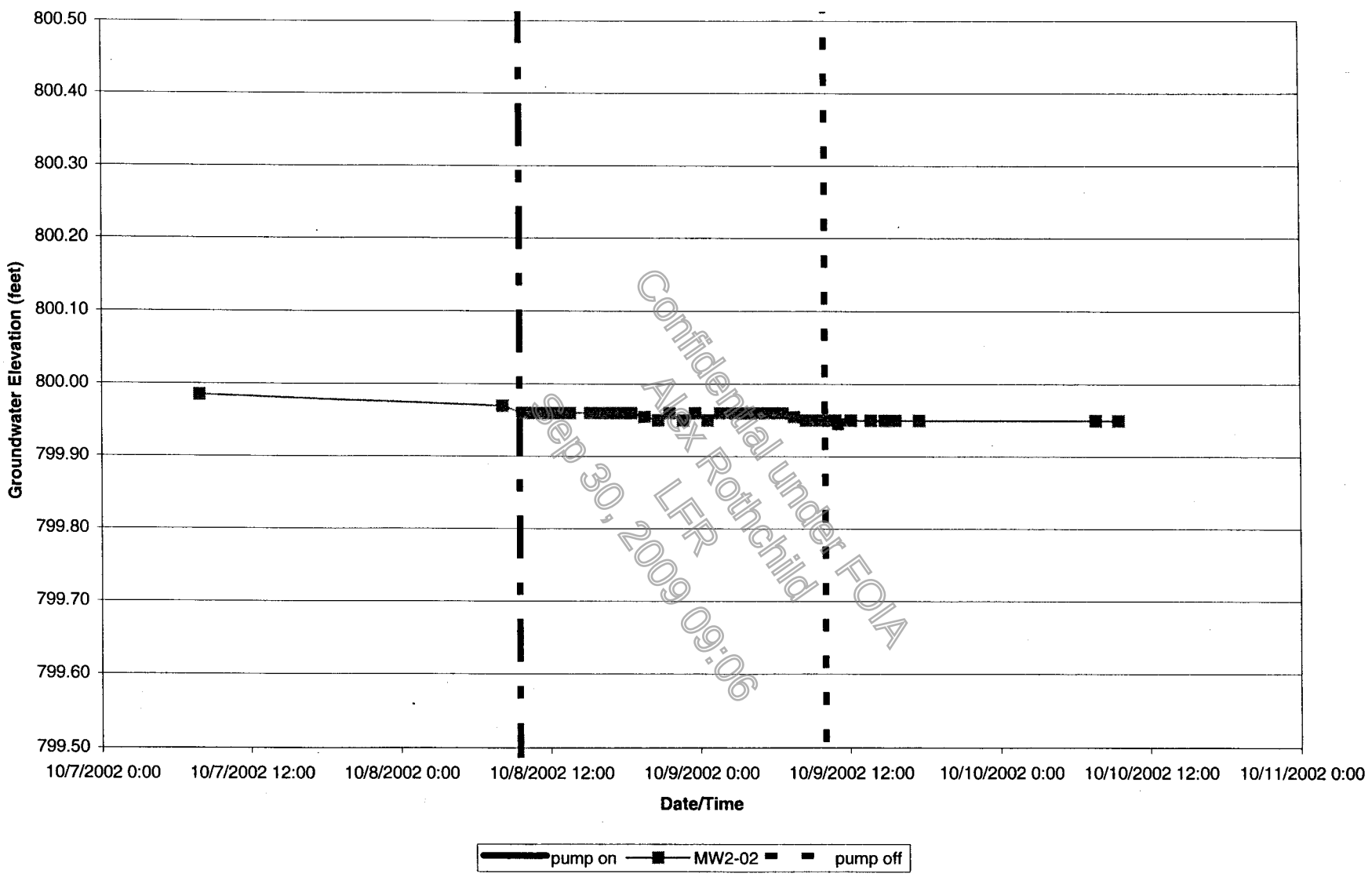
Alex Rothchild
LFR
Sep 30, 2009 09:06



WATER LEVEL HYDROGRAPH FOR MW2-02
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

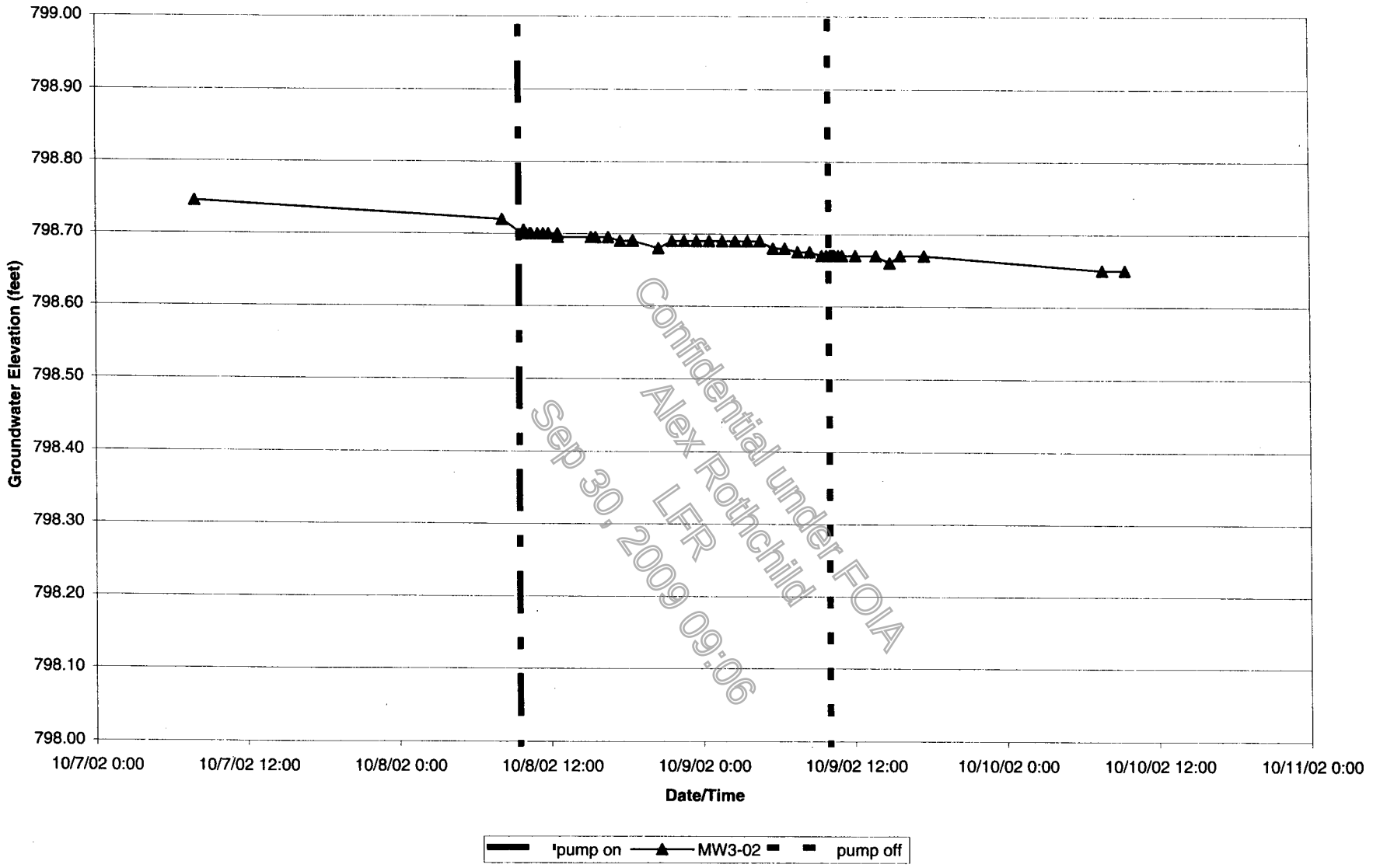
Constant Rate Pumping Test @ PFW-1
Monitor: MW2-02

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 7:53:00	-1537.0	11.005	799.985	-0.015	
10/8/02 8:08:00	-82.0	11.020	799.970	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 9:43:30	13.5	11.030	799.960	0.010	
10/8/02 9:55:00	25.0	11.030	799.960	0.010	
10/8/02 10:13:00	43.0	11.030	799.960	0.010	
10/8/02 10:21:00	51.0	11.030	799.960	0.010	
10/8/02 10:27:30	57.5	11.030	799.960	0.010	
10/8/02 10:58:00	88.0	11.030	799.960	0.010	
10/8/02 11:25:00	115.0	11.030	799.960	0.010	
10/8/02 11:52:00	142.0	11.030	799.960	0.010	
10/8/02 12:33:00	183.0	11.030	799.960	0.010	
10/8/02 13:34:00	244.0	11.030	799.960	0.010	
10/8/02 15:12:00	342.0	11.030	799.960	0.010	
10/8/02 15:34:00	364.0	11.030	799.960	0.010	
10/8/02 16:33:00	423.0	11.030	799.960	0.010	
10/8/02 17:31:00	481.0	11.030	799.960	0.010	
10/8/02 11:50:00	140.0	11.030	799.960	0.010	
10/8/02 18:27:30	537.5	11.030	799.960	0.010	
10/8/02 19:32:00	602.0	11.035	799.955	0.015	
10/8/02 20:38:00	668.0	11.040	799.950	0.020	
10/8/02 21:33:00	723.0	11.030	799.960	0.010	
10/8/02 22:36:00	786.0	11.040	799.950	0.020	
10/8/02 23:35:00	845.0	11.030	799.960	0.010	
10/9/02 0:35:00	905.0	11.040	799.950	0.020	
10/9/02 1:37:00	967.0	11.030	799.960	0.010	
10/9/02 2:34:00	1024.0	11.030	799.960	0.010	
10/9/02 3:36:00	1086.0	11.030	799.960	0.010	
10/9/02 4:35:00	1145.0	11.030	799.960	0.010	
10/9/02 5:37:00	1207.0	11.030	799.960	0.010	
10/9/02 6:35:00	1265.0	11.030	799.960	0.010	
10/9/02 7:32:00	1322.0	11.035	799.955	0.015	
10/9/02 8:29:00	1379.0	11.040	799.950	0.020	
10/9/02 9:28:00	1438.0	11.040	799.950	0.020	
10/9/02 9:51:00	1461	11.040	799.950	0.020	
10/9/02 10:00:00	1470.0	nm	--	0.000	Pump off - Recovery
10/9/02 10:07:00	1477.0	11.040	799.950	0.020	
10/9/02 10:09:40	1479.7	11.040	799.950	0.020	
10/9/02 10:12:25	1482.4	11.040	799.950	0.020	
10/9/02 10:15:15	1485.2	11.040	799.950	0.020	
10/9/02 10:18:30	1488.5	11.040	799.950	0.020	
10/9/02 10:21:10	1491.2	11.040	799.950	0.020	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW2-02

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/9/02 10:23:50	1493.8	11.040	799.950	0.020	
10/9/02 10:26:20	1496.3	11.040	799.950	0.020	
10/9/02 10:28:45	1498.7	11.040	799.950	0.020	
10/9/02 10:50:00	1520.0	11.040	799.950	0.020	
10/9/02 11:03:00	1533.0	11.045	799.945	0.025	
10/9/02 12:05:00	1595.0	11.040	799.950	0.020	
10/9/02 13:40:00	1690.0	11.040	799.950	0.020	
10/9/02 14:47:00	1757.0	11.040	799.950	0.020	
10/9/02 15:38:00	1808.0	11.040	799.950	0.020	
10/9/02 17:31:00	1921.0	11.040	799.950	0.020	
10/10/02 7:41:00	2771.0	11.040	799.950	0.020	
10/10/02 9:30:00	2880.0	11.040	799.950	0.020	



WATER LEVEL HYDROGRAPH FOR MW3-02
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test MW3-02 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

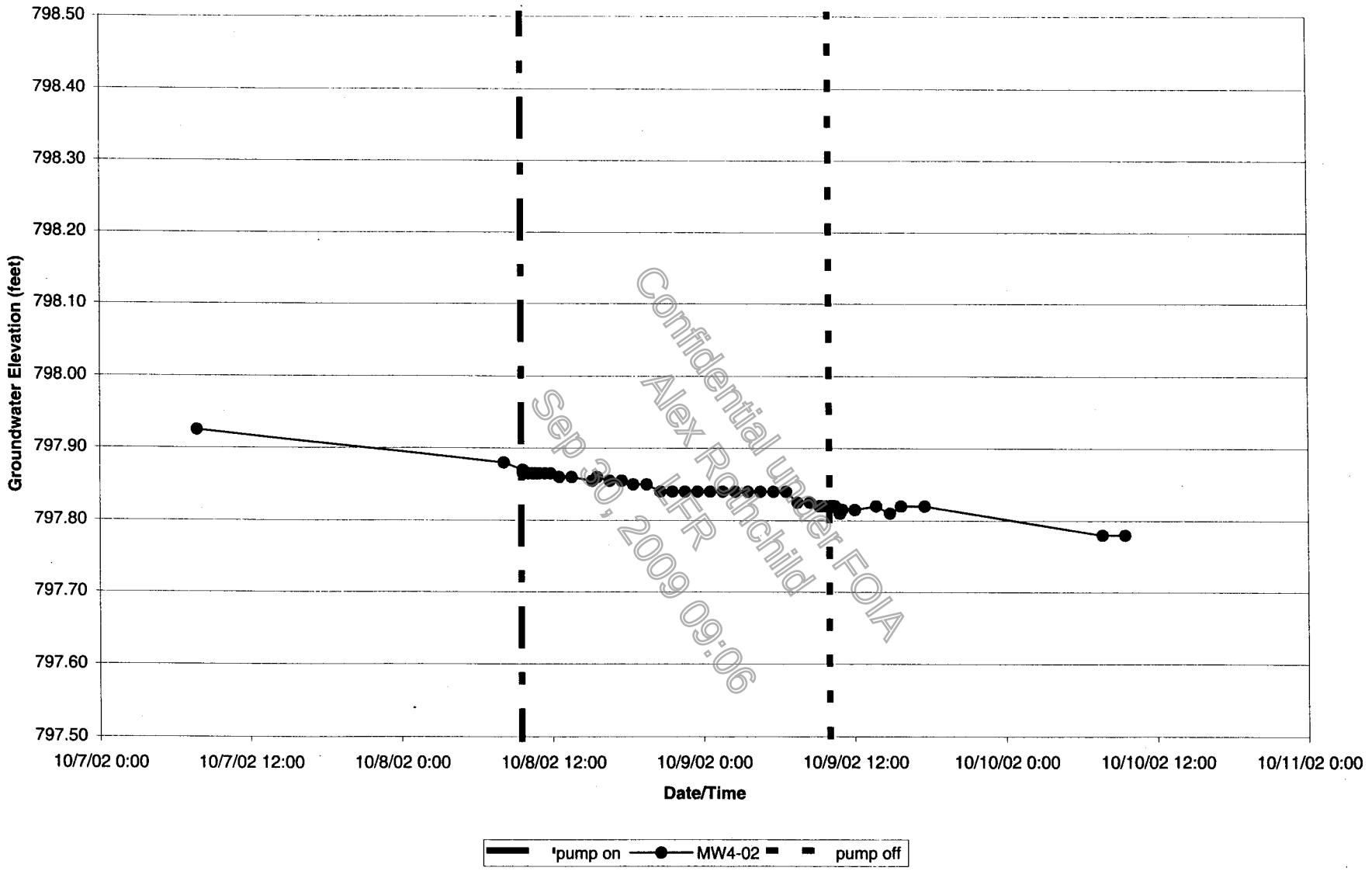
Constant Rate Pumping Test @ PFW-1
Monitor: MW3-02

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 7:50:00	-1540.0	12.095	798.745	-0.025	
10/8/02 8:10:00	-80.0	12.120	798.720	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 9:44:30	14.5	12.140	798.700	0.020	
10/8/02 9:53:00	23.0	12.135	798.705	0.015	
10/8/02 10:05:00	35.0	12.140	798.700	0.020	
10/8/02 10:22:00	52.0	12.140	798.700	0.020	
10/8/02 10:28:00	58.0	12.140	798.700	0.020	
10/8/02 10:59:00	89.0	12.140	798.700	0.020	
10/8/02 11:26:00	116.0	12.140	798.700	0.020	
10/8/02 11:51:00	141.0	12.140	798.700	0.020	
10/8/02 12:34:00	184.0	12.140	798.700	0.020	
10/8/02 12:35:00	185.0	12.145	798.695	0.025	
10/8/02 15:13:00	343.0	12.145	798.695	0.025	
10/8/02 15:35:00	365.0	12.145	798.695	0.025	
10/8/02 16:35:00	425.0	12.145	798.695	0.025	
10/8/02 17:32:00	482.0	12.150	798.690	0.030	
10/8/02 18:29:00	539.0	12.150	798.690	0.030	
10/8/02 18:33:30	543.5	12.150	798.690	0.030	
10/8/02 20:33:00	663.0	12.160	798.680	0.040	
10/8/02 21:37:00	727.0	12.150	798.690	0.030	
10/8/02 22:34:00	784.0	12.150	798.690	0.030	
10/8/02 23:33:00	843.0	12.150	798.690	0.030	
10/9/02 0:33:00	903.0	12.150	798.690	0.030	
10/9/02 1:35:00	965.0	12.150	798.690	0.030	
10/9/02 2:36:00	1026.0	12.150	798.690	0.030	
10/9/02 3:34:00	1084.0	12.150	798.690	0.030	
10/9/02 4:33:00	1143.0	12.150	798.690	0.030	
10/9/02 5:35:00	1205.0	12.160	798.680	0.040	
10/9/02 6:32:00	1262.0	12.160	798.680	0.040	
10/9/02 7:33:00	1323.0	12.165	798.675	0.045	
10/9/02 8:31:00	1381.0	12.165	798.675	0.045	
10/9/02 9:27:00	1437.0	12.170	798.670	0.050	
10/9/02 9:49:00	1459.0	12.170	798.670	0.050	
10/9/02 10:00:00	1470.0	nm	--	0.000	Pump off - Recovery
10/9/02 10:06:13	1476.2	12.170	798.670	0.050	
10/9/02 10:09:00	1479.0	12.170	798.670	0.050	
10/9/02 10:11:45	1481.7	12.170	798.670	0.050	
10/9/02 10:14:38	1484.6	12.170	798.670	0.050	
10/9/02 10:17:55	1487.9	12.170	798.670	0.050	
10/9/02 10:20:25	1490.4	12.170	798.670	0.050	
10/9/02 10:23:10	1493.2	12.170	798.670	0.050	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW3-02

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/9/02 10:25:40	1495.7	12.170	798.670	0.050	
10/9/02 10:28:10	1498.2	12.170	798.670	0.050	
10/9/02 10:45:15	1515.2	12.170	798.670	0.050	
10/9/02 11:04:30	1534.5	12.170	798.670	0.050	
10/9/02 12:07:00	1597.0	12.170	798.670	0.050	
10/9/02 13:44:00	1694.0	12.170	798.670	0.050	
10/9/02 14:49:00	1759.0	12.180	798.660	0.060	
10/9/02 15:40:00	1810.0	12.170	798.670	0.050	
10/9/02 17:32:00	1922.0	12.170	798.670	0.050	
10/10/02 7:40:00	2770.0	12.190	798.650	0.070	
10/10/02 9:28:00	2878.0	12.190	798.650	0.070	



WATER LEVEL HYDROGRAPH FOR MW4-02
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test MW4-02 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

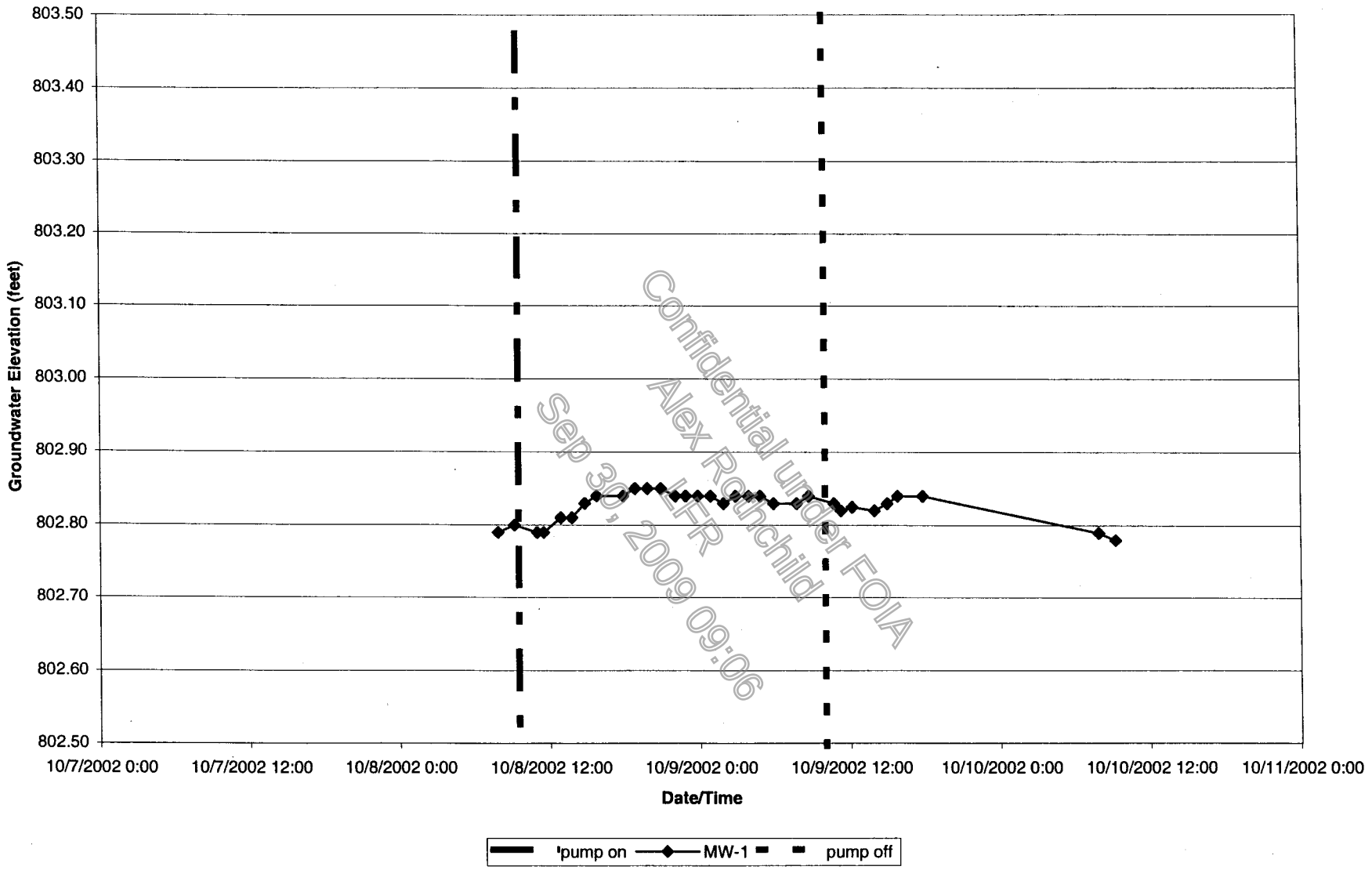
Constant Rate Pumping Test @ PFW-1
Monitor: MW4-02

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 7:45:00	-1545.0	12.705	797.925	-0.045	
10/8/02 8:07:00	-83.0	12.750	797.880	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 9:37:00	7.0	12.760	797.870	0.010	
10/8/02 9:39:00	9.0	12.765	797.865	0.015	
10/8/02 9:40:00	10.0	12.765	797.865	0.015	
10/8/02 9:46:30	16.5	12.765	797.865	0.015	
10/8/02 9:48:00	18.0	12.765	797.865	0.015	
10/8/02 9:50:00	20.0	12.765	797.865	0.015	
10/8/02 9:58:00	28.0	12.765	797.865	0.015	
10/8/02 10:00:00	30.0	12.765	797.865	0.015	
10/8/02 10:16:00	46.0	12.765	797.865	0.015	
10/8/02 10:26:00	56.0	12.765	797.865	0.015	
10/8/02 10:30:00	60.0	12.765	797.865	0.015	
10/8/02 10:46:00	76.0	12.765	797.865	0.015	
10/8/02 10:56:00	86.0	12.765	797.865	0.015	
10/8/02 11:22:30	112.5	12.765	797.865	0.015	
10/8/02 11:50:00	140.0	12.765	797.865	0.015	
10/8/02 12:31:00	181.0	12.770	797.860	0.020	
10/8/02 13:31:00	241.0	12.770	797.860	0.020	
10/8/02 15:09:00	339.0	12.775	797.855	0.025	
10/8/02 15:32:00	362.0	12.770	797.860	0.020	
10/8/02 16:33:00	423.0	12.775	797.855	0.025	
10/8/02 17:30:00	480.0	12.775	797.855	0.025	
10/8/02 18:25:00	535.0	12.780	797.850	0.030	
10/8/02 19:29:00	599.0	12.780	797.850	0.030	
10/8/02 20:35:00	665.0	12.790	797.840	0.040	
10/8/02 21:32:00	722.0	12.790	797.840	0.040	
10/8/02 22:32:00	782.0	12.790	797.840	0.040	
10/8/02 23:32:00	842.0	12.790	797.840	0.040	
10/9/02 0:32:00	902.0	12.790	797.840	0.040	
10/9/02 1:33:00	963.0	12.790	797.840	0.040	
10/9/02 2:32:00	1022.0	12.790	797.840	0.040	
10/9/02 3:32:00	1082.0	12.790	797.840	0.040	
10/9/02 4:32:00	1142.0	12.790	797.840	0.040	
10/9/02 5:34:00	1204.0	12.790	797.840	0.040	
10/9/02 6:34:00	1264.0	12.790	797.840	0.040	
10/9/02 7:29:00	1319.0	12.805	797.825	0.055	
10/9/02 8:28:00	1378.0	12.805	797.825	0.055	
10/9/02 9:13:00	1423.0	12.810	797.820	0.060	
10/9/02 9:26:00	1436.0	12.810	797.820	0.060	
10/9/02 9:48:00	1458.0	12.810	797.820	0.060	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW4-02

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/9/02 10:00:00	1470.0	nm	--	0.000	Pump off - Recovery
10/9/02 10:00:30	1470.5	12.810	797.820	0.060	
10/9/02 10:01:00	1471.0	12.810	797.820	0.060	
10/9/02 10:01:00	1471.0	12.810	797.820	0.060	
10/9/02 10:01:30	1471.5	12.810	797.820	0.060	
10/9/02 10:02:00	1472.0	12.810	797.820	0.060	
10/9/02 10:02:30	1472.5	12.810	797.820	0.060	
10/9/02 10:03:00	1473.0	12.810	797.820	0.060	
10/9/02 10:03:30	1473.5	12.810	797.820	0.060	
10/9/02 10:04:00	1474.0	12.810	797.820	0.060	
10/9/02 10:04:30	1474.5	12.810	797.820	0.060	
10/9/02 10:05:00	1475.0	12.810	797.820	0.060	
10/9/02 10:08:30	1478.5	12.810	797.820	0.060	
10/9/02 10:11:15	1481.2	12.810	797.820	0.060	
10/9/02 10:14:00	1484.0	12.810	797.820	0.060	
10/9/02 10:17:20	1487.3	12.810	797.820	0.060	
10/9/02 10:19:50	1489.8	12.810	797.820	0.060	
10/9/02 10:22:35	1492.6	12.810	797.820	0.060	
10/9/02 10:25:16	1495.3	12.810	797.820	0.060	
10/9/02 10:27:30	1497.5	12.810	797.820	0.060	
10/9/02 10:48:30	1518.5	12.820	797.810	0.070	
10/9/02 10:51:30	1521.5	12.820	797.810	0.070	
10/9/02 11:01:30	1531.5	12.815	797.815	0.065	
10/9/02 12:01:00	1591.0	12.815	797.815	0.065	
10/9/02 13:42:00	1692.0	12.810	797.820	0.060	
10/9/02 14:48:00	1758.0	12.820	797.810	0.070	
10/9/02 15:41:00	1811.0	12.810	797.820	0.060	
10/9/02 17:33:00	1923.0	12.810	797.820	0.060	
10/10/02 7:39:00	2769.0	12.850	797.780	0.100	
10/10/02 9:26:00	2876.0	12.850	797.780	0.100	



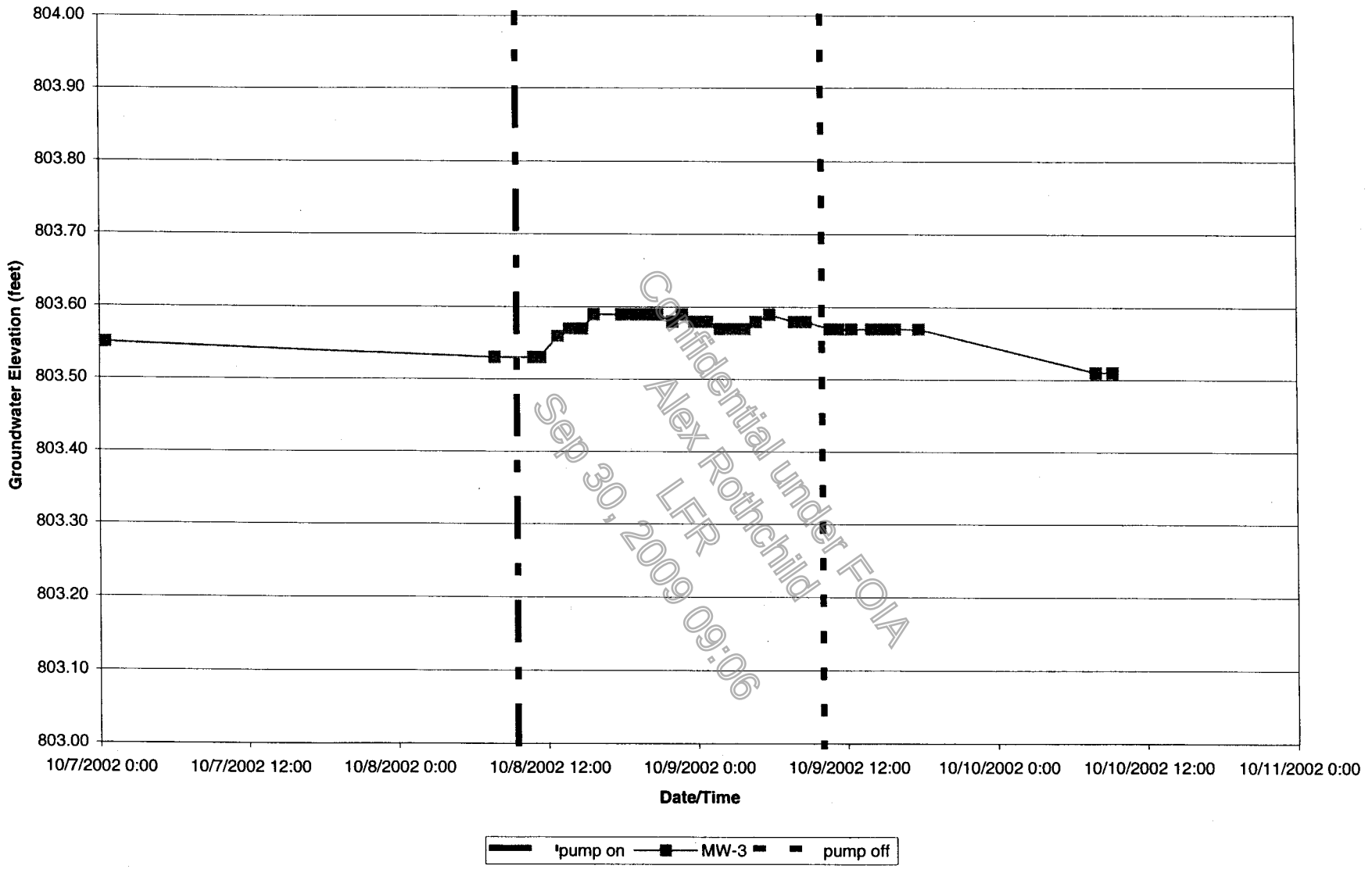
WATER LEVEL HYDROGRAPH FOR MW-1
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [12636-25-AppF (Constant Rate Pumping Test) MW-1 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW-1

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 15:07:00	-1004.0	2.630	806.570	-3.780	
10/8/02 7:51:00	0.0	6.410	802.790	0.000	Pre-Test Static
10/8/02 7:51:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 9:10:00	79.0	6.400	802.800	-0.010	
10/8/02 10:58:00	187.0	6.410	802.790	0.000	
10/8/02 11:30:00	219.0	6.410	802.790	0.000	
10/8/02 12:53:00	302.0	6.390	802.810	-0.020	
10/8/02 13:46:00	355.0	6.390	802.810	-0.020	
10/8/02 14:48:00	417.0	6.370	802.830	-0.040	
10/8/02 15:45:00	474.0	6.360	802.840	-0.050	
10/8/02 17:52:00	601.0	6.360	802.840	-0.050	
10/8/02 18:50:00	659.0	6.350	802.850	-0.060	
10/8/02 19:49:00	718.0	6.350	802.850	-0.060	
10/8/02 20:53:00	782.0	6.350	802.850	-0.060	
10/8/02 22:03:00	852.0	6.360	802.840	-0.050	
10/8/02 22:53:00	902.0	6.360	802.840	-0.050	
10/8/02 23:51:00	960.0	6.360	802.840	-0.050	
10/9/02 0:52:00	1021.0	6.360	802.840	-0.050	
10/9/02 1:54:00	1083.0	6.370	802.830	-0.040	
10/9/02 2:52:00	1141.0	6.360	802.840	-0.050	
10/9/02 3:54:00	1203.0	6.360	802.840	-0.050	
10/9/02 4:49:00	1258.0	6.360	802.840	-0.050	
10/9/02 5:53:00	1322.0	6.370	802.830	-0.040	
10/9/02 7:43:00	1432.0	6.370	802.830	-0.040	
10/9/02 8:40:00	1489.0	6.360	802.840	-0.050	
10/9/02 10:00:00	1569.0	nm	--	--	Pump off - Recovery
10/9/02 10:42:00	1611.0	6.370	802.830	-0.040	
10/9/02 11:16:00	1645.0	6.380	802.820	-0.030	
10/9/02 12:09:00	1698.0	6.375	802.825	-0.035	
10/9/02 13:56:00	1805.0	6.380	802.820	-0.030	
10/9/02 14:58:00	1867.0	6.370	802.830	-0.040	
10/9/02 15:48:00	1917.0	6.360	802.840	-0.050	
10/9/02 17:48:00	2037.0	6.360	802.840	-0.050	
10/10/02 7:53:00	2882.0	6.410	802.790	0.000	
10/10/02 9:13:00	2962.0	6.420	802.780	0.010	



WATER LEVEL HYDROGRAPH FOR MW-3
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

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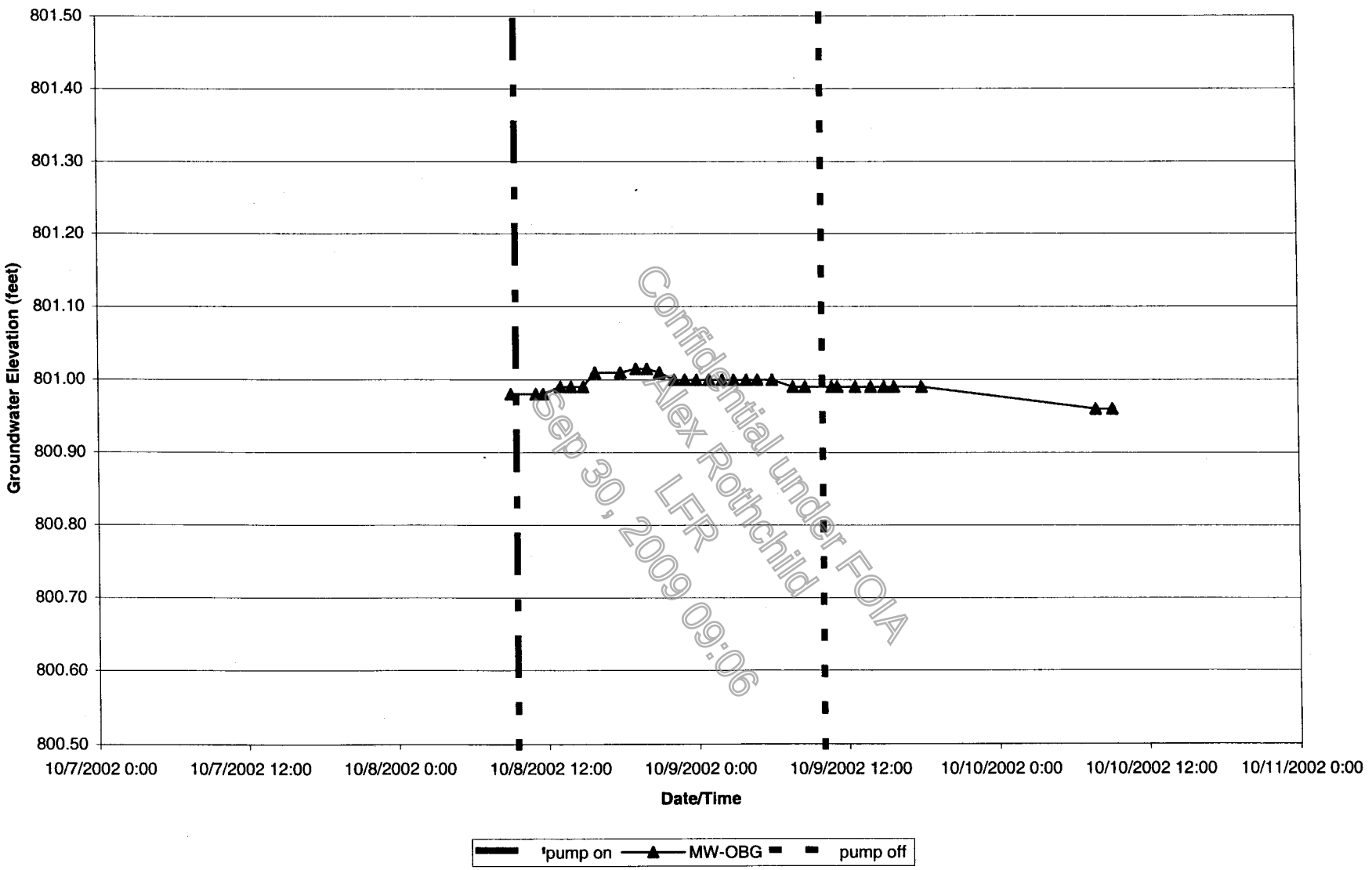
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW-3

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 0:27:00	-1875.0	6.950	803.550	-0.020	
10/8/02 7:42:00	0.0	6.970	803.530	0.000	Pre-Test Static
10/8/02 7:42:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 10:51:00	189.0	6.970	803.530	0.000	
10/8/02 11:24:00	222.0	6.970	803.530	0.000	
10/8/02 12:48:00	306.0	6.940	803.560	-0.030	
10/8/02 13:43:00	361.0	6.930	803.570	-0.040	
10/8/02 14:45:00	423.0	6.930	803.570	-0.040	
10/8/02 15:42:00	480.0	6.910	803.590	-0.060	
10/8/02 17:55:00	613.0	6.910	803.590	-0.060	
10/8/02 18:48:00	666.0	6.910	803.590	-0.060	
10/8/02 19:46:00	724.0	6.910	803.590	-0.060	
10/8/02 20:48:00	786.0	6.910	803.590	-0.060	
10/8/02 21:59:00	857.0	6.920	803.580	-0.050	
10/8/02 22:47:00	905.0	6.910	803.590	-0.060	
10/8/02 23:46:00	964.0	6.920	803.580	-0.050	
10/9/02 0:47:00	1025.0	6.920	803.580	-0.050	
10/9/02 1:49:00	1087.0	6.930	803.570	-0.040	
10/9/02 2:46:00	1144.0	6.930	803.570	-0.040	
10/9/02 3:47:00	1205.0	6.930	803.570	-0.040	
10/9/02 4:42:00	1260.0	6.920	803.580	-0.050	
10/9/02 5:48:00	1326.0	6.910	803.590	-0.060	
10/9/02 7:47:00	1445.0	6.920	803.580	-0.050	
10/9/02 8:43:00	1501.0	6.920	803.580	-0.050	
10/9/02 10:00:00	1578.0	nm	--	--	Pump off - Recovery
10/9/02 10:38:00	1616.0	6.930	803.570	-0.040	
10/9/02 11:20:00	1658.0	6.930	803.570	-0.040	
10/9/02 12:23:00	1721.0	6.930	803.570	-0.040	
10/9/02 14:00:00	1818.0	6.930	803.570	-0.040	
10/9/02 15:02:00	1880.0	6.930	803.570	-0.040	
10/9/02 15:52:00	1930.0	6.930	803.570	-0.040	
10/9/02 17:45:00	2043.0	6.930	803.570	-0.040	
10/10/02 7:57:00	2895.0	6.990	803.510	0.020	
10/10/02 9:18:00	2976.0	6.990	803.510	0.020	

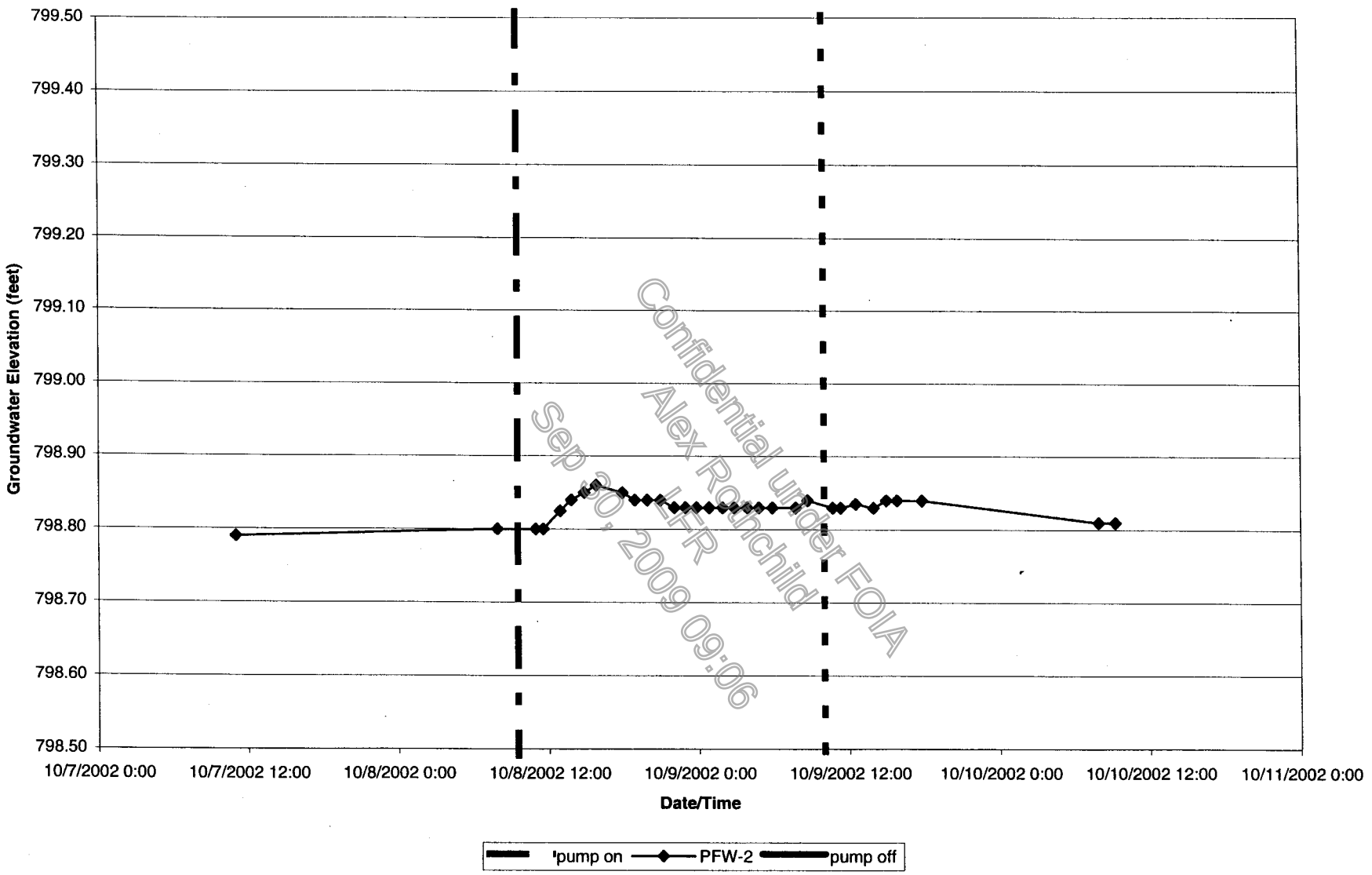


WATER LEVEL HYDROGRAPH FOR MW-OBG
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: MW-OBG

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/8/02 9:04:00	-120.0	8.520	800.980	0.000	
10/8/02 11:04:00	0.0	8.520	800.980	0.000	Pre-Test Static
10/8/02 11:04:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 11:39:00	35.0	8.520	800.980	0.000	
10/8/02 13:02:00	118.0	8.510	800.990	-0.010	
10/8/02 13:53:00	169.0	8.510	800.990	-0.010	
10/8/02 14:52:00	228.0	8.510	800.990	-0.010	
10/8/02 15:48:00	284.0	8.490	801.010	-0.030	
10/8/02 17:50:00	406.0	8.490	801.010	-0.030	
10/8/02 19:04:00	480.0	8.485	801.015	-0.035	
10/8/02 19:56:00	532.0	8.485	801.015	-0.035	
10/8/02 20:57:00	593.0	8.490	801.010	-0.030	
10/8/02 22:08:00	664.0	8.500	801.000	-0.020	
10/8/02 22:59:00	715.0	8.500	801.000	-0.020	
10/8/02 23:54:00	770.0	8.500	801.000	-0.020	
10/9/02 0:55:00	831.0	8.500	801.000	-0.020	
10/9/02 1:58:00	894.0	8.500	801.000	-0.020	
10/9/02 2:54:00	950.0	8.500	801.000	-0.020	
10/9/02 3:55:00	1011.0	8.500	801.000	-0.020	
10/9/02 4:49:00	1065.0	8.500	801.000	-0.020	
10/9/02 5:59:00	1135.0	8.500	801.000	-0.020	
10/9/02 7:39:00	1235.0	8.510	800.990	-0.010	
10/9/02 8:37:00	1293.0	8.510	800.990	-0.010	
10/9/02 10:00:00	1376.0	nm	--	--	Pump off - Recovery
10/9/02 10:45:00	1421.0	8.510	800.990	-0.010	
10/9/02 11:13:00	1449.0	8.510	800.990	-0.010	
10/9/02 12:38:00	1534.0	8.510	800.990	-0.010	
10/9/02 13:52:00	1608.0	8.510	800.990	-0.010	
10/9/02 14:55:00	1671.0	8.510	800.990	-0.010	
10/9/02 15:44:00	1720.0	8.510	800.990	-0.010	
10/9/02 17:55:00	1851.0	8.510	800.990	-0.010	
10/10/02 7:50:00	2686.0	8.540	800.960	0.020	
10/10/02 9:11:00	2767.0	8.540	800.960	0.020	



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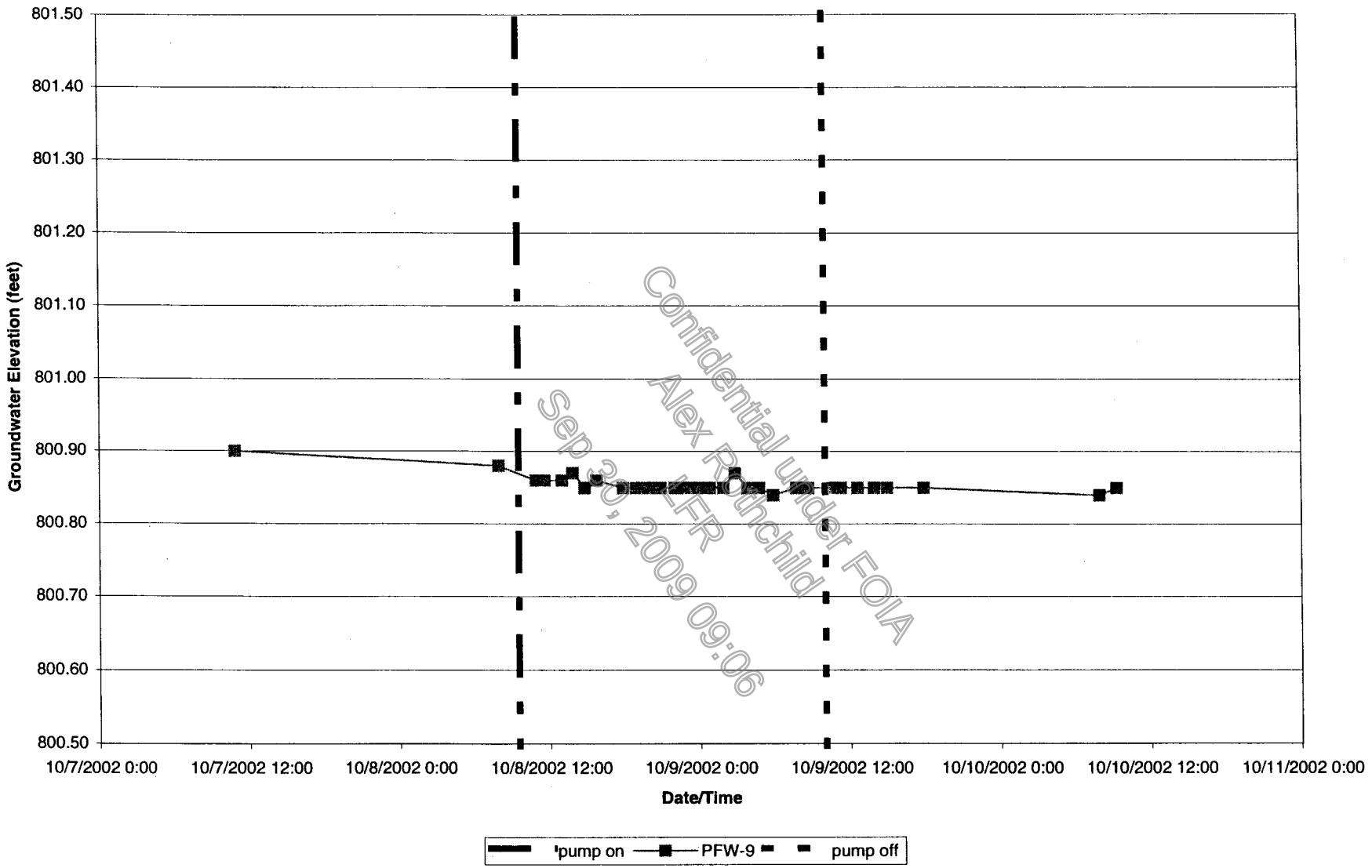
WATER LEVEL HYDROGRAPH FOR PFW-2
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [12636-25-AppF (Constant Rate Pumping Test) PFW-2 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: PFW-2

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/7/02 11:00:00	-1252.0	10.210	798.790	0.010	
10/8/02 7:52:00	0.0	10.200	798.800	0.000	Pre-Test Static
10/8/02 7:52:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 10:56:00	184.0	10.200	798.800	0.000	
10/8/02 11:32:00	220.0	10.200	798.800	0.000	
10/8/02 12:54:00	302.0	10.175	798.825	-0.025	
10/8/02 13:47:00	355.0	10.160	798.840	-0.040	
10/8/02 14:49:00	417.0	10.150	798.850	-0.050	
10/8/02 15:46:00	474.0	10.140	798.860	-0.060	
10/8/02 17:53:00	601.0	10.150	798.850	-0.050	
10/8/02 18:52:00	660.0	10.160	798.840	-0.040	
10/8/02 19:51:00	719.0	10.160	798.840	-0.040	
10/8/02 20:55:00	783.0	10.160	798.840	-0.040	
10/8/02 22:02:00	850.0	10.170	798.830	-0.030	
10/8/02 22:55:00	903.0	10.170	798.830	-0.030	
10/8/02 23:49:00	957.0	10.170	798.830	-0.030	
10/9/02 0:49:00	1017.0	10.170	798.830	-0.030	
10/9/02 1:53:00	1081.0	10.170	798.830	-0.030	
10/9/02 2:50:00	1138.0	10.170	798.830	-0.030	
10/9/02 3:52:00	1200.0	10.170	798.830	-0.030	
10/9/02 4:47:00	1255.0	10.170	798.830	-0.030	
10/9/02 5:52:00	1320.0	10.170	798.830	-0.030	
10/9/02 7:44:00	1432.0	10.170	798.830	-0.030	
10/9/02 8:41:00	1489.0	10.160	798.840	-0.040	
10/9/02 10:00:00	1568.0	nm	--	--	Pump off - Recovery
10/9/02 10:41:00	1609.0	10.170	798.830	-0.030	
10/9/02 11:18:00	1646.0	10.170	798.830	-0.030	
10/9/02 12:31:00	1719.0	10.165	798.835	-0.035	
10/9/02 13:57:00	1805.0	10.170	798.830	-0.030	
10/9/02 14:59:00	1867.0	10.160	798.840	-0.040	
10/9/02 15:49:00	1917.0	10.160	798.840	-0.040	
10/9/02 17:49:00	2037.0	10.160	798.840	-0.040	
10/10/02 7:54:00	2882.0	10.190	798.810	-0.010	
10/10/02 9:14:00	2962.0	10.190	798.810	-0.010	



WATER LEVEL HYDROGRAPH FOR PFW-9
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [12636-25-AppF (Constant Rate Pumping Test) PFW-9 graph]

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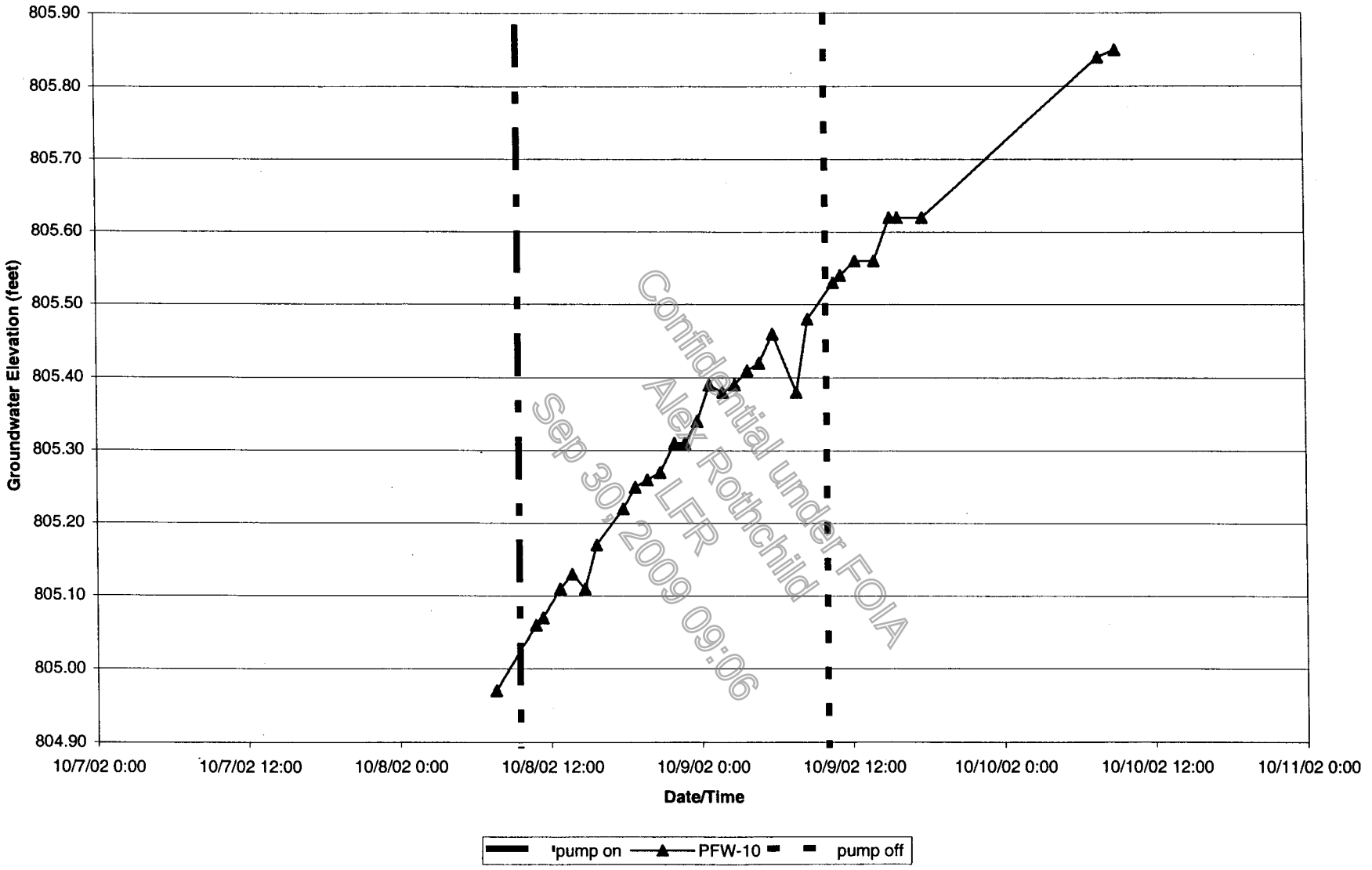
Sep 30, 2009 09:06

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: PFW-9

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 10:50:00	-1264.0	10.100	800.900	-0.020	
10/8/02 7:54:00	0.0	10.120	800.880	0.000	Pre-Test Static
10/8/02 7:54:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 10:53:00	179.0	10.140	800.860	0.020	
10/8/02 11:35:00	221.0	10.140	800.860	0.020	
10/8/02 12:58:00	304.0	10.140	800.860	0.020	
10/8/02 13:49:00	355.0	10.130	800.870	0.010	
10/8/02 14:47:00	413.0	10.150	800.850	0.030	
10/8/02 15:44:00	470.0	10.140	800.860	0.020	
10/8/02 17:51:00	597.0	10.150	800.850	0.030	
10/8/02 18:56:00	662.0	10.150	800.850	0.030	
10/8/02 19:52:00	718.0	10.150	800.850	0.030	
10/8/02 20:51:00	777.0	10.150	800.850	0.030	
10/8/02 22:00:00	846.0	10.150	800.850	0.030	
10/8/02 22:50:00	896.0	10.150	800.850	0.030	
10/8/02 23:47:00	953.0	10.150	800.850	0.030	
10/9/02 0:48:00	1014.0	10.150	800.850	0.030	
10/9/02 1:52:00	1078.0	10.150	800.850	0.030	
10/9/02 2:48:00	1134.0	10.130	800.870	0.010	
10/9/02 3:49:00	1195.0	10.150	800.850	0.030	
10/9/02 4:44:00	1250.0	10.150	800.850	0.030	
10/9/02 5:50:00	1316.0	10.160	800.840	0.040	
10/9/02 7:42:00	1428.0	10.150	800.850	0.030	
10/9/02 8:39:00	1485.0	10.150	800.850	0.030	
10/9/02 10:00:00	1566.0	nm	--	--	Pump off - Recovery
10/9/02 10:40:00	1606.0	10.150	800.850	0.030	
10/9/02 11:15:00	1641.0	10.150	800.850	0.030	
10/9/02 12:35:00	1721.0	10.150	800.850	0.030	
10/9/02 13:54:00	1800.0	10.150	800.850	0.030	
10/9/02 14:57:00	1863.0	10.150	800.850	0.030	
10/9/02 17:51:00	2037.0	10.150	800.850	0.030	
10/10/02 7:55:00	2881.0	10.160	800.840	0.040	
10/10/02 9:17:00	2963.0	10.150	800.850	0.030	



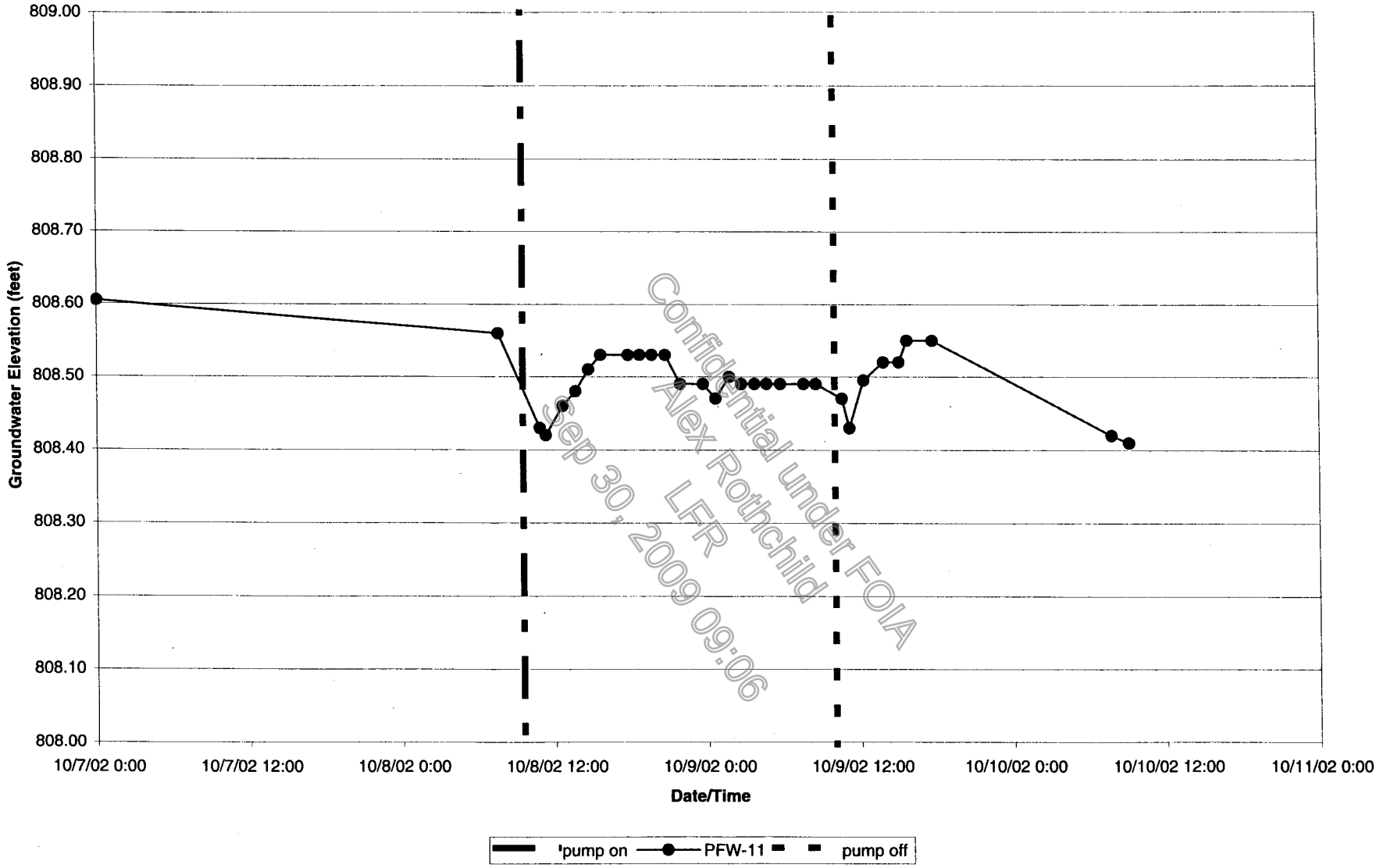
WATER LEVEL HYDROGRAPH FOR PFW-10
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test PFW-10 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: PFW-10

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/7/02 12:06:00	-1270.0	7.715	804.285	0.685	
10/8/02 7:35:00	-101.0	7.030	804.970	0.000	Pre-Test Static
10/8/02 9:16:00	0.0	6.970	805.030	-0.060	Pump on - Drawdown
10/8/02 10:47:00	91.0	6.940	805.060	-0.090	
10/8/02 11:20:00	124.0	6.930	805.070	-0.100	
10/8/02 12:43:00	207.0	6.890	805.110	-0.140	
10/8/02 13:41:00	265.0	6.870	805.130	-0.160	
10/8/02 14:42:00	326.0	6.890	805.110	-0.140	
10/8/02 15:39:00	383.0	6.830	805.170	-0.200	
10/8/02 17:47:00	511.0	6.780	805.220	-0.250	
10/8/02 18:45:00	569.0	6.750	805.250	-0.280	
10/8/02 19:42:00	626.0	6.740	805.260	-0.290	
10/8/02 20:44:00	688.0	6.730	805.270	-0.300	
10/8/02 21:54:00	758.0	6.690	805.310	-0.340	
10/8/02 22:44:00	808.0	6.690	805.310	-0.340	
10/8/02 23:43:00	867.0	6.660	805.340	-0.370	
10/9/02 0:42:00	926.0	6.610	805.390	-0.420	
10/9/02 1:46:00	990.0	6.620	805.380	-0.410	
10/9/02 2:44:00	1048.0	6.610	805.390	-0.420	
10/9/02 3:44:00	1108.0	6.590	805.410	-0.440	
10/9/02 4:41:00	1165.0	6.580	805.420	-0.450	
10/9/02 5:45:00	1229.0	6.540	805.460	-0.490	
10/9/02 7:37:00	1341.0	6.620	805.380	-0.410	
10/9/02 8:34:00	1398.0	6.520	805.480	-0.510	
10/9/02 10:00:00	1484.0	nm	--	--	Pump off - Recovery
10/9/02 10:36:00	1520.0	6.470	805.530	-0.560	
10/9/02 11:09:00	1553.0	6.460	805.540	-0.570	
10/9/02 12:19:00	1623.0	6.440	805.560	-0.590	
10/9/02 13:50:00	1714.0	6.440	805.560	-0.590	
10/9/02 15:05:00	1789.0	6.380	805.620	-0.650	
10/9/02 15:43:00	1827.0	6.380	805.620	-0.650	
10/9/02 17:41:00	1945.0	6.380	805.620	-0.650	
10/10/02 7:47:00	2791.0	6.160	805.840	-0.870	
10/10/02 9:09:00	2873.0	6.150	805.850	-0.880	



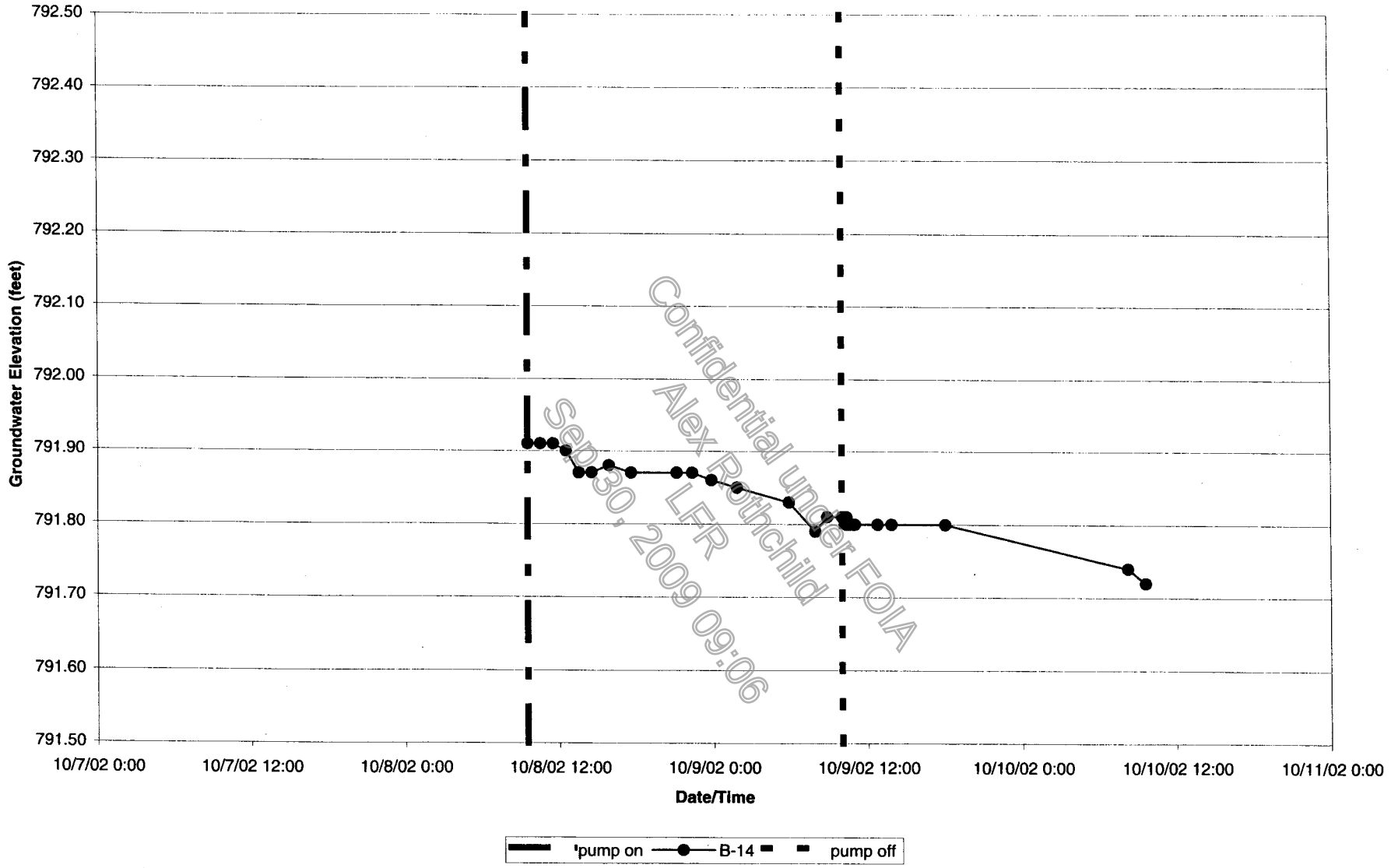
WATER LEVEL HYDROGRAPH FOR PFW-11
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test PFW-11 graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: PFW-11

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/7/02 12:01:00	-1172.0	3.395	808.605	-0.045	
10/8/02 7:33:00	0.0	3.440	808.560	0.000	Pre-Test Static
10/8/02 7:33:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 10:49:00	196.0	3.570	808.430	0.130	
10/8/02 11:17:00	224.0	3.580	808.420	0.140	
10/8/02 12:38:00	305.0	3.540	808.460	0.100	
10/8/02 13:39:00	366.0	3.520	808.480	0.080	
10/8/02 14:40:00	427.0	3.490	808.510	0.050	pump shut off at 14:00-14:20?
10/8/02 15:38:00	485.0	3.470	808.530	0.030	
10/8/02 17:48:00	615.0	3.470	808.530	0.030	
10/8/02 18:42:00	669.0	3.470	808.530	0.030	
10/8/02 19:39:00	726.0	3.470	808.530	0.030	
10/8/02 20:42:00	789.0	3.470	808.530	0.030	
10/8/02 21:52:00	859.0	3.510	808.490	0.070	
10/8/02 23:40:00	967.0	3.510	808.490	0.070	
10/9/02 0:39:00	1026.0	3.530	808.470	0.090	
10/9/02 1:43:00	1090.0	3.500	808.500	0.060	
10/9/02 2:40:00	1147.0	3.510	808.490	0.070	
10/9/02 3:42:00	1209.0	3.510	808.490	0.070	
10/9/02 4:39:00	1266.0	3.510	808.490	0.070	
10/9/02 5:43:00	1330.0	3.510	808.490	0.070	
10/9/02 7:34:00	1441.0	3.510	808.490	0.070	
10/9/02 8:31:00	1498.0	3.510	808.490	0.070	
10/9/02 10:00:00	1587.0	nm	--	--	Pump off - Recovery
10/9/02 10:34:00	1621.0	3.530	808.470	0.090	
10/9/02 11:08:00	1655.0	3.570	808.430	0.130	
10/9/02 12:16:00	1723.0	3.505	808.495	0.065	
10/9/02 13:49:00	1816.0	3.480	808.520	0.040	
10/9/02 15:03:00	1890.0	3.480	808.520	0.040	
10/9/02 15:41:00	1928.0	3.450	808.550	0.010	
10/9/02 17:40:00	2047.0	3.450	808.550	0.010	
10/10/02 7:45:00	2892.0	3.580	808.420	0.140	
10/10/02 9:07:00	2974.0	3.590	808.410	0.150	



WATER LEVEL HYDROGRAPH FOR B-14
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test B-14 graph]

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06
Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

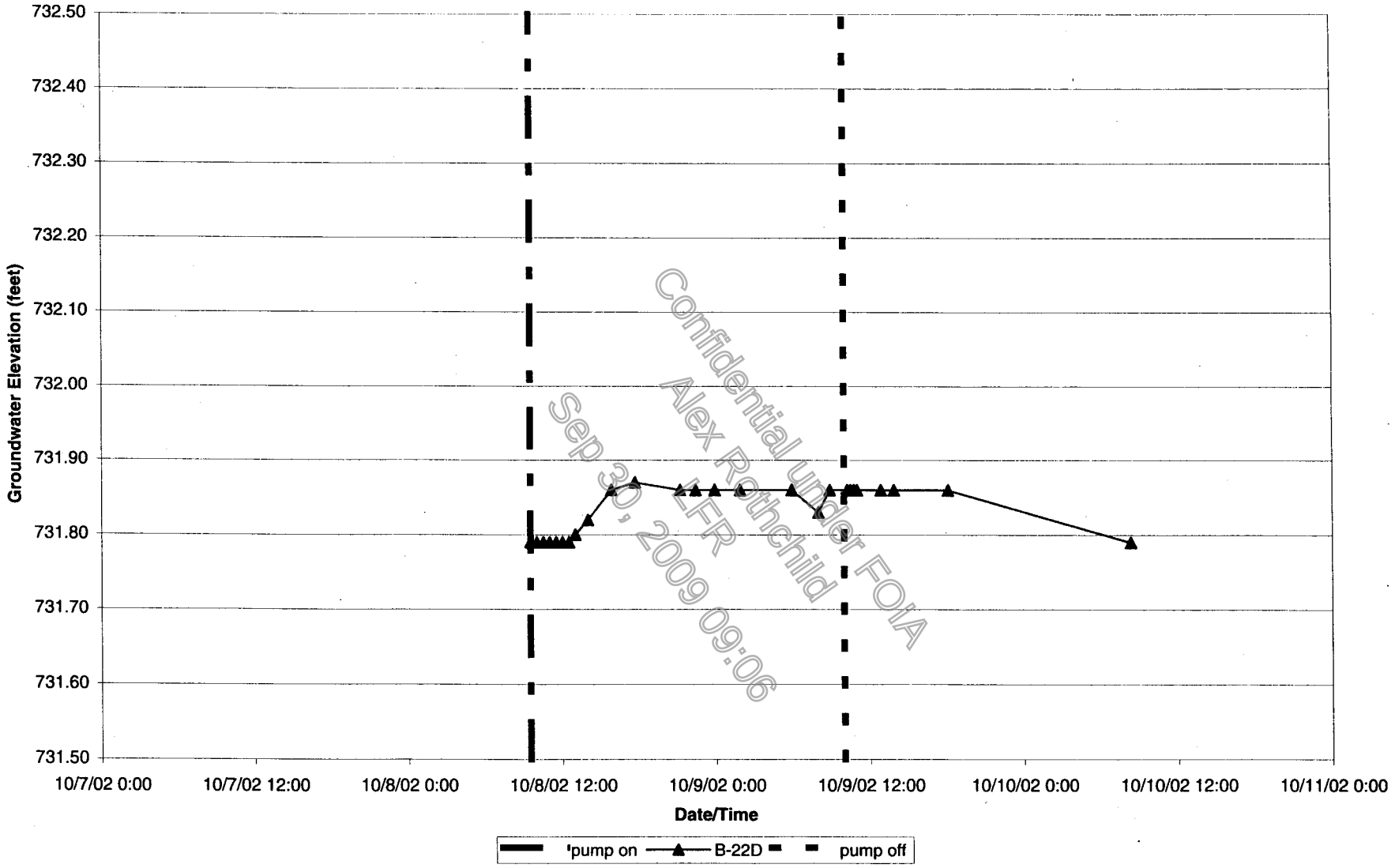
Constant Rate Pumping Test @ PFW-1
Monitor: B-14

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/8/02 10:30:00	60.0	21.590	791.910	0.000	
10/8/02 9:30:00	0.0	21.590	791.910	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 10:30:00	60.0	21.590	791.910	0.000	
10/8/02 11:30:00	120.0	21.590	791.910	0.000	
10/8/02 12:30:00	180.0	21.600	791.900	0.010	
10/8/02 13:30:00	240.0	21.630	791.870	0.040	
10/8/02 14:30:00	300.0	21.630	791.870	0.040	
10/8/02 15:51:00	381.0	21.620	791.880	0.030	
10/8/02 17:35:00	485.0	21.630	791.870	0.040	
10/8/02 21:08:00	698.0	21.630	791.870	0.040	
10/8/02 22:20:00	770.0	21.630	791.870	0.040	
10/8/02 23:50:00	860.0	21.640	791.860	0.050	
10/9/02 1:50:00	980.0	21.650	791.850	0.060	
10/9/02 5:53:00	1223.0	21.670	791.830	0.080	
10/9/02 7:56:00	1346.0	21.710	791.790	0.120	
10/9/02 8:51:00	1401.0	21.690	791.810	0.100	
10/9/02 10:00:00	1470.0	nm	--	--	Pump off - Recovery
10/9/02 10:01:00	1471.0	21.690	791.810	0.100	
10/9/02 10:02:00	1472.0	21.690	791.810	0.100	
10/9/02 10:03:00	1473.0	21.690	791.810	0.100	
10/9/02 10:04:00	1474.0	21.690	791.810	0.100	
10/9/02 10:05:00	1475.0	21.690	791.810	0.100	
10/9/02 10:07:00	1477.0	21.690	791.810	0.100	
10/9/02 10:09:00	1479.0	21.690	791.810	0.100	
10/9/02 10:11:00	1481.0	21.690	791.810	0.100	
10/9/02 10:13:00	1483.0	21.690	791.810	0.100	
10/9/02 10:15:00	1485.0	21.690	791.810	0.100	
10/9/02 10:17:00	1487.0	21.690	791.810	0.100	
10/9/02 10:19:00	1489.0	21.700	791.800	0.110	
10/9/02 10:21:00	1491.0	21.690	791.810	0.100	
10/9/02 10:23:00	1493.0	21.700	791.800	0.110	
10/9/02 10:25:00	1495.0	21.700	791.800	0.110	
10/9/02 10:27:00	1497.0	21.700	791.800	0.110	
10/9/02 10:29:00	1499.0	21.700	791.800	0.110	
10/9/02 10:35:00	1505.0	21.700	791.800	0.110	
10/9/02 10:40:00	1510.0	21.700	791.800	0.110	
10/9/02 10:45:00	1515.0	21.700	791.800	0.110	
10/9/02 10:50:00	1520.0	21.700	791.800	0.110	
10/9/02 10:55:00	1525.0	21.700	791.800	0.110	
10/9/02 11:00:00	1530.0	21.700	791.800	0.110	
10/9/02 12:46:00	1636.0	21.700	791.800	0.110	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: B-14

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/9/02 13:51:00	1701.0	21.700	791.800	0.110	
10/9/02 18:01:00	1951.0	21.700	791.800	0.110	
10/10/02 8:12:00	2802.0	21.760	791.740	0.170	
10/10/02 9:35:00	2885.0	21.780	791.720	0.190	



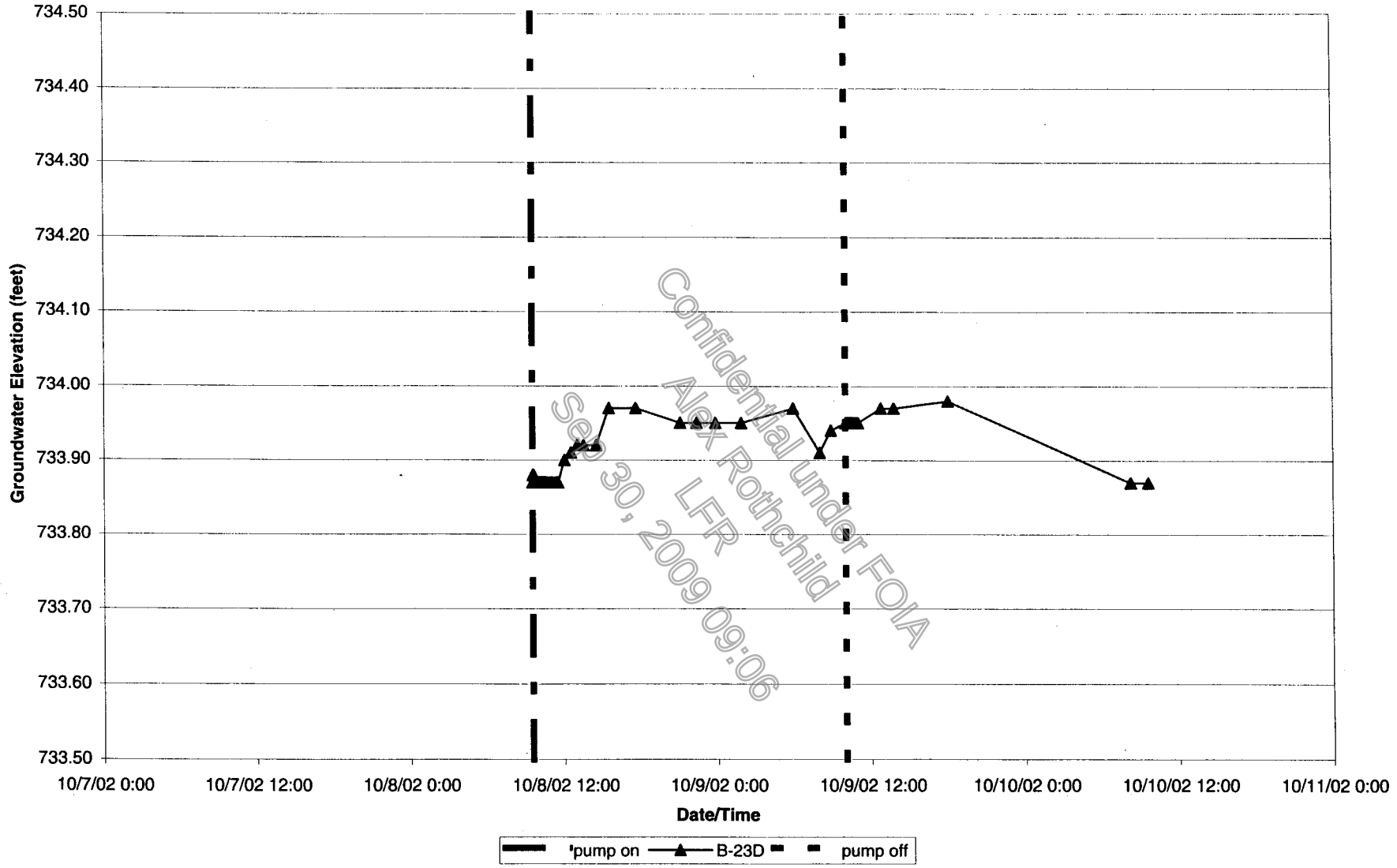
WATER LEVEL HYDROGRAPH FOR B-22D
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test B-22D graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: B-22D

Calendar Date/Time	*Elasped Time (min.)*	*Water Level (feet BTOR)*	*Water Elevation (ft)*	*Drawdown (feet)*	*Notes*
10/7/02 0:00:00	--	nm	--	--	key not available
10/8/02 9:30:00	0.0	89.710	731.790	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 10:00:00	30.0	89.710	731.790	0.000	
10/8/02 10:30:00	60.0	89.710	731.790	0.000	
10/8/02 11:00:00	90.0	89.710	731.790	0.000	
10/8/02 11:30:00	120.0	89.710	731.790	0.000	
10/8/02 12:00:00	150.0	89.710	731.790	0.000	
10/8/02 12:30:00	180.0	89.710	731.790	0.000	
10/8/02 13:00:00	210.0	89.700	731.800	-0.010	
10/8/02 14:00:00	270.0	89.680	731.820	-0.030	
10/8/02 15:50:00	380.0	89.640	731.860	-0.070	
10/8/02 17:40:00	490.0	89.630	731.870	-0.080	
10/8/02 21:12:00	702.0	89.640	731.860	-0.070	
10/8/02 22:25:00	775.0	89.640	731.860	-0.070	
10/8/02 23:54:00	864.0	89.640	731.860	-0.070	
10/9/02 1:54:00	984.0	89.640	731.860	-0.070	
10/9/02 5:56:00	1226.0	89.640	731.860	-0.070	
10/9/02 8:00:00	1350.0	89.670	731.830	-0.040	diff water level tape
10/9/02 8:54:00	1404.0	89.640	731.860	-0.070	
10/9/02 10:00:00	1470.0	nm	--	--	Pump off - Recovery
10/9/02 10:15:00	1485.0	89.640	731.860	-0.070	
10/9/02 10:30:00	1500.0	89.640	731.860	-0.070	
10/9/02 10:45:00	1515.0	89.640	731.860	-0.070	
10/9/02 11:00:00	1530.0	89.640	731.860	-0.070	
10/9/02 12:51:00	1641.0	89.640	731.860	-0.070	
10/9/02 13:52:00	1702.0	89.640	731.860	-0.070	
10/9/02 18:05:00	1955.0	89.640	731.860	-0.070	
10/10/02 8:20:00	2810.0	89.710	731.790	0.000	



WATER LEVEL HYDROGRAPH FOR B-23D
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Constant Rate Pumping Test B-23D graph]

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: B-23D

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/7/02 0:00:00	--	nm	--	--	key not available
10/8/02 9:30:00	0.0	79.130	733.870	0.000	Pre-Test Static
10/8/02 9:30:00	0.0	nm	--	0.000	Pump on - Drawdown
10/8/02 9:30:30	0.5	79.130	733.870	0.000	
10/8/02 9:31:00	1.0	79.120	733.880	-0.010	
10/8/02 9:31:30	1.5	79.120	733.880	-0.010	
10/8/02 9:32:00	2.0	79.120	733.880	-0.010	
10/8/02 9:32:30	2.5	79.120	733.880	-0.010	
10/8/02 9:33:00	3.0	79.120	733.880	-0.010	
10/8/02 9:33:30	3.5	79.120	733.880	-0.010	
10/8/02 9:34:00	4.0	79.120	733.880	-0.010	
10/8/02 9:34:30	4.5	79.120	733.880	-0.010	
10/8/02 9:35:00	5.0	79.120	733.880	-0.010	
10/8/02 9:36:00	6.0	79.130	733.870	0.000	
10/8/02 9:37:00	7.0	79.130	733.870	0.000	
10/8/02 9:38:00	8.0	79.130	733.870	0.000	
10/8/02 9:39:00	9.0	79.130	733.870	0.000	
10/8/02 9:40:00	10.0	79.130	733.870	0.000	
10/8/02 9:41:00	11.0	79.130	733.870	0.000	
10/8/02 9:42:00	12.0	79.130	733.870	0.000	
10/8/02 9:43:00	13.0	79.130	733.870	0.000	
10/8/02 9:44:00	14.0	79.130	733.870	0.000	
10/8/02 9:45:00	15.0	79.130	733.870	0.000	
10/8/02 9:47:00	17.0	79.130	733.870	0.000	
10/8/02 9:49:00	19.0	79.130	733.870	0.000	
10/8/02 9:51:00	21.0	79.130	733.870	0.000	
10/8/02 9:53:00	23.0	79.130	733.870	0.000	
10/8/02 9:55:00	25.0	79.130	733.870	0.000	
10/8/02 9:57:00	27.0	79.130	733.870	0.000	
10/8/02 9:59:00	29.0	79.130	733.870	0.000	
10/8/02 10:05:00	35.0	79.130	733.870	0.000	
10/8/02 10:10:00	40.0	79.130	733.870	0.000	
10/8/02 10:15:00	45.0	79.130	733.870	0.000	
10/8/02 10:20:00	50.0	79.130	733.870	0.000	
10/8/02 10:25:00	55.0	79.130	733.870	0.000	
10/8/02 10:30:00	60.0	79.130	733.870	0.000	
10/8/02 10:40:00	70.0	79.130	733.870	0.000	
10/8/02 10:50:00	80.0	79.130	733.870	0.000	
10/8/02 11:00:00	90.0	79.130	733.870	0.000	
10/8/02 11:10:00	100.0	79.130	733.870	0.000	
10/8/02 11:20:00	110.0	79.130	733.870	0.000	
10/8/02 11:30:00	120.0	79.130	733.870	0.000	
10/8/02 12:00:00	150.0	79.100	733.900	-0.030	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: B-23D

Calendar Date/Time	Elasped Time (min.)	Water Level (feet BTOR)	Water Elevation (ft)	Drawdown (feet)	Notes
10/8/02 12:30:00	180.0	79.090	733.910	-0.040	
10/8/02 13:00:00	210.0	79.080	733.920	-0.050	
10/8/02 13:30:00	240.0	79.080	733.920	-0.050	
10/8/02 14:30:00	300.0	79.080	733.920	-0.050	
10/8/02 15:30:00	360.0	79.030	733.970	-0.100	
10/8/02 17:36:00	486.0	79.030	733.970	-0.100	
10/8/02 21:05:00	695.0	79.050	733.950	-0.080	
10/8/02 22:23:00	773.0	79.050	733.950	-0.080	
10/8/02 23:51:00	861.0	79.050	733.950	-0.080	
10/9/02 1:51:00	981.0	79.050	733.950	-0.080	
10/9/02 5:54:00	1224.0	79.030	733.970	-0.100	
10/9/02 7:58:00	1348.0	79.090	733.910	-0.040	
10/9/02 8:52:00	1402.0	79.060	733.940	-0.070	
10/9/02 10:00:00	1469.5	nm	--	--	Pump off - Recovery
10/9/02 10:01:00	1470.5	79.050	733.950	-0.080	
10/9/02 10:02:00	1471.5	79.050	733.950	-0.080	
10/9/02 10:03:00	1472.5	79.050	733.950	-0.080	
10/9/02 10:04:00	1473.5	79.050	733.950	-0.080	
10/9/02 10:05:00	1474.5	79.050	733.950	-0.080	
10/9/02 10:07:00	1476.5	79.050	733.950	-0.080	
10/9/02 10:09:00	1478.5	79.050	733.950	-0.080	
10/9/02 10:11:00	1480.5	79.050	733.950	-0.080	
10/9/02 10:13:00	1482.5	79.050	733.950	-0.080	
10/9/02 10:15:00	1484.5	79.050	733.950	-0.080	
10/9/02 10:17:00	1486.5	79.050	733.950	-0.080	
10/9/02 10:19:00	1488.5	79.050	733.950	-0.080	
10/9/02 10:21:00	1490.5	79.050	733.950	-0.080	
10/9/02 10:23:00	1492.5	79.050	733.950	-0.080	
10/9/02 10:25:00	1494.5	79.050	733.950	-0.080	
10/9/02 10:27:00	1496.5	79.050	733.950	-0.080	
10/9/02 10:29:00	1498.5	79.050	733.950	-0.080	
10/9/02 10:35:00	1504.5	79.050	733.950	-0.080	
10/9/02 10:40:00	1509.5	79.050	733.950	-0.080	
10/9/02 10:45:00	1514.5	79.050	733.950	-0.080	
10/9/02 10:50:00	1519.5	79.050	733.950	-0.080	
10/9/02 10:55:00	1524.5	79.050	733.950	-0.080	
10/9/02 11:00:00	1529.5	79.050	733.950	-0.080	
10/9/02 12:47:00	1636.5	79.030	733.970	-0.100	
10/9/02 13:47:00	1696.5	79.030	733.970	-0.100	
10/9/02 18:00:00	1949.5	79.020	733.980	-0.110	
10/10/02 8:14:00	2803.5	79.130	733.870	0.000	
10/10/02 9:36:00	2885.5	79.130	733.870	0.000	

APPENDIX G

CLIMATOLOGICAL DATA

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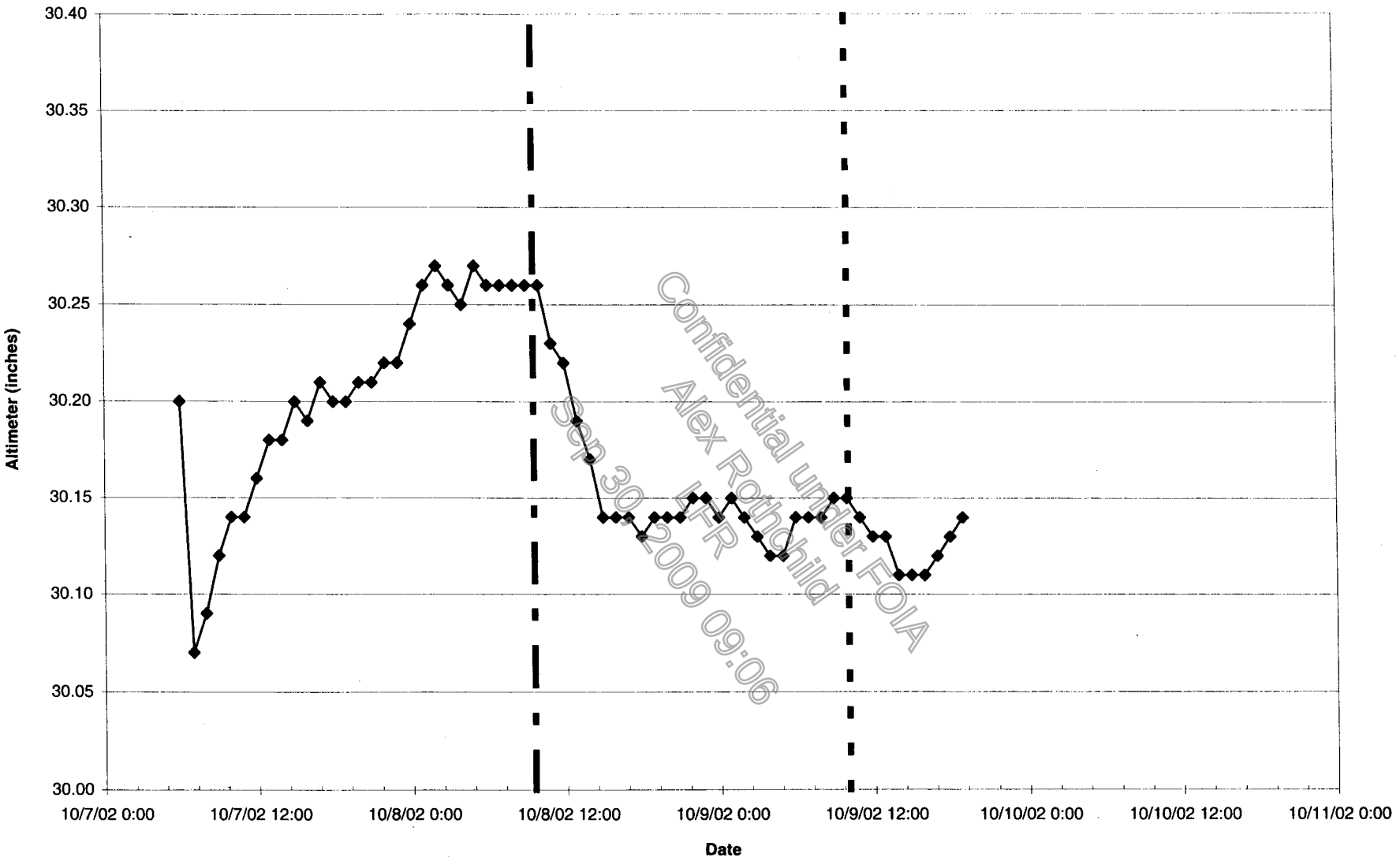
Sep 30, 2009 09:06



BAROMETRIC PRESSURE DATA
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Climatic Data baro graph]

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GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

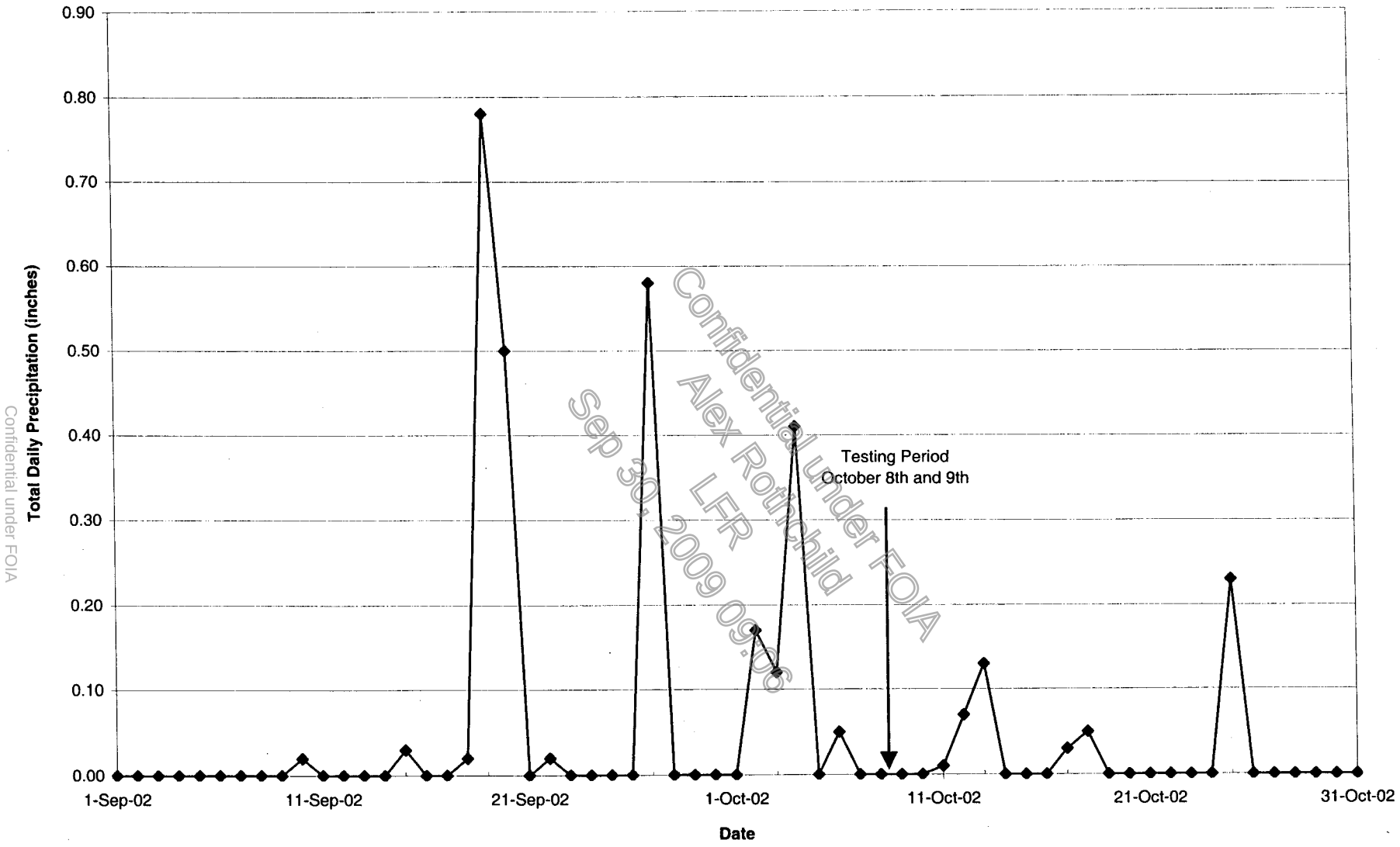
Constant Rate Pumping Test @ PFW-1
Monitor: Barometric Pressure

Calendar Date/Time	*Elasped Time (min.)*	*Pressure Altimeter (inches)*	*Notes*
10/7/02 5:53:00	-1657.0	30.20	
10/7/02 6:53:00	-1597.0	30.07	
10/7/02 7:53:00	-1537.0	30.09	
10/7/02 8:53:00	-1477.0	30.12	
10/7/02 9:53:00	-1417.0	30.14	
10/7/02 10:53:00	-1357.0	30.14	
10/7/02 11:53:00	-1297.0	30.16	
10/7/02 12:53:00	-1237.0	30.18	
10/7/02 13:53:00	-1177.0	30.18	
10/7/02 14:53:00	-1117.0	30.20	
10/7/02 15:53:00	-1057.0	30.19	
10/7/02 16:53:00	-997.0	30.21	
10/7/02 17:53:00	-937.0	30.20	
10/7/02 18:53:00	-877.0	30.20	
10/7/02 19:53:00	-817.0	30.21	
10/7/02 20:53:00	-757.0	30.21	
10/7/02 21:53:00	-697.0	30.22	
10/7/02 22:53:00	-637.0	30.22	
10/7/02 23:53:00	-577.0	30.24	
10/8/02 0:53:00	-517.0	30.26	
10/8/02 1:53:00	-457.0	30.27	
10/8/02 2:53:00	-397.0	30.26	
10/8/02 3:53:00	-337.0	30.25	
10/8/02 4:53:00	-277.0	30.27	
10/8/02 5:53:00	-217.0	30.26	
10/8/02 6:53:00	-157.0	30.26	
10/8/02 7:53:00	-97.0	30.26	
10/8/02 8:53:00	-37.0	30.26	
10/8/02 9:30:00	0.0	nm	Pump on
10/8/02 9:53:00	23.0	30.26	
10/8/02 10:53:00	83.0	30.23	
10/8/02 11:53:00	143.0	30.22	
10/8/02 12:53:00	203.0	30.19	
10/8/02 13:53:00	263.0	30.17	
10/8/02 14:53:00	323.0	30.14	
10/8/02 15:53:00	383.0	30.14	
10/8/02 16:53:00	443.0	30.14	
10/8/02 17:53:00	503.0	30.13	
10/8/02 18:53:00	563.0	30.14	
10/8/02 19:53:00	623.0	30.14	
10/8/02 20:53:00	683.0	30.14	
10/8/02 21:53:00	743.0	30.15	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: Barometric Pressure

Calendar Date/Time	*Elasped Time (min.)*	*Pressure Altimeter (inches)*	*Notes*
10/8/02 22:53:00	803.0	30.15	
10/8/02 23:53:00	863.0	30.14	
10/9/02 0:53:00	923.0	30.15	
10/9/02 1:53:00	983.0	30.14	
10/9/02 2:53:00	1043.0	30.13	
10/9/02 3:53:00	1103.0	30.12	
10/9/02 4:53:00	1163.0	30.12	
10/9/02 5:53:00	1223.0	30.14	
10/9/02 6:53:00	1283.0	30.14	
10/9/02 7:53:00	1343.0	30.14	
10/9/02 8:53:00	1403.0	30.15	
10/9/02 9:53:00	1463.0	30.15	
10/9/02 10:00:00	1470.0	nm	Pump off
10/9/02 10:53:00	1523.0	30.14	
10/9/02 11:53:00	1583.0	30.13	
10/9/02 12:53:00	1643.0	30.13	
10/9/02 13:53:00	1703.0	30.11	
10/9/02 14:53:00	1763.0	30.11	
10/9/02 15:53:00	1823.0	30.11	
10/9/02 16:53:00	1883.0	30.12	
10/9/02 17:53:00	1943.0	30.13	
10/9/02 18:53:00	2003.0	30.14	



PRECIPITATION DATA
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: Precipitation

Calendar Date	*Total Precipitation (inches)*	*Notes*
1-Sep-02	0	
2-Sep-02	0	
3-Sep-02	0	
4-Sep-02	0	
5-Sep-02	0	
6-Sep-02	0	
7-Sep-02	0	
8-Sep-02	0	
9-Sep-02	0	
10-Sep-02	0.02	
11-Sep-02	0	
12-Sep-02	0	
13-Sep-02	0	
14-Sep-02	trace (<0.01)	
15-Sep-02	0.03	
16-Sep-02	0	
17-Sep-02	0	
18-Sep-02	0.02	
19-Sep-02	0.78	
20-Sep-02	0.5	
21-Sep-02	trace (<0.01)	
22-Sep-02	0.02	
23-Sep-02	0	
24-Sep-02	0	
25-Sep-02	0	
26-Sep-02	0	
27-Sep-02	0.58	
28-Sep-02	0	
29-Sep-02	0	
30-Sep-02	0	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: Precipitation

Calendar Date	*Total Precipitation (inches)*	*Notes*
1-Oct-02	trace (<0.01)	
2-Oct-02	0.17	
3-Oct-02	0.12	
4-Oct-02	0.41	
5-Oct-02	trace (<0.01)	
6-Oct-02	0.05	
7-Oct-02	trace (<0.01)	
8-Oct-02	0	
9-Oct-02	0	
10-Oct-02	trace (<0.01)	
11-Oct-02	0.01	
12-Oct-02	0.07	
13-Oct-02	0.13	
14-Oct-02	0	
15-Oct-02	0	
16-Oct-02	0	
17-Oct-02	0.03	
18-Oct-02	0.05	
19-Oct-02	trace (<0.01)	
20-Oct-02	0	
21-Oct-02	0	
22-Oct-02	trace (<0.01)	
23-Oct-02	trace (<0.01)	
24-Oct-02	0	
25-Oct-02	0.23	
26-Oct-02	trace (<0.01)	
27-Oct-02	0	
28-Oct-02	0	
29-Oct-02	0	
30-Oct-02	0	
31-Oct-02	0	

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APPENDIX G

CLIMATOLOGICAL DATA

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Sep 30, 2009 09:06

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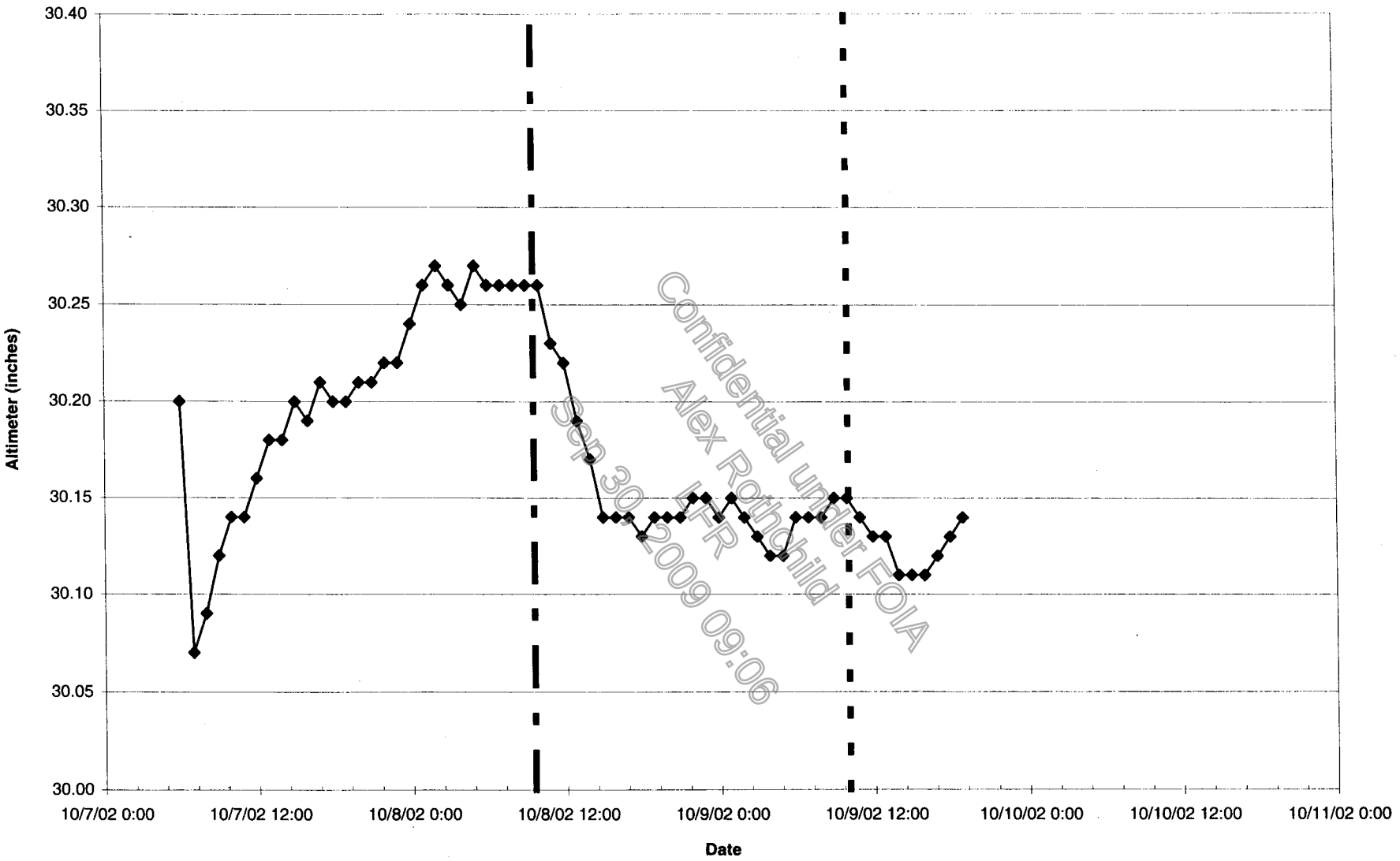
Sep 30, 2009 09:06



BAROMETRIC PRESSURE DATA
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

12636 (25) [Climatic Data baro graph]

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GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

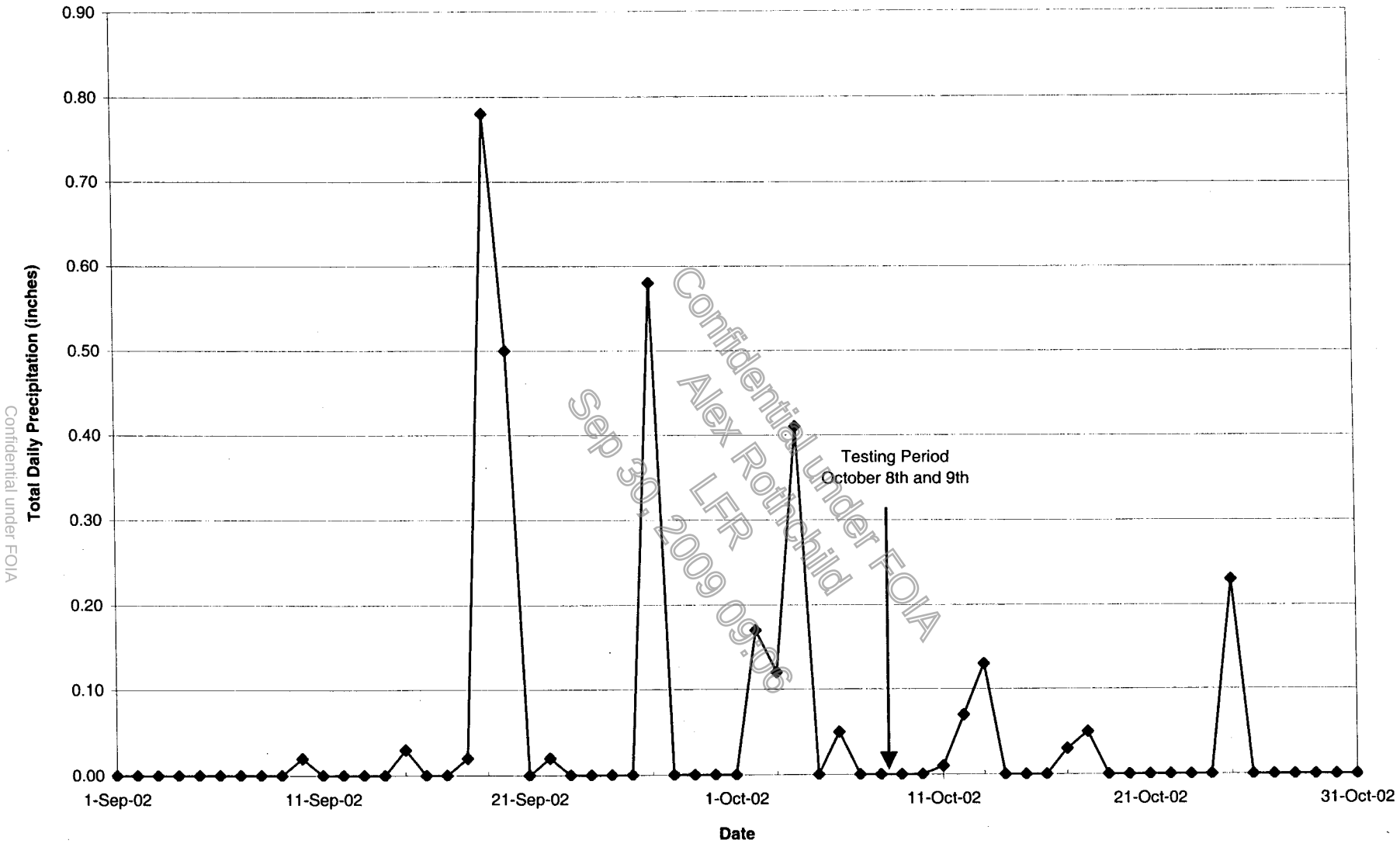
Constant Rate Pumping Test @ PFW-1
Monitor: Barometric Pressure

Calendar Date/Time	*Elasped Time (min.)*	*Pressure Altimeter (inches)*	*Notes*
10/7/02 5:53:00	-1657.0	30.20	
10/7/02 6:53:00	-1597.0	30.07	
10/7/02 7:53:00	-1537.0	30.09	
10/7/02 8:53:00	-1477.0	30.12	
10/7/02 9:53:00	-1417.0	30.14	
10/7/02 10:53:00	-1357.0	30.14	
10/7/02 11:53:00	-1297.0	30.16	
10/7/02 12:53:00	-1237.0	30.18	
10/7/02 13:53:00	-1177.0	30.18	
10/7/02 14:53:00	-1117.0	30.20	
10/7/02 15:53:00	-1057.0	30.19	
10/7/02 16:53:00	-997.0	30.21	
10/7/02 17:53:00	-937.0	30.20	
10/7/02 18:53:00	-877.0	30.20	
10/7/02 19:53:00	-817.0	30.21	
10/7/02 20:53:00	-757.0	30.21	
10/7/02 21:53:00	-697.0	30.22	
10/7/02 22:53:00	-637.0	30.22	
10/7/02 23:53:00	-577.0	30.24	
10/8/02 0:53:00	-517.0	30.26	
10/8/02 1:53:00	-457.0	30.27	
10/8/02 2:53:00	-397.0	30.26	
10/8/02 3:53:00	-337.0	30.25	
10/8/02 4:53:00	-277.0	30.27	
10/8/02 5:53:00	-217.0	30.26	
10/8/02 6:53:00	-157.0	30.26	
10/8/02 7:53:00	-97.0	30.26	
10/8/02 8:53:00	-37.0	30.26	
10/8/02 9:30:00	0.0	nm	Pump on
10/8/02 9:53:00	23.0	30.26	
10/8/02 10:53:00	83.0	30.23	
10/8/02 11:53:00	143.0	30.22	
10/8/02 12:53:00	203.0	30.19	
10/8/02 13:53:00	263.0	30.17	
10/8/02 14:53:00	323.0	30.14	
10/8/02 15:53:00	383.0	30.14	
10/8/02 16:53:00	443.0	30.14	
10/8/02 17:53:00	503.0	30.13	
10/8/02 18:53:00	563.0	30.14	
10/8/02 19:53:00	623.0	30.14	
10/8/02 20:53:00	683.0	30.14	
10/8/02 21:53:00	743.0	30.15	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: Barometric Pressure

Calendar Date/Time	*Elasped Time (min.)*	*Pressure Altimeter (inches)*	*Notes*
10/8/02 22:53:00	803.0	30.15	
10/8/02 23:53:00	863.0	30.14	
10/9/02 0:53:00	923.0	30.15	
10/9/02 1:53:00	983.0	30.14	
10/9/02 2:53:00	1043.0	30.13	
10/9/02 3:53:00	1103.0	30.12	
10/9/02 4:53:00	1163.0	30.12	
10/9/02 5:53:00	1223.0	30.14	
10/9/02 6:53:00	1283.0	30.14	
10/9/02 7:53:00	1343.0	30.14	
10/9/02 8:53:00	1403.0	30.15	
10/9/02 9:53:00	1463.0	30.15	
10/9/02 10:00:00	1470.0	nm	Pump off
10/9/02 10:53:00	1523.0	30.14	
10/9/02 11:53:00	1583.0	30.13	
10/9/02 12:53:00	1643.0	30.13	
10/9/02 13:53:00	1703.0	30.11	
10/9/02 14:53:00	1763.0	30.11	
10/9/02 15:53:00	1823.0	30.11	
10/9/02 16:53:00	1883.0	30.12	
10/9/02 17:53:00	1943.0	30.13	
10/9/02 18:53:00	2003.0	30.14	



PRECIPITATION DATA
CONSTANT RATE PUMPING TEST @ PFW-1
GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: Precipitation

Calendar Date	*Total Precipitation (inches)*	*Notes*
1-Sep-02	0	
2-Sep-02	0	
3-Sep-02	0	
4-Sep-02	0	
5-Sep-02	0	
6-Sep-02	0	
7-Sep-02	0	
8-Sep-02	0	
9-Sep-02	0	
10-Sep-02	0.02	
11-Sep-02	0	
12-Sep-02	0	
13-Sep-02	0	
14-Sep-02	trace (<0.01)	
15-Sep-02	0.03	
16-Sep-02	0	
17-Sep-02	0	
18-Sep-02	0.02	
19-Sep-02	0.78	
20-Sep-02	0.5	
21-Sep-02	trace (<0.01)	
22-Sep-02	0.02	
23-Sep-02	0	
24-Sep-02	0	
25-Sep-02	0	
26-Sep-02	0	
27-Sep-02	0.58	
28-Sep-02	0	
29-Sep-02	0	
30-Sep-02	0	

GROUNDWATER NOT IN AN AQUIFER EVALUATION
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESSEE TOWNSHIP, MICHIGAN

Constant Rate Pumping Test @ PFW-1
Monitor: Precipitation

Calendar Date	*Total Precipitation (inches)*	*Notes*
1-Oct-02	trace (<0.01)	
2-Oct-02	0.17	
3-Oct-02	0.12	
4-Oct-02	0.41	
5-Oct-02	trace (<0.01)	
6-Oct-02	0.05	
7-Oct-02	trace (<0.01)	
8-Oct-02	0	
9-Oct-02	0	
10-Oct-02	trace (<0.01)	
11-Oct-02	0.01	
12-Oct-02	0.07	
13-Oct-02	0.13	
14-Oct-02	0	
15-Oct-02	0	
16-Oct-02	0	
17-Oct-02	0.03	
18-Oct-02	0.05	
19-Oct-02	trace (<0.01)	
20-Oct-02	0	
21-Oct-02	0	
22-Oct-02	trace (<0.01)	
23-Oct-02	trace (<0.01)	
24-Oct-02	0	
25-Oct-02	0.23	
26-Oct-02	trace (<0.01)	
27-Oct-02	0	
28-Oct-02	0	
29-Oct-02	0	
30-Oct-02	0	
31-Oct-02	0	

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Sep 30, 2009 09:06

APPENDIX H

LETTER FROM MDEQ
RE: SITE NOT LOCATED IN WELLHEAD PROTECTION AREA
(APRIL 5, 2001)

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Sep 30, 2009 09:06

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

REPLY TO:

DRINKING WATER & RADIOLOGICAL
PROTECTION DIVISION
3423 N MARTIN L KING JR BLVD
PO BOX 30630
LANSING, MI 48909-8130

April 05, 2001

Ms. Sara Varty
Conestoga-Rovers & Associates
651 Colby Drive
Waterloo, Ontario N2V 1C2

SUBJECT: Wellhead Protection Areas

Dear Ms. Varty:

In response to your telephone inquiry today, I have checked our database for the existence of delineated wellhead protection areas in the vicinity of the following site:

- G-1245 E. Coldwater Road, Flint, Michigan (Genesee Township)

This site is not within a delineated wellhead protection area. The nearest wellhead protection area is approximately 10 miles east-southeast of your site, in Davison, Michigan.

Please contact me if you have further questions.

Sincerely,

Wayne W. Kukuk, Geologist
Wellhead Protection Unit
Ground Water Supply Section
Drinking Water and Radiological
Protection Division
517-335-8964
kukukw@state.mi.us

APPENDIX I

GROUNDWATER ANALYTICAL DATA

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Sep 30, 2009 09:06

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Sep 30, 2009 09:06

SEVERN TRENT STL

SDG # 16R

ANALYTICAL REPORT

PROJECT NO. 12636-40

FORMER PEREGRINE

Lot #: A2J110317

Paul Wiseman

Conestoga Rovers & Assoc., Inc
14496 Sheldon Rd Suite 200
Plymouth, MI 48170

SEVERN TRENT LABORATORIES, INC.

ORIGINAL ANALYTICAL REPORT
Project#: 12636 Lab#: A2J110317
Name: Former Peregrine
Description
Event: Groundwater - RFI
Samples: 4 waters
Analysis: VOC + Lead

TAT: 5D
Lab: STL-NC
Checked Against Preliminary Data:
Date: 12/18/02 Init.: PBW
Date of Validation Memo: 12/19/02
Invoice Approval Date:
Comments:

Amy L. McCormick
Project Manager

November 27, 2002

Severn Trent Laboratories, Inc.
STL North Canton • 4101 Shuffel Drive NW, North Canton, OH 44720
Tel 330 497 9396 Fax 330 497 0772 • www.stl-inc.com

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Committed To *Your* Success

CASE NARRATIVE

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CASE NARRATIVE

A2J110317

The following report contains the analytical results for three water samples and one quality control sample submitted to STL North Canton by Conestoga-Rovers & Associates, Inc. from the Former Peregrine Site, project number 12636-40. The samples were received October 11, 2002, according to documented sample acceptance procedures.

Metals were analyzed at STL's Denver, Colorado facility.

The samples presented in this report were analyzed for the parameters listed on the analytical methods summary page in accordance with the methods indicated. Preliminary results were provided to the Chemistry Department on October 25, 2002. A summary of QC data for these analyses is included at the rear of the report.

Results for all analyses were evaluated to the method detection limit.

SUPPLEMENTAL QC INFORMATION

GC/MS VOLATILES

Sample(s) that contain results between the MDL and the RL were flagged with "J". There is the possibility of false positive or mis-identification at these quantitation levels. In analytical methods requiring confirmation of the analyte reported, confirmation was performed only down to the standard reporting limit (SRL). The acceptance criteria for QC samples may not be met at these quantitation levels.

GENERAL CHEMISTRY

Matrix spike/duplicate spike recoveries were outside the acceptance limits for some analytes. The acceptable laboratory control sample analysis data indicated that the analytical system was operating within control and this condition is most likely due to matrix interference. See the Matrix Spike Report for the affected analytes which were flagged with "N".

STL utilizes USEPA approved methods in all analytical work. The results included in this report have been reviewed for compliance with the laboratory QA/QC plan. All data have been found to be compliant with laboratory protocol.

Amy McCormick
Project Manager

QUALITY CONTROL ELEMENTS OF SW-846 METHODS

STL North Canton conducts a quality assurance/quality control (QA/QC) program designed to provide scientifically valid and legally defensible data. Toward this end, several types of quality control indicators are incorporated into the QA/QC program, which is described in detail in QA Policy, QA-003. These indicators are introduced into the sample testing process to provide a mechanism for the assessment of the analytical data.

QC BATCH

Environmental samples are taken through the testing process in groups called QUALITY CONTROL BATCHES (QC batches). A QC batch contains up to twenty environmental samples of a similar matrix (water, soil) that are processed using the same reagents and standards. STL North Canton requires that each environmental sample be associated with a QC batch.

Several quality control samples are included in each QC batch and are processed identically to the twenty environmental samples. These QC samples include a METHOD BLANK (MB), a LABORATORY CONTROL SAMPLE (LCS) and, where appropriate, a MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) pair or a MATRIX SPIKE/SAMPLE DUPLICATE (MS/DU) pair. If there is insufficient sample to perform an MS/MSD or an MS/DU, then a LABORATORY CONTROL SAMPLE DUPLICATE (LCSD) is included in the QC batch.

LABORATORY CONTROL SAMPLE

The Laboratory Control Sample is a QC sample that is created by adding known concentrations of a full or partial set of target analytes to a matrix similar to that of the environmental samples in the QC batch. The LCS analyte recovery results are used to monitor the analytical process and provide evidence that the laboratory is performing the method within acceptable guidelines. All control analytes indicated by a bold type in the LCS must meet acceptance criteria. Failure to meet the established recovery guidelines requires the repreparation and reanalysis of all samples in the QC batch. The only exception is that if the LCS recoveries are biased high and the associated sample is ND (non-detected) for the parameter(s) of interest, the batch is acceptable.

At times, a Laboratory Control Sample Duplicate (LCSD) is also included in the QC batch. An LCSD is a QC sample that is created and handled identically to the LCS. Analyte recovery data from the LCSD is assessed in the same way as that of the LCS. The LCSD recoveries, together with the LCS recoveries, are used to determine the reproducibility (precision) of the analytical system. Precision data are expressed as relative percent differences (RPDs). If the RPD fails for an LCS/LCSD and yet the recoveries are within acceptance criteria, the batch is still acceptable.

METHOD BLANK

The Method Blank is a QC sample consisting of all the reagents used in analyzing the environmental samples contained in the QC batch. Method Blank results are used to determine if interference or contamination in the analytical system could lead to the reporting of false positive data or elevated analyte concentrations. All target analytes must be below the reporting limits (RL) or the associated sample(s) must be ND except under the following circumstances:

- Common organic contaminants may be present at concentrations up to 5 times the reporting limits. Common metals contaminants may be present at concentrations up to 2 times the reporting limit, or the reported blank concentration must be twenty fold less than the concentration reported in the associated environmental samples. (See common laboratory contaminants listed below.)

Volatile (GC or GC/MS)	Semivolatile (GC/MS)	Metals
Methylene chloride	Phthalate Esters	Copper
Acetone		Iron
2-Butanone		Zinc
		Lead*

- *for analyses run on TJA Trace ICP, ICPMS or GFAA only*

- Organic blanks will be accepted if compounds detected in the blank are present in the associated samples at levels 10 times the blank level. Inorganic blanks will be accepted if elements detected in the blank are present in the associated samples at 20 times the blank level.

- Blanks will be accepted if the compounds/elements detected are not present in any of the associated environmental samples.

Failure to meet these Method Blank criteria requires the repreparation and reanalysis of all samples in the QC batch.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A Matrix Spike and a Matrix Spike Duplicate are a pair of environmental samples to which known concentrations of a full or partial set of target analytes are added. The MS/MSD results are determined in the same manner as the results of the environmental sample used to prepare the MS/MSD. The analyte recoveries and the relative percent differences (RPDs) of the recoveries are calculated and used to evaluate the effect of the sample matrix on the analytical results. Due to the potential variability of the matrix of each sample, the MS/MSD results may not have an immediate bearing on any samples except the one spiked; therefore, the associated batch MS/MSD may not reflect the same compounds as the samples contained in the analytical report. When these MS/MSD results fail to meet acceptance criteria, the data is evaluated. If the LCS is within acceptance criteria, the batch is considered acceptable. The acceptance criteria do not apply to samples that are diluted for organics if the native sample amount is 4x the concentration of the spike.

For certain methods, a Matrix Spike/Sample Duplicate (MS/DU) may be included in the QC batch in place of the MS/MSD. For the parameters (i.e. pH, ignitability) where it is not possible to prepare a spiked sample, a Sample Duplicate may be included in the QC batch. However, a Sample Duplicate is less likely to provide usable precision statistics depending on the likelihood of finding concentrations below the standard reporting limit. When the Sample Duplicate result fails to meet acceptance criteria, the data is evaluated.

SURROGATE COMPOUNDS

In addition to these batch-related QC indicators, each organic environmental and QC sample is spiked with surrogate compounds. Surrogates are organic chemicals that behave similarly to the analytes of interest and that are rarely present in the environment. Surrogate recoveries are used to monitor the individual performance of a sample in the analytical system.

If surrogate recoveries are biased high in the LCS, LCSD, or the Method Blank, and the associated sample(s) are ND, the batch is acceptable. Otherwise, if the LCS, LCSD, or Method Blank surrogate(s) fail to meet recovery criteria, the entire sample batch is reprepped and reanalyzed. If the surrogate recoveries are outside criteria for environmental samples, the samples will be reprepped and reanalyzed unless there is objective evidence of matrix interference or if the sample dilution is greater than the threshold outlined in the associated method SOP.

For the GC/MS BNA methods, the surrogate criterion is that two of the three surrogates for each fraction must meet acceptance criteria. The third surrogate must have a recovery of ten percent or greater.

For the Pesticide, PCB, PAH, and Herbicide methods, the surrogate criterion is that one of two surrogate compounds must meet acceptance criteria.

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METHOD REFERENCE

ANALYTICAL METHODS SUMMARY

A2J110317

PARAMETER	ANALYTICAL METHOD
Trace Inductively Coupled Plasma (ICP) Metals	SW846 6010B
Volatile Organics by GC/MS	SW846 8260B

References:

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

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SAMPLE SUMMARY

SAMPLE SUMMARY

A2J110317

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMI TIMI
E9V5A	001	GW-12636-100802-DD-001	10/08/02	10::
E9V5E	002	GW-12636-100802-DD-002	10/08/02	21::
E9V5J	003	GW-12636-100902-DD-003	10/09/02	09:30
E9V5K	004	TB-12636-100902-DD-004	10/09/02	

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

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SHIPPING AND RECEIVING DOCUMENTS

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CRA
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14496 Sheldon Road, Suite 200
Plymouth, MI 48170 • (734) 453-5123

CHAIN OF CUSTODY RECORD

SHIPPED TO (Laboratory Name): Severn Trent Lab- North Canton

REFERENCE NUMBER: 12636-40

PROJECT NAME: Former Peerless

SAMPLER'S SIGNATURE: Dan Deitner PRINTED NAME: Dan Deitner

SEQ: No.	DATE	TIME		SAMPLE TYPE	No. OF CONTAINERS	PARAMETERS: TCL VOCs	PARAMETERS: Dissolved Lead	REMARKS
	10-03-02	1032	GW-12636-100302-DP-001	water	4	✓	✓	2 week TAT
	10-03-02	2132	GW-12636-100302-DP-002	water	4	✓	✓	
DP	~~10-03-02~~	~~0930~~	~~GW-12636-100302-DP-003~~	~~water~~	~~4~~			~~DP~~
	10-03-02	0930	GW-12636-100302-DP-003	water	4	✓	✓	
	10-3-02	—	TB-12636-100302-DP-004	water	1	✓		~~Carbon Tet~~ trip blank
								CA contact Paul Wisenau

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
1. Dan Deitner	10/3/02	1400	1.		
2.			2.		
3.			1.		

METHOD OF SHIPMENT: FED-EX AIR BILL No.

White -Fully Executed Copy; Yellow -Receiving Laboratory Copy; Pink -Shipper Copy; Goldenrod -Sampler Copy

SAMPLE TEAM: Dan Deitner

RECEIVED FOR LABORATORY BY: [signature] DATE: 10-11-02 TIME: 1105

1001 (FORMS) APRIL 29, 93-REV.0-(C)(F-01)

STL North Canton

RSR280

Severn Trent Laboratories, Inc.
Sample Control Record

Client: 57787

Lot #: A2J110317

Case Number/SDG: 12636-40

Storage Location: MS/MS OUT

Laboratory Sample I.D.	Transferred By	Date	Entered	Removed	Reason	Date Returned
E9V5A	STILLERJ	10/11/02	Yes		Storage	
E9V5E	STILLERJ	10/11/02	Yes		Storage	
E9V5J	STILLERJ	10/11/02	Yes		Storage	
E9V5K	STILLERJ	10/11/02	Yes		Storage	

STL Cooler Receipt Form/Narrative
North Canton Facility

Lot Number: A2J110317

Client: [illegible] Project: 12606-40 Quote#:

Cooler Received on: 10-11-02 Opened on: 10-11-02 by: [illegible] (Signature)

Fedx ☐ Client Drop Off ☐ UPS ☐ Airborne ☐ Other:

Cooler ☐ Safe ☐ Foam Box ☐ Client Cooler ☐ Other:

STL Shipper No#: NA

1. Were custody seals on the outside of the cooler? Yes ☐ No ☑ Intact? Yes ☐ No ☐ NA ☑
   If YES. Quantity _____ Location _____
   Were the custody seals signed and dated? Yes ☐ No ☐ NA ☑
2. Shipper's packing slip attached to this form? Yes ☑ No ☐
3. Were custody papers included inside the cooler and relinquished? Yes ☑ No ☐
4. Did you sign the custody papers in the appropriate place? Yes ☑ No ☐
5. Packing material used:
   Peanuts ☐ Bubble Wrap ☑ Vermiculite ☐ Foam ☐ None ☐ Other : _____
6. Cooler temperature upon receipt 2.0 °C (see back of form for multiple coolers/temp)
   METHOD: emp Vial ☐ Coolant & Sample ☐ Against Bottles ☐ IR ☒ ICE/H_2O Slurry ☐
   COOLANT: Wet Ice ☒ Blue Ice ☐ Dry Ice ☐ Water ☐ None ☐
7. Did all bottles arrive in good condition (Unbroken)? Yes ☑ No ☐
8. Did all bottle labels and tags agree with the custody papers? Yes ☑ No ☐
9. Were samples at the correct pH? (record on back) Yes ☑ No ☐ NA ☐
10. Were correct bottles used for the tests indicated? Yes ☑ No ☐
11. Were air bubbles >6 mm in any VOA vials? Yes ☐ No ☑ NA ☐
12. Was a sufficient amount of sample sent in each bottle? Yes ☑ No ☐

Contacted PM _____ Date: _____ by: _____ via Voice Mail ☐ Verbal ☐ Other ☐

Concerning: _____

√	MACRO	MACRO
1. CHAIN OF CUSTODY		
	SR1A	The chain of custody and sample bottles did not agree. The following discrepancies occurred _____
2. SAMPLE CONDITION		
	SR2A	Sample(s) _____ were received or requested after the recommended holding time had expired.
	SR2B	Sample(s) were received with insufficient volume.
	SR2C	Sample(s) were received in a broken container.
3. SAMPLE PRESERVATION		
	SR3A	Sample(s) _____ were further preserved in sample receiving to meet recommended pH level(s). *Nitric Acid Lot # 120701-HNO3; Sulfuric Acid Lot # 010802-H2SO4; Sodium Hydroxide Lot # 011102-NaOH; Hyarochloric Acid Lot # 020501-HCl; Sodium Hydroxide and Zinc Acetate Lot # 112801-CH3COO2ZN/NaOH*
	SR3B	Sample(s) _____ were received with bubble > 6 mm in diameter (cc: PM)
4. Other (see below or back)		

STL Cooler Receipt Form/Narrative
North Canton Facility

Client ID	pH	Date	Initials
DD-001	<2	10-11-02	AMB
2	<2	"	"
3	<2	"	"

Cooler	Temp	Method	Comments

Discrepancies Cont.

Macro Name:

Macro Name:

Macro Name:

Other Anomalies:

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GCMS VOLATILE DATA

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Client Sample ID: GW-12636-100802-DD-001

GC/MS Volatiles

Lot-Sample #...: A2J110317-001	**Work Order #...:** E9V5A1AA	**Matrix.....:** WG
Date Sampled...: 10/08/02 10:30	**Date Received..:** 10/11/02	
Prep Date.....: 10/16/02	**Analysis Date..:** 10/16/02	
Prep Batch #...: 2290209		
Dilution Factor: 1	**Initial Wgt/Vol:** 5 mL	**Final Wgt/Vol..:** 5 mL
	Method.....: SW846 8260B	

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Methyl tert-butyl ether (MTBE)	ND	5.0	ug/L
1,2-Dibromo-3-chloro-propane	ND	1.0	ug/L
1,2-Dibromoethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
Dichlorodifluoromethane	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
Trichlorofluoromethane	ND	1.0	ug/L
Isopropylbenzene	ND	1.0	ug/L
1,2,4-Trichloro-benzene	ND	1.0	ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
Bromomethane	ND	1.0	ug/L
Vinyl chloride	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Methylene chloride	ND	1.0	ug/L
Acetone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Benzene	ND	1.0	ug/L

(Continued on next page)

CONESTOGA ROVERS & ASSOC.,INC.

Client Sample ID: GW-12636-100802-DD-001

GC/MS Volatiles

Lot-Sample #...: A2J110317-001 **Work Order #...:** E9V5A1AA **Matrix.....:** WG

PARAMETER	RESULT	REPORTING LIMIT	UNITS
trans-1,3-Dichloropropene	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	10	ug/L
2-Hexanone	ND	10	ug/L
Tetrachloroethene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
Styrene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
Cyclohexane	ND	1.0	ug/L
Methyl acetate	ND	10	ug/L
Methylcyclohexane	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	98	(73 - 122)
1,2-Dichloroethane-d4	93	(61 - 128)
Toluene-d8	102	(76 - 110)
4-Bromofluorobenzene	86	(74 - 116)

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Client Sample ID: GW-12636-100802-DD-002

GC/MS Volatiles

Lot-Sample #...: A2J110317-002	**Work Order #...:** E9V5E1AA	**Matrix.....:** WG	
Date Sampled...: 10/08/02 21:30	**Date Received..:** 10/11/02		
Prep Date.....: 10/16/02	**Analysis Date..:** 10/16/02		
Prep Batch #...: 2290209			
Dilution Factor: 1	**Initial Wgt/Vol:** 5 mL	**Final Wgt/Vol..:** 5 mL	
	Method.....: SW846 8260B		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Cyclohexane	ND	1.0	ug/L
Methyl acetate	ND	10	ug/L
Methylcyclohexane	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	5.0	ug/L
1,2-Dibromo-3-chloro-propane	ND	1.0	ug/L
1,2-Dibromoethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
Dichlorodifluoromethane	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
Trichlorofluoromethane	ND	1.0	ug/L
Isopropylbenzene	ND	1.0	ug/L
1,2,4-Trichloro-benzene	ND	1.0	ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
Bromomethane	ND	1.0	ug/L
Vinyl chloride	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Methylene chloride	ND	1.0	ug/L
Acetone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L

(Continued on next page)

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Client Sample ID: GW-12636-100802-DD-002

GC/MS Volatiles

Lot-Sample #...: A2J110317-002 **Work Order #...:** E9V5E1AA **Matrix.....:** WG

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Dibromochloromethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Benzene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	10	ug/L
2-Hexanone	ND	10	ug/L
Tetrachloroethene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
Styrene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	97	(73 - 122)
1,2-Dichloroethane-d4	91	(61 - 128)
Toluene-d8	101	(76 - 110)
4-Bromofluorobenzene	84	(74 - 116)

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Client Sample ID: GW-12636-100902-DD-003

GC/MS Volatiles

Lot-Sample #...: A2J110317-003	**Work Order #...:** E9V5J1AA	**Matrix.....:** WG	
Date Sampled...: 10/09/02 09:30	**Date Received..:** 10/11/02		
Prep Date.....: 10/16/02	**Analysis Date..:** 10/16/02		
Prep Batch #...: 2290209			
Dilution Factor: 1	**Initial Wgt/Vol:** 5 mL	**Final Wgt/Vol..:** 5 mL	
	Method.....: SW846 8260B		

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Methyl tert-butyl ether (MTBE)	ND	5.0	ug/L
1,2-Dibromo-3-chloro-propane	ND	1.0	ug/L
1,2-Dibromoethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
Dichlorodifluoromethane	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
Trichlorofluoromethane	ND	1.0	ug/L
Isopropylbenzene	ND	1.0	ug/L
1,2,4-Trichloro-benzene	ND	1.0	ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
Bromomethane	ND	1.0	ug/L
Vinyl chloride	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Methylene chloride	ND	1.0	ug/L
Acetone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Benzene	ND	1.0	ug/L

(Continued on next page)

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Client Sample ID: GW-12636-100902-DD-003

GC/MS Volatiles

Lot-Sample #...: A2J110317-003 **Work Order #...:** E9V5J1AA **Matrix.....:** WG

PARAMETER	RESULT	REPORTING LIMIT	UNITS
trans-1,3-Dichloropropene	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	10	ug/L
2-Hexanone	ND	10	ug/L
Tetrachloroethene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
Styrene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
Cyclohexane	ND	1.0	ug/L
Methyl acetate	ND	10	ug/L
Methylcyclohexane	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	98	(73 - 122)
1,2-Dichloroethane-d4	95	(61 - 128)
Toluene-d8	100	(76 - 110)
4-Bromofluorobenzene	84	(74 - 116)

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Client Sample ID: TB-12636-100902-DD-004

GC/MS Volatiles

Lot-Sample #...: A2J110317-004	**Work Order #...:** E9V5K1AA	**Matrix.....:** WQ
Date Sampled...: 10/09/02	**Date Received..:** 10/11/02	
Prep Date.....: 10/16/02	**Analysis Date..:** 10/16/02	
Prep Batch #...: 2290209		
Dilution Factor: 1	**Initial Wgt/Vol:** 5 mL	**Final Wgt/Vol..:** 5 mL
	Method.....: SW846 8260B	

PARAMETER	RESULT	REPORTING LIMIT	UNITS
1,2-Dibromo-3-chloro-propane	ND	1.0	ug/L
1,2-Dibromoethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
Dichlorodifluoromethane	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
Trichlorofluoromethane	ND	1.0	ug/L
Isopropylbenzene	ND	1.0	ug/L
1,2,4-Trichloro-benzene	ND	1.0	ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	5.0	ug/L
Chloromethane	ND	2.0	ug/L
Bromomethane	ND	1.0	ug/L
Vinyl chloride	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Methylene chloride	ND	1.0	ug/L
Acetone	**1.6 J**	**10**	**ug/L**
Carbon disulfide	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
2-Butanone	**1.0 J**	**10**	**ug/L**
1,1,1-Trichloroethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Benzene	ND	1.0	ug/L

(Continued on next page)

CONESTOGA ROVERS & ASSOC.,INC.

Client Sample ID: TB-12636-100902-DD-004

GC/MS Volatiles

Lot-Sample #...: A2J110317-004 **Work Order #...:** E9V5K1AA **Matrix.....:** WQ

PARAMETER	RESULT	REPORTING LIMIT	UNITS
trans-1,3-Dichloropropene	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	10	ug/L
2-Hexanone	ND	10	ug/L
Tetrachloroethene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
Styrene	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
Cyclohexane	ND	1.0	ug/L
Methyl acetate	ND	10	ug/L
Methylcyclohexane	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	100	(73 - 122)
1,2-Dichloroethane-d4	94	(61 - 128)
Toluene-d8	103	(76 - 110)
4-Bromofluorobenzene	86	(74 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

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METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: A2J110317
MB Lot-Sample #: A2J170000-209

Work Order #...: E966T1AA
Prep Date.....: 10/16/02
Prep Batch #...: 2290209
Initial Wgt/Vol: 5 mL

Matrix.....: WATER
Final Wgt/Vol..: 5 mL

Analysis Date..: 10/16/02
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Acetone	ND	10	ug/L	SW846 8260B
Benzene	ND	1.0	ug/L	SW846 8260B
Bromodichloromethane	ND	1.0	ug/L	SW846 8260B
Bromoform	ND	1.0	ug/L	SW846 8260B
Bromomethane	ND	1.0	ug/L	SW846 8260B
2-Butanone	ND	10	ug/L	SW846 8260B
Carbon disulfide	ND	1.0	ug/L	SW846 8260B
Carbon tetrachloride	ND	1.0	ug/L	SW846 8260B
Chlorobenzene	ND	1.0	ug/L	SW846 8260B
Dibromochloromethane	ND	1.0	ug/L	SW846 8260B
Chloroethane	ND	2.0	ug/L	SW846 8260B
Chloroform	ND	1.0	ug/L	SW846 8260B
Chloromethane	ND	2.0	ug/L	SW846 8260B
1,1-Dichloroethane	ND	1.0	ug/L	SW846 8260B
1,2-Dichloroethane	ND	1.0	ug/L	SW846 8260B
1,1-Dichloroethene	ND	1.0	ug/L	SW846 8260B
cis-1,2-Dichloroethene	ND	0.50	ug/L	SW846 8260B
trans-1,2-Dichloroethene	ND	0.50	ug/L	SW846 8260B
1,2-Dichloropropane	ND	1.0	ug/L	SW846 8260B
cis-1,3-Dichloropropene	ND	1.0	ug/L	SW846 8260B
trans-1,3-Dichloropropene	ND	1.0	ug/L	SW846 8260B
Ethylbenzene	ND	1.0	ug/L	SW846 8260B
2-Hexanone	ND	10	ug/L	SW846 8260B
Methylene chloride	0.35 J	1.0	ug/L	SW846 8260B
4-Methyl-2-pentanone	ND	10	ug/L	SW846 8260B
Styrene	ND	1.0	ug/L	SW846 8260B
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L	SW846 8260B
Tetrachloroethene	ND	1.0	ug/L	SW846 8260B
Toluene	ND	1.0	ug/L	SW846 8260B
1,1,1-Trichloroethane	ND	1.0	ug/L	SW846 8260B
1,1,2-Trichloroethane	ND	1.0	ug/L	SW846 8260B
Trichloroethene	ND	1.0	ug/L	SW846 8260B
Vinyl chloride	ND	1.0	ug/L	SW846 8260B
Xylenes (total)	ND	1.0	ug/L	SW846 8260B
Dichlorodifluoromethane	ND	1.0	ug/L	SW846 8260B
Trichlorofluoromethane	ND	1.0	ug/L	SW846 8260B
Isopropylbenzene	ND	1.0	ug/L	SW846 8260B
Methyl acetate	ND	10	ug/L	SW846 8260B
Methylcyclohexane	ND	1.0	ug/L	SW846 8260B
1,2,4-Trichloro-benzene	ND	1.0	ug/L	SW846 8260B

(Continued on next page)

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: A2J110317 **Work Order #...:** E966T1AA **Matrix.....:** WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1.0	ug/L	SW846 8260B
Methyl tert-butyl ether (MTBE)	ND	5.0	ug/L	SW846 8260B
1,2-Dibromo-3-chloro-propane	ND	1.0	ug/L	SW846 8260B
Cyclohexane	ND	1.0	ug/L	SW846 8260B
1,2-Dibromoethane	ND	1.0	ug/L	SW846 8260B
1,2-Dichlorobenzene	ND	1.0	ug/L	SW846 8260B
1,3-Dichlorobenzene	ND	1.0	ug/L	SW846 8260B
1,4-Dichlorobenzene	ND	1.0	ug/L	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	95	(73 - 122)
1,2-Dichloroethane-d4	89	(61 - 128)
Toluene-d8	100	(76 - 110)
4-Bromofluorobenzene	85	(74 - 116)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

J Estimated result. Result is less than RL.

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LABORATORY CONTROL SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #...: A2J110317 **Work Order #...:** E966T1AC-LCS **Matrix.....:** WATER
LCS Lot-Sample#: A2J170000-209 E966T1AD-LCSD
Prep Date.....: 10/16/02 **Analysis Date..:** 10/16/02
Prep Batch #...: 2290209
Dilution Factor: 1 **Final Wgt/Vol..:** 5 mL
Initial Wgt/Vol: 5 mL

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	RPD	METHOD
1,1-Dichloroethene	10	9.8	ug/L	98		SW846 8260B
	10	9.5	ug/L	95	2.5	SW846 8260B
Trichloroethene	10	8.9	ug/L	89		SW846 8260B
	10	8.9	ug/L	89	0.29	SW846 8260B
Benzene	10	10	ug/L	103		SW846 8260B
	10	10	ug/L	103	0.010	SW846 8260B
Toluene	10	10	ug/L	102		SW846 8260B
	10	10	ug/L	102	0.080	SW846 8260B
Chlorobenzene	10	10	ug/L	103		SW846 8260B
	10	10	ug/L	100	2.2	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	97	(73 - 122)
	96	(73 - 122)
1,2-Dichloroethane-d4	98	(61 - 128)
	98	(61 - 128)
Toluene-d8	97	(76 - 110)
	97	(76 - 110)
4-Bromofluorobenzene	95	(74 - 116)
	94	(74 - 116)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A2J110317 **Work Order #...:** E966T1AC-LCS **Matrix.....:** WATER
LCS Lot-Sample#: A2J170000-209 E966T1AD-LCSD
Prep Date.....: 10/16/02 **Analysis Date..:** 10/16/02
Prep Batch #...: 2290209
Dilution Factor: 1 **Final Wgt/Vol..:** 5 mL
Initial Wgt/Vol: 5 mL

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
1,1-Dichloroethene	98	(63 - 130)			SW846 8260B
	95	(63 - 130)	2.5	(0-20)	SW846 8260B
Trichloroethene	89	(75 - 122)			SW846 8260B
	89	(75 - 122)	0.29	(0-20)	SW846 8260B
Benzene	103	(80 - 116)			SW846 8260B
	103	(80 - 116)	0.010	(0-20)	SW846 8260B
Toluene	102	(74 - 119)			SW846 8260B
	102	(74 - 119)	0.080	(0-20)	SW846 8260B
Chlorobenzene	103	(76 - 117)			SW846 8260B
	100	(76 - 117)	2.2	(0-20)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	97	(73 - 122)
	96	(73 - 122)
1,2-Dichloroethane-d4	98	(61 - 128)
	98	(61 - 128)
Toluene-d8	97	(76 - 110)
	97	(76 - 110)
4-Bromofluorobenzene	95	(74 - 116)
	94	(74 - 116)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

MATRIX SPIKE SAMPLE DATA REPORT

GC/MS Volatiles

Client Lot #...: A2J110317 **Work Order #...:** E9NT01AC-MS **Matrix.....:** WATER
MS Lot-Sample #: A2J090326-003 E9NT01AD-MSD
Date Sampled...: 10/08/02 11:00 **Date Received..:** 10/09/02
Prep Date.....: 10/16/02 **Analysis Date..:** 10/16/02
Prep Batch #...: 2290209
Dilution Factor: 1 **Initial Wgt/Vol:** 5 mL **Final Wgt/Vol..:** 5 mL

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD
1,1-Dichloroethene	ND	10	11	ug/L	108		SW846 8260B
	ND	10	11	ug/L	114	4.6	SW846 8260B
Trichloroethene	ND	10	9.3	ug/L	93		SW846 8260B
	ND	10	9.3	ug/L	93	0.04	SW846 8260B
Benzene	ND	10	11	ug/L	107		SW846 8260B
	ND	10	11	ug/L	106	0.93	SW846 8260B
Toluene	ND	10	11	ug/L	106		SW846 8260B
	ND	10	10	ug/L	105	0.73	SW846 8260B
Chlorobenzene	ND	10	10	ug/L	104		SW846 8260B
	ND	10	10	ug/L	103	1.4	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	97	(73 - 122)
	95	(73 - 122)
1,2-Dichloroethane-d4	98	(61 - 128)
	97	(61 - 128)
Toluene-d8	97	(76 - 110)
	95	(76 - 110)
4-Bromofluorobenzene	96	(74 - 116)
	92	(74 - 116)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A2J110317 **Work Order #...:** E9NT01AC-MS **Matrix.....:** WATER
MS Lot-Sample #: A2J090326-003 E9NT01AD-MSD
Date Sampled...: 10/08/02 11:00 **Date Received..:** 10/09/02
Prep Date.....: 10/16/02 **Analysis Date..:** 10/16/02
Prep Batch #...: 2290209
Dilution Factor: 1 **Initial Wgt/Vol:** 5 mL **Final Wgt/Vol..:** 5 mL

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
1,1-Dichloroethene	108	(62 - 130)			SW846 8260B
	114	(62 - 130)	4.6	(0-20)	SW846 8260B
Trichloroethene	93	(62 - 130)			SW846 8260B
	93	(62 - 130)	0.04	(0-20)	SW846 8260B
Benzene	107	(78 - 118)			SW846 8260B
	106	(78 - 118)	0.93	(0-20)	SW846 8260B
Toluene	106	(70 - 119)			SW846 8260B
	105	(70 - 119)	0.73	(0-20)	SW846 8260B
Chlorobenzene	104	(76 - 117)			SW846 8260B
	103	(76 - 117)	1.4	(0-20)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	97	(73 - 122)
	95	(73 - 122)
1,2-Dichloroethane-d4	98	(61 - 128)
	97	(61 - 128)
Toluene-d8	97	(76 - 110)
	95	(76 - 110)
4-Bromofluorobenzene	96	(74 - 116)
	92	(74 - 116)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

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STL DENVER DATA

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CONESTOGA ROVERS & ASSOC.,INC.

Client Sample ID: GW-12636-100802-DD-001

DISSOLVED Metals

Lot-Sample #...: A2J110317-001 **Matrix.....:** WG
Date Sampled...: 10/08/02 10:30 **Date Received..:** 10/11/02

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 2289448						
Lead	ND	3.0	ug/L	SW846 6010B	10/18-10/22/02	E9V5A1AC
		Dilution Factor: 1		MDL.....: 2.0		

FORM 1
Equivalent

CONESTOGA ROVERS & ASSOC., INC.

Client Sample ID: GW-12636-100802-DD-002

DISSOLVED Metals

Lot-Sample #...: A2J110317-002 Matrix.....: WG
Date Sampled...: 10/08/02 21:30 Date Received..: 10/11/02

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 2289448						
Lead	ND	3.0	ug/L	SW846 6010B	10/18-10/22/02	E9V5E1AC
		Dilution Factor: 1		MDL.....: 2.0		

FORM 1
Equivalent

CONESTOGA ROVERS & ASSOC., INC.

Client Sample ID: GW-12636-100902-DD-003

DISSOLVED Metals

Lot-Sample #...: A2J110317-003 Matrix.....: WG
Date Sampled...: 10/09/02 09:30 Date Received..: 10/11/02

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 2289448						
Lead	ND	3.0	ug/L	SW846 6010B	10/18-10/22/02	E9V5J1AC
		Dilution Factor: 1		MDL.....: 2.0		

FORM 1
Equivalent

METHOD BLANK REPORT

DISSOLVED Metals

Client Lot #...: A2J110317 Matrix.....: WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: D2J160000-448 Prep Batch #...: 2289448						
Lead	ND	3.0	ug/L	SW846 6010B	10/18-10/22/02	E95V81CA
		Dilution Factor: 1				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results

FORM 3
Equivalent

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DISSOLVED METALS

-3-

BLANKS

Contract: CONESTOGA ROVERS & ASSOC., INC.

Lab Code: STLDEN Case No.: _____ SAS No.: _____ SDG NO.: A2J110317

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Lead	2.00	U	2.00	U	2.00	U	2.20	B	2.0	U	P

Comments:

STL DENVER

DISSOLVED METALS

-3-

BLANKS

Contract: CONESTOGA ROVERS & ASSOC., INC.

Lab Code: STLDEN Case No.: _____ SAS No.: _____ SDG NO.: A2J110317

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Lead			2.64	B	2.00	U	2.00	U			P

Comments:

DISSOLVED METALS

-3-

BLANKS

Contract: CONESTOGA ROVERS & ASSOC., INC.

Lab Code: STLDEN Case No.: _____ SAS No.: _____ SDG NO.: A2J110317

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Lead			2.00	U							P

Comments:

MATRIX SPIKE SAMPLE DATA REPORT

DISSOLVED Metals

Client Lot #...: A2J110317 Matrix.....: WATER
Date Sampled...: 10/10/02 14:10 Date Received..: 10/11/02

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: D2J110429-001 Prep Batch #...: 2289448									
Lead									
	ND	500	452 N	ug/L	90		SW846 6010B	10/18-10/22/02	E9W0F1CW
	ND	500	458	ug/L	92	1.2	SW846 6010B	10/18-10/22/02	E9W0F1CX

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

N Spiked analyte recovery is outside stated control limits.

FORM 5A
Equivalent

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MATRIX SPIKE SAMPLE EVALUATION REPORT

DISSOLVED Metals

Client Lot #...: A2J110317 Matrix.....: WATER
Date Sampled...: 10/10/02 14:10 Date Received..: 10/11/02

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: D2J110429-001 Prep Batch #...: 228944B							
Lead	90 N	(91 - 112)			SW846 6010B	10/18-10/22/02	E9W0F1CW
	92	(91 - 112)	1.2	(0-20)	SW846 6010B	10/18-10/22/02	E9W0F1CX

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

N Spiked analyte recovery is outside stated control limits.

FORM 5A
Equivalent

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LABORATORY CONTROL SAMPLE DATA REPORT

DISSOLVED Metals

Client Lot #...: A2J110317 Matrix.....: WATER

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: D2J160000-448 Prep Batch #...: 2289448							
Lead	500	502	ug/L	100	SW846 6010B	10/18-10/22/02	E95V81CC

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM 7
Equivalent

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LABORATORY CONTROL SAMPLE EVALUATION REPORT

DISSOLVED Metals

Client Lot #...: A2J110317 Matrix.....: WATER

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: D2J160000-448 Prep Batch #...: 2289448					
Lead	100	(91 - 112)	SW846 6010B	10/18-10/22/02	E95V81CC
		Dilution Factor: 1			

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM 7
Equivalent

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Plymouth, Michigan 48170
Telephone: (734) 453-5123 Fax: (734) 453-5201
www.CRAworld.com

MEMORANDUM

TO: Sylvie Eastman

REF. NO.: 12636

FROM: Paul Wiseman/mw/155/Det.

DATE: December 19, 2002

RE: Data Quality Assessment and Validation – Expanded Deliverables
Former Peregrine (US) Inc. Coldwater Road Facility
Genesee Township, Michigan

The following details a quality assessment and validation of the analytical data resulting from the October 8, 9, and 17, 2002 collection of eight (8) water samples including two (2) quality control samples from the Coldwater Road Facility, in Genesee Township. The sample summary detailing sample identification, sample location, quality control samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Severn Trent Laboratories in North Canton, Ohio (STL) with the exception of metals analysis which was completed at STL in Denver, Colorado in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).[1]

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by STL were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometry (GC/MS) instrument used for volatile organic compounds (VOC) analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB). The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration – Organics

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for organic analyses required that all compounds meet a method-specific minimum mean relative response factor (RRF) and a maximum percent relative standard deviation (RSD). The initial calibration data for organic analyses were within the acceptance criteria indicating the instruments were capable of acceptable performance prior to analysis.

[1] Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

Initial Calibration – Inorganics

The initial calibration criteria for inorganic analysis require an initial calibration verification standard be analyzed within a method-specific percent recovery of the accepted or true value. The initial calibration data for the inorganic analyses were within the acceptance criteria indicating the instruments were capable of acceptable performance prior to analysis.

Continuing Calibration – Organics

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for organic analyses required that compounds meet a method-specific minimum RRF and maximum percent difference (D) between the initial calibration mean RRF and the continuing calibration RRF. Table 4 presents the samples which should be qualified due to violation of continuing calibration criteria. The remaining continuing calibration verification data were within the acceptance criteria.

Continuing Calibration – Inorganics

Continuing calibration criteria for inorganic analyses were the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples – Organics

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analyses of method blank samples. The laboratory method blank was reported with methylene chloride detected but the associated sample results were reported non-detect therefore, no qualification was required.

Laboratory Blank Samples – Inorganics

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of initial calibration blanks (ICB), continuing calibration blanks (CCB) and method blank samples. Several ICB/CCBs were reported with detectable concentrations but the associated sample results were either non-detect or five (5) times greater than the ICB/CCB therefore, no qualification was required. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating no laboratory-attributable contamination occurred.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses serve as a monitor of the overall performance in all steps of the sample analysis. The LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Inductively Coupled Plasma Interference Check Sample Analysis – Inorganics

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Inorganics

Matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the relative percent difference (RPD) of the concentrations were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. Non Site-specific samples were utilized for MS/MSD analysis, therefore qualification of samples associated with these MS/MSDs was not performed.

Serial Dilution – Inorganics

The percent difference (D) between serial dilutions of a sample from each matrix were monitored to determine if physical or chemical interference may be present. The percent D acceptance criteria was met.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organics

To assess the long term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and the RPD of the concentrations were determined. Non Site-specific samples were utilized for MS/MSD analysis, therefore qualification of samples associated with these MS/MSDs was not performed.

Internal Standard Summaries - Organics

Overall instrument stability and performance for the VOC analyses was monitored using internal standard peak area and retention time (RT) data. Internal standard peak areas of the samples were required to fall within method-specific percent recovery of their respective internal standard areas in the continuing calibration standard. The RT for each internal standard in the samples were required to be within method-specific time intervals of their respective internal standard RT in the continuing calibration standard. The VOC internal standard and retention time data were within the acceptance criteria.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The organics reported adhered to the specified identification criteria.

Compound Quantitation

The reported quantitation results and detection limits were checked to ensure results reported were accurate. No discrepancies were found between the raw data and the sample results reported by the laboratory.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of one (1) field duplicate sample and one (1) trip blank sample. Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample set. No target analytes were reported detected in the field duplicate sample set.

To monitor potential cross-contamination of VOC during aqueous sample transportation and storage, a trip blank was submitted to the laboratory for VOC analysis with each shipping cooler containing multiple samples. Although two (2) analytes were reported detected in the trip blank sample these analytes were not detected in the investigative samples, therefore no data qualification was required.

System Performance

System performance between various quality control checks was evaluated to monitor for changes that may have caused the degradation of data quality. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

Confidential under FOIA
Alex Rothchild
LFR
Sep 30, 2009 09:06

TABLE 1

SAMPLE SUMMARY
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Sample Identification	*Sample Location*	*Matrix*	*QC Samples*	*Parameter*
GW-12636-100802-DD-001	PFW-1	Water		VOCs, dissolved lead
GW-12636-100802-DD-002	PFW-1	Water		VOCs, dissolved lead
GW-12636-100902-DD-003	PFW-1	Water		VOCs, dissolved lead
TB-12636-100902-DD-004		Water	trip blank	VOCs
GW-12636-101702-DD-004	MW-3	Water		dissolved lead
GW-12636-101702-DD-005	MW-3	Water	Duplicate of Sample 004	dissolved lead
GW-12636-101702-DD-006	PFW-10	Water		dissolved barium
GW-12636-101702-DD-007	PFW-9	Water		dissolved lead

TABLE 2

SUMMARY OF ANALYTICAL METHODS
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	*Method*
Target Compound List (TCL) Volatile Organic Compounds (VOC)	SW-846 8260B [1]
Metals	
Barium	SW-846 6010B
Lead	SW-846 6010B

[1] SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and Promulgated updates, November 1986.

TABLE 3

HOLDING TIME PERIODS
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Analysis	*Matrix*	*Holding Time Period*
TCL VOC	Water	- 14 days from sample collection to completion of analysis
Metals (Lead and Barium)	Water	- 180 days from sample collection to completion of analysis

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Sep 30, 2009 09:06

TABLE 4

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO VIOLATION OF CONTINUING CALIBRATION ACCEPTANCE CRITERIA FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Parameters*	*Associated Samples*	*Qualifiers* [1]
VOC	Acetone	TB-12636-100902-DD-004	J
	2-Butanone		J
	2-Hexanone		UJ

[1] The parameter results should be qualified for the listed samples as:

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample (for detected parameters).

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analytes in the sample (for non-detected parameters).

APPENDIX J

FACILITY SEWER PLANS

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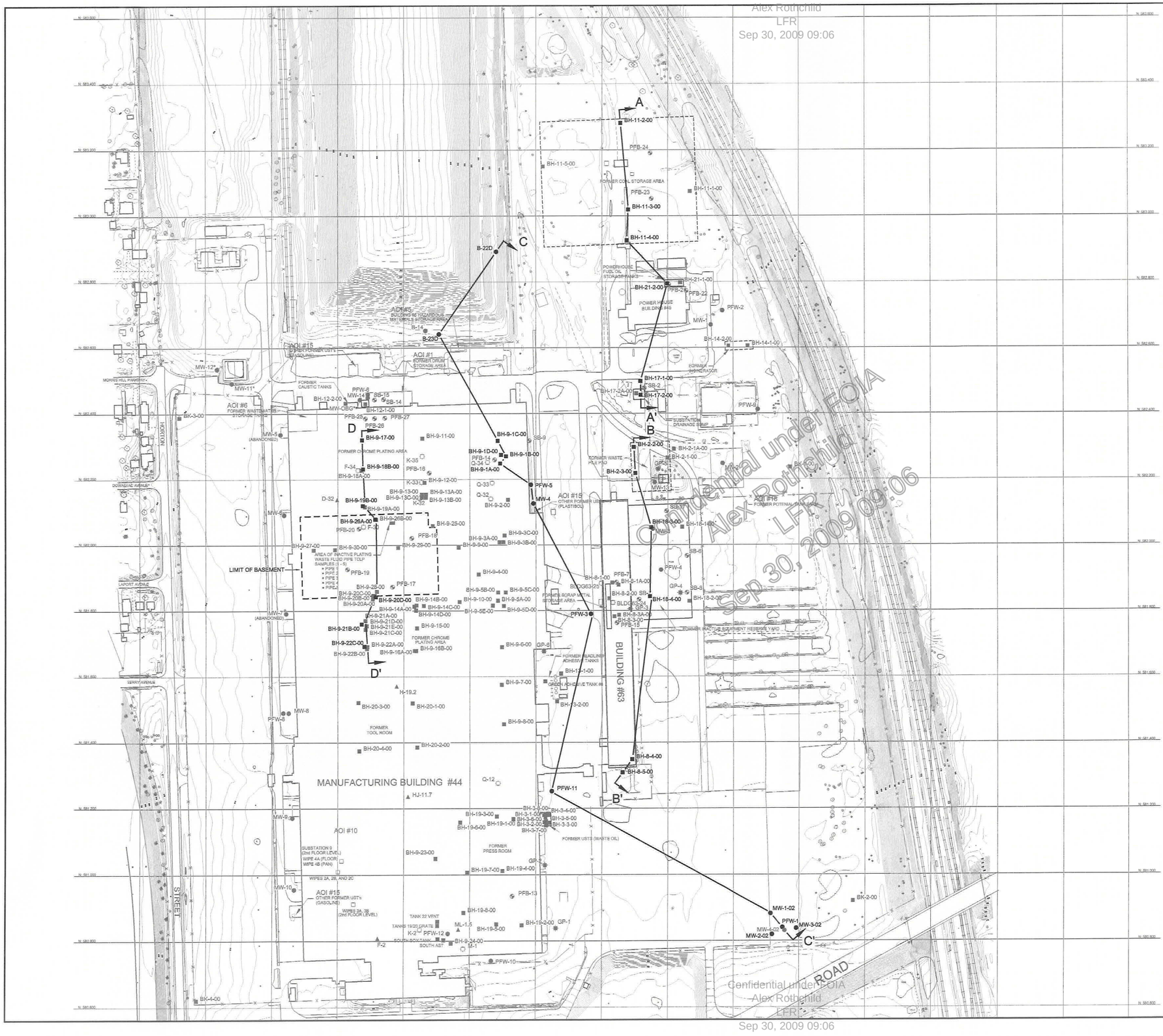
LFR
Sep 30, 2009 09:06



NOTES:
1) Reference System:
Vertical - NAVD 1988.
Horizontal - NAD 83(1994)
Michigan South zone 2113.

2) Aerial Photo Date: 3/2500
Date of Mapping: April 2000

3) Boreholes surveyed, received July 3, 2000.

NO	Revision	Date	Initial

0 50 150ft.

LEGEND

- ASPHALT LINE
- BUILDING
- FORMER BASEMENT
- CURB
- DITCH
- FENCELINE
- GRAVEL LINE
- GUARDRAIL
- RAILROAD
- ROAD
- SIDEWALK
- SHORELINE
- TRAIL
- CATCH BASIN
- FIRE HYDRANT
- MANHOLE
- TANK
- VEGETATION
- BH-18-4-00 BOREHOLE LOCATION
- MW-1 STUDY 2 MONITORING WELL LOCATION AND NUMBER
- PFW-1 STUDY 4 MONITORING WELL LOCATION AND NUMBER
- PFB-7 STUDY 4 SOIL BORING LOCATION AND NUMBER
- SB-2 STUDY 2 SOIL BORING LOCATION AND NUMBER
- GR1 STUDY 1 GEOPROBE LOCATION AND NUMBER
- Q-34 STUDY 2 GEOPROBE LOCATION AND NUMBER
- H-192 WOOD BLOCK SAMPLE LOCATION
- WIPE 3A WIPE SAMPLE LOCATION
- TANK 22 VENT TCLP SAMPLE LOCATION
- APPROXIMATE WELL LOCATION
- A A' CROSS-SECTION LOCATION

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PEREGRINE (US) INC.
COLDWATER ROAD FACILITY

REALM

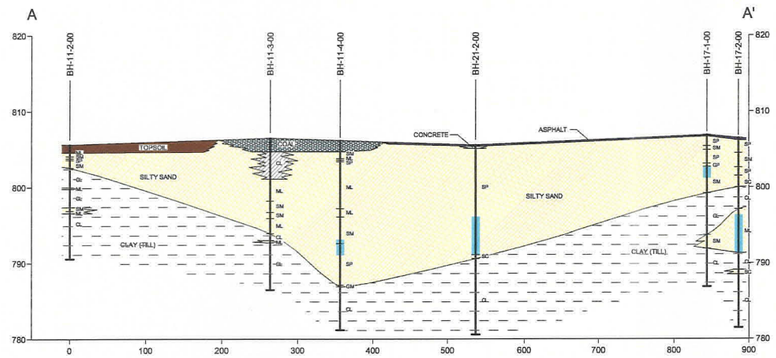
MONITORING LOCATIONS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
NOVA CONSULTANTS, INC. MAY 28, 2000

Project Manager:	Reviewed By:	Date:	
S.E.		JUNE 2002	
Scale: 1"=150'	Project No: 12636-40	Report No: 025	Drawing No: 1

12636-40(025)GN-WA002 JAN 28/2003



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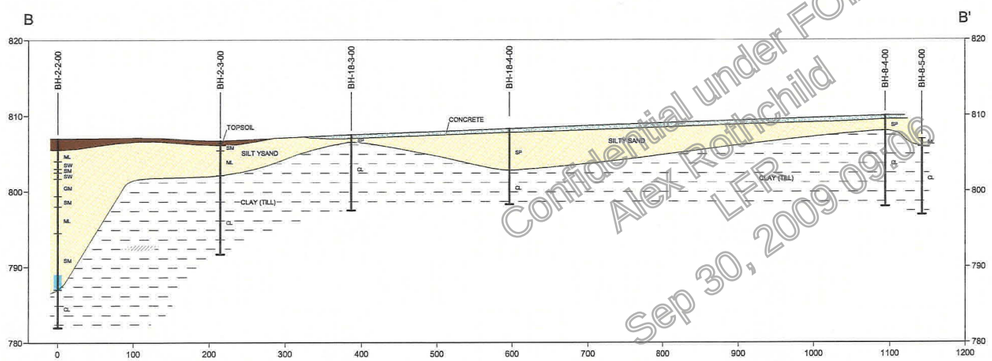

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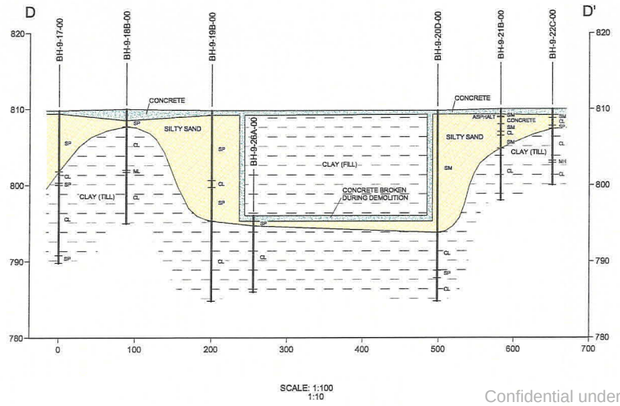


SCALE: 1:100
1:10

NO	Revision	Date	Initial

LEGEND

- TOPSOIL
- COAL
- CLAY
- SILTY SAND FILL
- DRIFT AQUIFER
- SATURATED ZONE
- WELL SCREEN
- 733.87 GROUNDWATER ELEVATION (ft. AMSL)

NOTE: WATER LEVELS MEASURED 10/8/02.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PEREGRINE (US) INC.
COLDWATER ROAD FACILITY

REALM

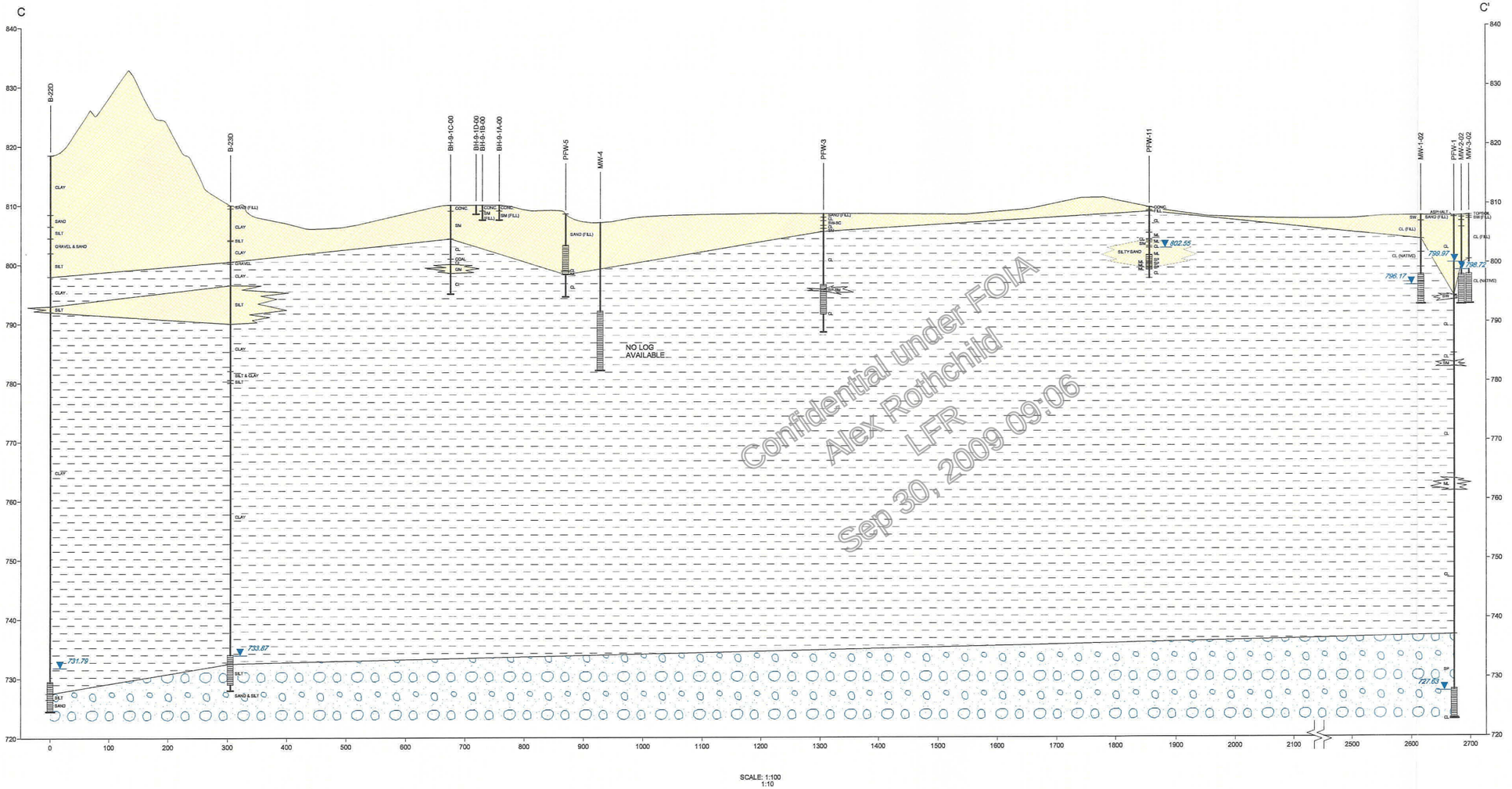
GEOLOGIC CROSS-SECTIONS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
NOVA CONSULTANTS, INC. MAY 26, 2000

Project Manager:	Reviewed By:	Date:	
S.E.		JUNE 2002	
Scale: 1"=150'	Project N°: 12636-40	Report N°: 025	Drawing N°: 2a

12636-40(025)GN-WA002 JAN 28/2003



SCALE: 1:100
1:10

N0	Revision	Date	Initial

LEGEND

- TOPSOIL
- COAL
- CLAY
- SILTY SAND FILL
- DRIFT AQUIFER
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- WELL SCREEN
- 733.87 GROUNDWATER ELEVATION (ft. AMSL)

NOTE: WATER LEVELS MEASURED 10/8/02.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PEREGRINE (US) INC.
COLDWATER ROAD FACILITY

REALM

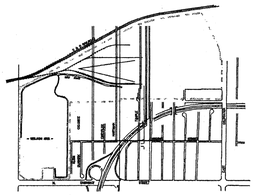
GEOLOGIC CROSS-SECTIONS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
NOVA CONSULTANTS, INC. MAY 26, 2000

Project Manager:	Reviewed By:	Date:	
S.E.		JUNE 2002	
Scale: 1"=150'	Project N°: 12636-40	Report N°: 025	Drawing N°: 2b

12636-40(025)GN-WA002 JAN 28/2003



Legend

- MANHOLE
- CNF — CAN NOT FIND
- CATCH BASIN
- ESTIMATED SURFACE DRAINAGE DIRECTION
- SANITARY LINES
- STORM LINES
- PROCESS LINES
- AST — ABOVEGROUND STORAGE TANKS
- FENCE LINE
- PROPERTY BOUNDARY
- KNOWN DRAINAGE DIRECTION
- PAVEMENT
- COLUMN LINE

1. BUILDING #63, CHEMICAL STORAGE (PAINT, ADHESIVES, FLOOR/ROOFING REPAIR MATERIAL)
2. BUILDING #63, CHEMICAL STORAGE (CORROSIVES, OILS, ADHESIVES)
3. COMPRESSED GAS STORAGE
4. MATERIALS CRIB (GENERAL STORES, AEROSOL CANS, USED BATTERIES)
5. MAINTENANCE PAINT CRIB (FLAMMABLE PAINT THINNER AND PAINT)
6. TRUCK REPAIR (ACID BATTERY STORAGE)
7. BUILDING #66, HAZARDOUS MATERIAL STORAGE (FLAMMABLE WASTE, PAINT AND PAINT RELATED MATERIAL, ADHESIVES)
8. SANITATION DEPARTMENT (2ND FLOOR CLEANING CHEMICALS)
9. BUILDING #45, POWER HOUSE (NaOH, POTASSIUM HYDROXIDE, COOLING WATER TREATMENT CHEMICALS, FUEL OIL)
10. BUILDING #68A (WASTEWATER TREATMENT PLANT) (NaOH, FERRIC CHLORIDE, LIME, 213F WATER BASED DIE LUBE, EM00 WATER BASED DIE LUBE)
11. LANDFILL CELL (TREATED FOUR WASTE)
12. UNLEADED GASOLINE AST
13. DIESEL FUEL AST's
14. EDS TOWER (LPG GAS)
15. PCB TRANSFORMERS E-5, 2nd FLOOR, BUILDING #44
16. PCB TRANSFORMERS O-7, 1st FLOOR, BUILDING #44
17. PCB TRANSFORMER N-27, 1st FLOOR, BUILDING #44

Note

1. THIS DRAWING IS FOR REFERENCE ONLY AND IS NEITHER COMPLETE NOR TO EXACTING SCALE.
2. DRAWING NO. 1795W BUICK MOTOR DIVISION SHEET NO 1M WAS USED AS A REFERENCE DRAWING.
3. OCTOBER, 1995–SECTION VI– CONTINGENCY PLAN MAP WAS USED AS A REFERENCE DRAWING.
4. INLAND FISHER GUIDE DIVISION FIGURE 4 STORM SEWER NETWORK MAP WAS USED AS A REFERENCE DRAWING.

N

STORAGE SCRAP HANDLING BUILDING #63
MAINTENANCE SHOPS
PRESS ROOM
MANUFACTURING
BUILDING #44
TOOL ROOM
STORAGE
IER YARD
OLD EQUIPMENT STORAGE
ADMINISTRATION BUILDING #44A
LANDFILL CELL
"OUTFALL" S301
"OUTFALL" S902
CURRENT ROAD
COLDWATER ROAD
HORTON STREET
I-475
WETLANDS AREA
DRAIN
GRAVEL DRAIN
LOCATION OF OLD INCINERATOR BUILDING
UNDERGROUND RESERVOIR
WATER BOOSTER BUILDING
DIESEL FUEL ASTs 100,000 GALLON 250 GALLON 250 GALLON 250 GALLON
COAL BREAKUP HOUSE
POWER HOUSE #45
MAIN SUB STATION
WATER TOWER
SUMP-PLUGGED
HOUSE SUBSTATION
IER YARD DRAINAGE EFFLUENT TO BUILDING #68 INDUSTRIAL WASTE MANAGEMENT AREA
PUMP HOUSE
NEW MANHOLE
HEW MANHOLE SOLID LID
OIL WATER PUMP IN SUMP PIT
SANDUST DISPOSAL SYSTEM
BIN STORAGE
TRUCK PARKING
EMPTY BIN STORAGE
DUST BIN STORAGE
ADHESIVE BULK STORAGE SYSTEM-INACTIVE
PARKING
EAST GUARD HOUSE
COOLING TOWERS
(VACANT) GUARD HOUSE
WATER SAMPLING SUMP
GAS METER HOUSE
VACANT GUARD HOUSE
SOUTHWEST GATE
NORTH GATE
(TRUCKS ONLY)
HAZARDOUS MATERIAL STORAGE BUILDING #66
FLOOD PROOF DOOR TRAIN OPENING
GASOLINE AST
DIESEL TANKS
#68A WASTE WATER TREATMENT BUILDING
MH #1 MH #2 MH #3 MH #4 MH #5 MH #6 MH #7 1/2 A MH #7 1/2 B MH #8A MH #9 MH #10 MH #53A MH #54 MH #55 MH #56 MH #57 MH #58 MH #59 MH #60 MH #61 MH #62 MH #63 MH #64 MH #65 MH #66 MH #67 MH #68 MH #69 MH #70 MH #71 MH #72 MH #73 MH #74 MH #75 MH #76 MH #77 MH #78 MH #79 MH #80 MH #81 MH #82 MH #83 MH #84 MH #85 MH #86 MH #87 MH #88 MH #89 MH #90 MH #91 MH #92 MH #93 MH #94 MH #95 MH #96 MH #97 MH #98 MH #99 MH #100 MH #101 MH #102 MH #103 MH #104 MH #105 MH #106 MH #107 MH #108 MH #109 MH #110 MH #111 MH #112 MH #113 MH #114 MH #115 MH #116 MH #117 MH #118 MH #119 MH #120 MH #121 MH #122 MH #123 MH #124 MH #125 MH #126 MH #127 MH #128 MH #129 MH #130 MH #131 MH #132 MH #133 MH #134 MH #135 MH #136 MH #137 MH #138 MH #139 MH #140 MH #141 MH #142 MH #143 MH #144 MH #145 MH #146 MH #147 MH #148 MH #149 MH #150 MH #151 MH #152 MH #153 MH #154 MH #155 MH #156 MH #157 MH #158 MH #159 MH #160 MH #161 MH #162 MH #163 MH #164 MH #165 MH #166 MH #167 MH #168 MH #169 MH #170 MH #171 MH #172 MH #173 MH #174 MH #175 MH #176 MH #177 MH #178 MH #179 MH #180 MH #181 MH #182 MH #183 MH #184 MH #185 MH #186 MH #187 MH #188 MH #189 MH #190 MH #191 MH #192 MH #193 MH #194 MH #195 MH #196 MH #197 MH #198 MH #199 MH #200 MH #201 MH #202 MH #203 MH #204 MH #205 MH #206 MH #207 MH #208 MH #209 MH #210 MH #211 MH #212 MH #213 MH #214 MH #215 MH #216 MH #217 MH #218 MH #219 MH #220 MH #221 MH #222 MH #223 MH #224 MH #225 MH #226 MH #227 MH #228 MH #229 MH #230 MH #231 MH #232 MH #233 MH #234 MH #235 MH #236 MH #237 MH #238 MH #239 MH #240 MH #241 MH #242 MH #243 MH #244 MH #245 MH #246 MH #247 MH #248 MH #249 MH #250 MH #251 MH #252 MH #253 MH #254 MH #255 MH #256 MH #257 MH #258 MH #259 MH #260 MH #261 MH #262 MH #263 MH #264 MH #265 MH #266 MH #267 MH #268 MH #269 MH #270 MH #271 MH #272 MH #273 MH #274 MH #275 MH #276 MH #277 MH #278 MH #279 MH #280 MH #281 MH #282 MH #283 MH #284 MH #285 MH #286 MH #287 MH #288 MH #289 MH #290 MH #291 MH #292 MH #293 MH #294 MH #295 MH #296 MH #297 MH #298 MH #299 MH #300 MH #301 MH #302 MH #303 MH #304 MH #305 MH #306 MH #307 MH #308 MH #309 MH #310 MH #311 MH #312 MH #313 MH #314 MH #315 MH #316 MH #317 MH #318 MH #319 MH #320 MH #321 MH #322 MH #323 MH #324 MH #325 MH #326 MH #327 MH #328 MH #329 MH #330 MH #331 MH #332 MH #333 MH #334 MH #335 MH #336 MH #337 MH #338 MH #339 MH #340 MH #341 MH #342 MH #343 MH #344 MH #345 MH #346 MH #347 MH #348 MH #349 MH #350 MH #351 MH #352 MH #353 MH #354 MH #355 MH #356 MH #357 MH #358 MH #359 MH #360 MH #361 MH #362 MH #363 MH #364 MH #365 MH #366 MH #367 MH #368 MH #369 MH #370 MH #371 MH #372 MH #373 MH #374 MH #375 MH #376 MH #377 MH #378 MH #379 MH #380 MH #381 MH #382 MH #383 MH #384 MH #385 MH #386 MH #387 MH #388 MH #389 MH #390 MH #391 MH #392 MH #393 MH #394 MH #395 MH #396 MH #397 MH #398 MH #399 MH #400 MH #401 MH #402 MH #403 MH #404 MH #405 MH #406 MH #407 MH #408 MH #409 MH #410 MH #411 MH #412 MH #413 MH #414 MH #415 MH #416 MH #417 MH #418 MH #419 MH #420 MH #421 MH #422 MH 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#548 MH #549 MH #550 MH #551 MH #552 MH #553 MH #554 MH #555 MH #556 MH #557 MH #558 MH #559 MH #560 MH #561 MH #562 MH #563 MH #564 MH #565 MH #566 MH #567 MH #568 MH #569 MH #570 MH #571 MH #572 MH #573 MH #574 MH #575 MH #576 MH #577 MH #578 MH #579 MH #580 MH #581 MH #582 MH #583 MH #584 MH #585 MH #586 MH #587 MH #588 MH #589 MH #590 MH #591 MH #592 MH #593 MH #594 MH #595 MH #596 MH #597 MH #598 MH #599 MH #600 MH #601 MH #602 MH #603 MH #604 MH #605 MH #606 MH #607 MH #608 MH #609 MH #610 MH #611 MH #612 MH #613 MH #614 MH #615 MH #616 MH #617 MH #618 MH #619 MH #620 MH #621 MH #622 MH #623 MH #624 MH #625 MH #626 MH #627 MH #628 MH #629 MH #630 MH #631 MH #632 MH #633 MH #634 MH #635 MH #636 MH #637 MH #638 MH #639 MH #640 MH #641 MH #642 MH #643 MH #644 MH #645 MH #646 MH #647 MH #648 MH #649 MH #650 MH #651 MH #652 MH #653 MH #654 MH #655 MH #656 MH #657 MH #658 MH #659 MH #660 MH #661 MH #662 MH #663 MH #664 MH #665 MH #666 MH #667 MH #668 MH #669 MH #670 MH #671 MH #672 MH 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#798 MH #799 MH #800 MH #801 MH #802 MH #803 MH #804 MH #805 MH #806 MH #807 MH #808 MH #809 MH #810 MH #811 MH #812 MH #813 MH #814 MH #815 MH #816 MH #817 MH #818 MH #819 MH #820 MH #821 MH #822 MH #823 MH #824 MH #825 MH #826 MH #827 MH #828 MH #829 MH #830 MH #831 MH #832 MH #833 MH #834 MH #835 MH #836 MH #837 MH #838 MH #839 MH #840 MH #841 MH #842 MH #843 MH #844 MH #845 MH #846 MH #847 MH #848 MH #849 MH #850 MH #851 MH #852 MH #853 MH #854 MH #855 MH #856 MH #857 MH #858 MH #859 MH #860 MH #861 MH #862 MH #863 MH #864 MH #865 MH #866 MH #867 MH #868 MH #869 MH #870 MH #871 MH #872 MH #873 MH #874 MH #875 MH #876 MH #877 MH #878 MH #879 MH #880 MH #881 MH #882 MH #883 MH #884 MH #885 MH #886 MH #887 MH #888 MH #889 MH #890 MH #891 MH #892 MH #893 MH #894 MH #895 MH #896 MH #897 MH #898 MH #899 MH #900 MH #901 MH #902 MH #903 MH #904 MH #905 MH #906 MH #907 MH #908 MH #909 MH #910 MH #911 MH #912 MH #913 MH #914 MH #915 MH #916 MH #917 MH #918 MH #919 MH #920 MH #921 MH #922 MH 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APPROXIMATE SCALE IN FEET
0 75 150 225

THE TRAVELER GROUP

A9608016/00000/AA-000 REV: 12/02/96 GH CHKD: GT

DELPHI interior & Lighting Systems

FIGURE 2
SITE DRAIN MAP
DELPHI INTERIOR LIG
FLINT COLDWATER ROAD PLANT
FLINT, MICHIGAN