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TRANSMITTAL LETTER

To: Ms. Jaclynne Drummond, North Carolina Department of Environment and Natural Resources

From: Mr. Alec Macbeth, P.G.

Date: September 7, 2010

cc: Mr. Chad Parker, Jackson County Solid Waste Department

Subject: Assessment of Corrective Measures Report

Ms. Drummond,

Please find attached the subject report and its attachments for the Jackson County Municipal Solid Waste Landfill, Permit number 50-02. We understand that this report is a few days behind schedule, and we appreciate your patience.

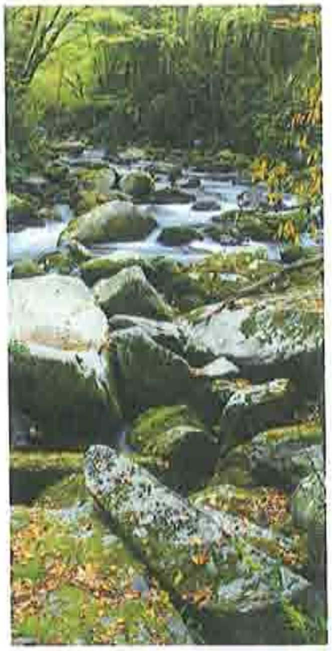
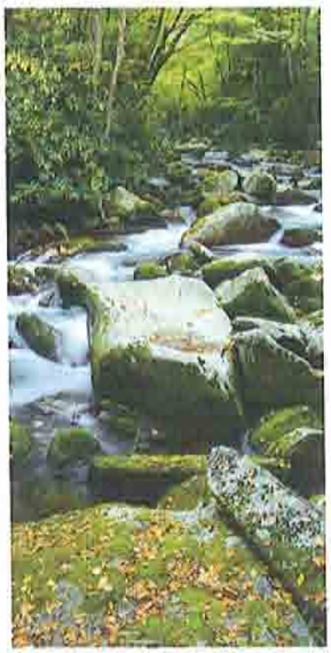
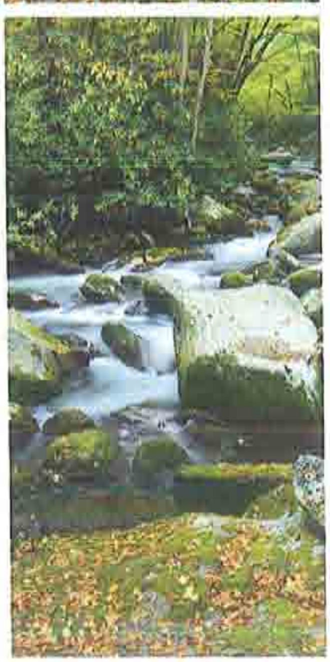
We also appreciate your time and consideration on this project. We look forward to discussing this report with you.

Sincerely,

ALTAMONT ENVIRONMENTAL, INC.

Alec Macbeth, P.G.

Enclosures: Assessment of Corrective Measures Report

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

Assessment of Corrective Measures

Jackson County

Municipal Solid Waste Landfill

Permit No. 50-02

September 7, 2010

Prepared for
Jackson County Solid Waste Department

Prepared by
Altamont Environmental, Inc.
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Assessment of Corrective Measures

Jackson County
Municipal Solid Waste Landfill

Permit No. 50-02

September 7, 2010

Alec Macbeth 9/7/10
Alec Macbeth, PG
Project Geologist

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1.0 Introduction

The Jackson County Solid Waste Department maintains a closed Municipal Solid Waste Landfill (MSWLF) located approximately 0.8 miles west of Dillsboro, North Carolina, on the northeast side of Haywood Road (also referred to as Old Dillsboro Road and Old U.S. Highway 74; Figure 1). The water quality monitoring at the landfill is governed by the North Carolina Department of Environment and Natural Resources (DENR), Division of Waste Management (DWM), Solid Waste Section (SWS), under Permit No. 50-02 issued to Jackson County. The landfill permit requires semiannual monitoring of groundwater and surface water quality. Samples are collected from selected monitoring points during the spring and fall of each year. The analytical suites associated with the most recent sampling event and upcoming sampling events are as follows:

Sampling Event	Analytical Suite
Spring 2010	Appendix I Volatile Organic Compounds (VOCs) Appendix I metals
Fall 2010	Appendix II VOCs Appendix II metals Appendix II herbicides Cyanide and sulfide Appendix II semivolatile organic compounds (SVOCs) Appendix II polychlorinated biphenyls (PCBs) Appendix II pesticides Appendix II organochloropesticides
Spring 2011	Appendix I VOCs Appendix I metals
Fall 2011	Appendix II VOCs Appendix II metals Appendix II herbicides Cyanide and sulfide

The semiannual sampling events are conducted and reported to DENR in accordance with requirements stipulated in the North Carolina DENR Solid Waste Management Rules codified under Title 15A Subchapter 13B of the North Carolina Administrative Code (15A NCAC 13B).

Historically, VOCs and metals have been detected in some of the groundwater samples at concentrations generally slightly exceeding the DENR 2L Standards. No detections or exceedences have ever been detected in the surface water samples collected from the Tuckasegee River. In the spring 2004 semiannual report, Altamont conducted additional characterization and a corrective measures evaluation to determine an appropriate response to these exceedences (Altamont, 2004). This characterization and corrective measures evaluation is discussed further in Section 2.0. On the basis of continued exceedences, DENR has required the development of an Assessment of Corrective Measures (ACM; DENR, 2010). This report and its associated activities are intended to meet that requirement. In accordance with DENR's letter, a public meeting will be conducted to discuss the results of this report once it has been reviewed by the DENR SWS. (This is discussed further in Section 8.0.) A Corrective Action Plan will be developed after approval of the selected remedy.

2.0 Site Background and History

The following bullets summarize key events in the landfill water quality monitoring program:

- Jackson County began implementing the assessment (Appendix II) groundwater semiannual sampling in 1998.
- Altamont began collecting the water monitoring samples and generating the semiannual reports in 1998.
- In 1999, MW-01 was installed in bedrock in the northeast-central part of the landfill just west of the ridgeline. This monitoring well was initially installed as a background well, but it exhibits groundwater impacted with VOCs.
- In the late 1990s, Jackson County began sampling residential potable water supply wells on an annual basis from residents who consented to the sampling. One adjacent landowner has denied access and therefore no groundwater samples have been collected from his water well.
- In the late 1990s, Jackson County installed and began monitoring landfill gas (LFG) probes along the perimeter of the landfill property.
- The final acceptance of waste was received at the landfill in June 2001.
- Monitoring well MW-06 was installed into bedrock in 2004 to evaluate whether impacted groundwater could be migrating northward toward a water well located on an adjacent residential property.
- In winter 2005, Jackson County began the full-scale operation of nine LFG extraction wells screened within the landfill waste. To the extent that landfill gas can mobilize VOCs, it was thought that the removal of the gas may provide benefits to the groundwater quality.
- In July 2010, an additional bedrock monitoring well, MW-07, was installed clustered with the saprolite monitoring well MW-04 to evaluate groundwater quality in fractured bedrock southwest (downgradient) of the landfill (Section 3.0).

Currently, there are seven monitoring wells (four bedrock, one partially weathered rock, and two saprolite), nine LFG extraction wells, and 26 LFG probes at the Jackson County landfill. The locations of these features are shown on Figure 2.

2.1 Physical Characteristics

The Jackson County Landfill lies within rugged mountainous terrain consisting of steep slopes reflecting thousands of feet of topographic relief (Figure 1). The landfill lies on a southwestward-facing slope that extends down to the Tuckasegee River, which is a moderate-sized river that drains an approximately 640 square mile watershed. The Jackson County property extends from a ridgeline to the northeast down to the river's edge (approximately 200 feet of relief). The property is cut by easements for NCDOT's Haywood Road and the Great Smokey Mountain Railroad (Figure 3). The landfill is bounded to the southeast by the Green Energy Park, the Jackson County Maintenance Building, and the Great Smokey Mountain Railroad (GSMR). The remaining four parcels adjacent to the landfill to the north and east are single family residential (Figure 3). As mentioned in Section 1.0, Jackson County has historically collected annual groundwater samples from the supply wells at two of these adjacent properties. The owner of the property north of the landfill property has refused access for sampling.

2.2 Local Geology and Hydrogeology

The local geology is typical for the region. It consists of a mantle of soil/saprolite and partially weathered rock (PWR) overlying fractured and jointed bedrock (which has been mapped as part of the Ocoee Supergroup. Figures 4 through 7 are cross-sections that may prove helpful in the following discussion. The depth to competent bedrock is variable. It has been measured at depths ranging from 13 feet below ground surface (bgs) in MW-02 in the western part of the site near the Tuckasegee River to 83 feet bgs in MW-01 near the ridgeline in the eastern part of the site (Table 1). The thickness of the PWR is variable and has not been consistently noted in monitoring well boring logs, which have been prepared by various consultants since environmental investigation activities were initiated.

Joints and fractures identified and mapped at the site exhibit varying orientation; however, a prominent northwest-southeast fracture set is evident throughout the area (Altamont, 2004).

An exposure of the Hayesville Fault is present in the railroad bed and road cut near the northwestern corner of the landfill. At this location, the Hayesville Fault consists of an approximately 50 to 100-foot-wide zone of highly weathered and sheared rock with prominent sulfidic staining common in alteration zones in the area.

Locally, the Hayesville Fault is the contact between metagreywacke of the Great Smokey Group to the north and biotite gneiss of the Tallulah Falls Formation to the south. This fault is inferred to continue toward the northeast, running essentially along the northern boundary of the landfill (Figure 2). The hydrogeologic significance of this feature is unclear. However, fault features may locally influence groundwater flow patterns.

Hydrogeology in the area is characterized by a locally present but discontinuous unconfined water-bearing zone in the saprolite and PWR, and a water-bearing zone within fractures and joints of the underlying bedrock. Water level data from monitoring wells near the landfill indicate that groundwater in the saprolite and PWR is unconfined; groundwater in the underlying bedrock may be unconfined to semi-confined (Table 2). As discussed in Altamont (2004) and shown in Figures 4 and 6, the saprolite in the northern part of the site does not contain a significant amount of groundwater. During the most recent measuring event on August 25, 2010, the saprolite monitoring well MW-05 could not be accessed, because of very thick kudzu. However, the depths to groundwater in the other two saprolite/PWR monitoring wells ranged from 28.5 feet bgs in MW-03 to 53.8 feet bgs in MW-04 (Tables 1 and 2). Because only two monitoring wells were gauged, a lateral groundwater flow direction could not be calculated. Flow directions measured during semiannual water quality monitoring, though, have consistently been to the southwest toward the Tuckasegee River. The measured horizontal hydraulic gradient in the saprolite measured during the spring 2010 sampling event (April 13, 2010) is 0.13. The groundwater in the saprolite in the southern part of the site probably discharges to the river; the water level elevation in MW-04 is roughly the same elevation as the river water surface (1950 feet above mean sea level [MSL]).

The measured depths to groundwater in the bedrock ranged from 27.0 feet bgs to 99.2 feet bgs on August 25, 2010 (Tables 1 and 2). The interpreted potentiometric surface (Figure 8) shows groundwater flow to the southwest at a horizontal gradient of approximately 0.14. Based on the potentiometric surface elevations measured in the well cluster MW-04 and MW-07, the vertical gradient between the saprolite/PWR and the bedrock appears to be downward.

2.3 LFG Extraction System

Jackson County, with assistance from Altamont, has been periodically monitoring landfill gas (LFG) concentrations in gas probes located along the perimeter of the landfill since 1999 (Altamont, 2003). In 2004, nine LFG extraction wells were installed within the waste footprint of the landfill. The LFG extraction system began full-scale operation in early 2005. The purposes of these LFG extraction wells were to minimize risks to human health and property associated with LFG and establish beneficial use of the LFG. Currently, the LFG is used as a source of energy to Green Energy Park in the southeastern part of the landfill property (Figure 2).

Extraction wells EW-01, EW-02, and EW-03 are four inches in diameter. The remaining extraction wells, EW-04, EW-05, EW-06, EW-07, EW-08, and EW-09, are six inches in diameter. All extraction wells are screened within the landfill waste. Total depths range from 40 to 90 feet bgs. Screened lengths range from 20 to 50 feet.

Another beneficial use of the LFG extraction system is the potential decrease in contaminant concentrations in the groundwater (Prosser and Janechek, 1995). The *Spring 2004 Semiannual Water Quality Monitoring and Site Characterization Report* (Altamont, 2004) suggested that the effects of the landfill gas removal should be monitored to assess potential benefits to groundwater quality.

Several of the gas probes, particularly GP-01A, GP-02, GP-03, showed significant decreases in LFG concentrations after startup of the LFG extraction system in 2005. Trend plots since August 2008 showing the LFG flow rate at each well head and associated measured methane concentration are shown in Appendix A. Trend plots showing concentrations of selected VOCs in individual monitoring wells are shown in Appendix B. The VOC groundwater concentrations have been consistently detected at low concentrations with some downward trends recognized since the LFG extraction startup date of early 2005. However, groundwater standards continue to be exceeded in some groundwater samples, albeit slightly. Groundwater quality is discussed in more detail in Section 2.4.

2.4 Evaluation of Groundwater Contaminant Trends

As noted above, the groundwater underlying the landfill has historically been impacted with low concentrations of VOCs. The analytical data are presented in detail in semiannual water quality monitoring reports that Altamont, on behalf of Jackson County, has been submitting to DENR since 1999. VOC concentrations both above and below associated North Carolina groundwater standards have been detected in MW-01 and MW-06 and the saprolite/PWR monitoring wells, MW-03, MW-04, and MW-05. Monitoring well MW-02, located in the northwestern part of the landfill property near the Tuckasegee River downslope of the waste has historically shown some concentrations of VOCs but no exceedences since 2002 of associated North Carolina groundwater standards. Historical trend plots for selected VOCs at each monitoring well are shown in Appendix B. These selected VOCs (1,1-dichloroethane [1,1-DCA], 1,4-dichlorobenzene [1,4-DCB], benzene, cis-1,2-dichloroethene [1,2-DCE], tetrachloroethene [PCE], trichloroethene [TCE], and vinyl chloride) have historically been detected more frequently and at higher concentrations than other analyzed VOCs. (Other compounds detected over the years include xylenes, methylene chloride, chlorobenzene, and chloroethane). As noted in the previous section, since the implementation of full-scale LFG extraction well operation in early 2005, a poorly developed downward trend in VOC concentrations is present for monitoring wells, MW-01, MW-03, MW-04, MW-05, and MW-06. However, as discussed below, exceedences of North Carolina groundwater standards continue to be detected in groundwater samples (Altamont, 2010). Furthermore, the downward trend in VOC concentrations also corresponds with a decrease in groundwater elevations due to a region-wide drought (see historical trend plots for MW-01 and MW-06 for evidence of the drought effects).

During the spring 2010 semiannual water monitoring event, four VOCs (1,1-DCA, 1,4-DCB, benzene, and vinyl chloride) were detected in one or more monitoring wells at concentrations exceeding the associated 2L Standards. Posted data from this sampling event are presented in Figure 9. Bedrock monitoring well MW-01, located near the upgradient edge of the waste, exhibited exceedences of three VOCs (1,1-DCA at 6.6 micrograms per liter [μg/L], 1,4-DCB at 11.0 μg/L, and benzene at 5.2 μg/L). Nearby residential water supply wells, also screened in bedrock, have exhibited no detections of VOCs. Saprolite monitoring well MW-05 also showed exceedences of three VOCs, 1,4-DCB at 12.1 μg/L, vinyl chloride at 1.3 μg/L, and benzene at 2 μg/L. This well is located near the downgradient edge of the waste. The three monitoring wells along the Tuckasegee River, MW-02 (saprolite), MW-04 (saprolite), and MW-07 (bedrock), showed no exceedences, although some detections were identified. Monitoring wells MW-06 (bedrock) and MW-03 (PWR) exhibited one compound, benzene, at a concentration (1.7 µg/L and 1.3 µg/L, respectively) above its 2L Standard.

In accordance with historical results, the Spring 2010 surface water samples collected from the Tuckasegee River showed no detections of VOCs or any other constituents analyzed for.

On the basis of these conditions, DENR requested the development of an ACM Report (DENR, 2010). As part of the ACM, Altamont and Jackson County evaluated the analytical and hydrogeological data and identified a potential data gap in the bedrock in the southwestern corner of the landfill property. Therefore a new bedrock monitoring well, MW-07, was installed to evaluate bedrock groundwater quality in this area. The installation of MW-07 and the laboratory analytical results from the initial round of sampling conducted on August 11, 2010 are discussed in Section 3.0.

Historically, isolated metals have been detected in the groundwater during semiannual monitoring events. Individual metals are not persistently detected over time and, historically, elevated turbidity levels in the samples may have affected the results. This ACM focuses on the VOCs. The corrective measures evaluated are designed to include potential metals in the groundwater. No corrective measures specifically designed to affect only metals are considered.

2.5 Water Supply Sources

The Jackson County Landfill is located approximately 0.8 miles northwest of the town of Dillsboro, North Carolina (Figure 1). The setting is rural with relatively large-acreage, single-family lots located on the north, east, and west (across the Tuckasegee River) sides of the landfill (Figure 3). These residences are primarily served by single-family-use water supply wells. The wells are commonly installed in fractured bedrock. Jackson County collects annual groundwater samples from two residential wells northeast of the landfill (Figure 9). These samples have not exhibited VOC detections. The owner of the parcel northerly adjacent to the landfill has consistently denied permission for the County to sample his well (Altamont, 2004). The County maintenance facility and the Green Energy Park, located contiguous to the landfill to the southeast (Figure 2), obtain their water from the City of Dillsboro.

3.0 Installation and Sampling of Monitoring Well MW-07

As part of this ACM, bedrock monitoring well MW-07 was drilled and installed in the southwestern corner of the Jackson County Landfill property on July 29 and 30, 2010. The monitoring well, clustered with saprolite monitoring well MW-04, is intended to evaluate the groundwater quality in the bedrock between the landfill and the Tuckasegee River. The boring and well construction diagram and well development and sampling logs are included in Appendices C and D.

3.1 Monitoring Well Drilling and Installation

Altamont completed the monitoring well installations on July 30, 2010. A North Carolina certified well driller, Geologic Exploration Inc. (North Carolina Certification No. 2452) of Statesville, North Carolina, installed the bedrock monitoring well under the direct supervision and oversight of Altamont.

The borehole for MW-07 was drilled in several steps. Initially, a ten-inch nominal diameter borehole was drilled through the saprolite and underlying partially weathered rock zone using air rotary drilling methods. Bedrock was encountered at a depth of 44 feet bgs. The borehole was then advanced using air rotary drilling methods an additional ten feet into the underlying bedrock. A six-inch nominal diameter polyvinyl chloride (PVC) surface casing was grouted into place to a total depth of 54 feet bgs.

After the grout had set for approximately 24 hours, a six-inch-diameter borehole was drilled through the surface casing into the underlying bedrock to a total depth of 95 feet below the ground surface, using air hammer techniques. Groundwater-bearing fractures were encountered at approximately 67 feet, 72 feet, and 89 feet bgs during drilling. A two-inch nominal diameter PVC monitoring well with a twenty-five-foot screened interval was installed in the borehole to a total depth of 95 feet bgs.

Well development took place on August 8, 2010, after the grout and bentonite seal had been allowed to set. The well was developed until the discharged water was clear of sediment and water quality field parameters had generally stabilized.

The location and elevation of monitoring well MW-07 was surveyed by a licensed surveyor (Appendix E).

3.2 Monitoring Well Purging and Sampling Methods

Prior to purging MW-07, the static water level was gauged and an initial round of field parameters consisting of pH, specific conductivity (SC), dissolved oxygen (DO), turbidity, temperature, and oxidation reduction potential (ORP) was measured. Static water level measurements and field parameter data are included in Appendix D.

A bladder pump and low-flow techniques were used to purge and sample MW-07. The monitoring wells were purged using low-flow techniques in accordance with the procedures described in the US Environmental Protection Agency's (EPA's) *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures* (EPA, 1996). During purging, the pH, specific conductivity, dissolved oxygen, ORP, turbidity, and temperature were measured and recorded approximately every three minutes. Well purging continued until these parameters generally stabilized for three consecutive readings. The required stabilization criteria were as follows:

- pH values within +/- 0.1 unit
- Specific conductivity values within +/- 5 percent
- Temperature, dissolved oxygen, and turbidity values within +/- 10 percent

- ORP values within +/- 10 millivolts

Once the parameters had stabilized, a groundwater sample was collected using laboratory-supplied sample bottles by a technician wearing a new pair of nitrile gloves.

Field parameters and additional observations pertaining to the MW-07 sampling are provided on sampling logs (Appendix D). Following sample collection, the groundwater sample was immediately placed on ice in a sample cooler for transport to Pace Analytical Services (Pace), a North Carolina certified laboratory located in Asheville, North Carolina. The groundwater sample collected from the monitoring well was analyzed for the following parameters:

- Appendix I VOCs using EPA Method 8260
- Appendix I metals using EPA Methods 6010, 6020 and 7470

Proper chain-of-custody documentation practices were followed during collection and transportation of the sample (Appendix F). A trip blank was included in the sample cooler and analyzed for Appendix I VOCs. The laboratory analytical report is provided in Appendix F.

3.3 Analytical Results

The laboratory analytical results for the groundwater sample from monitoring well MW-07 is summarized in Table 3.

Detected concentrations of constituents in groundwater samples were compared to the applicable North Carolina groundwater quality standards. For most constituents, this standard is the 2L Standard, from 15A NCAC 2L.0202. Detected concentrations of constituents in groundwater with no established 2L Standard were compared to the Groundwater Protection Standards (GWPSs) pursuant to 15A NCAC 13B.1634.

No metals or VOCs were detected at concentrations above associated 2L Standards or GWPSs. Six VOCs (benzene, 0.76 J µg/L; chlorobenzene 0.97 J µg/L; 1,4-dichlorobenzene 0.51 J µg/L; 1,1-DCA 0.87 J µg/L; cis-1,2-DCE 4.9 µg/L; and TCE 1.0 µg/L) were detected at low concentrations. Nine metals (arsenic, barium, chromium, cobalt, copper, nickel, silver, vanadium, and zinc) were also detected.

4.0 Conceptual Site Model

As described in Section 1.0, the Jackson County landfill received C&D and MSW up to 2002. It is currently closed. The waste footprint has been completely capped with soil and the topsoil over the cap and is adequately vegetated. The waste material in the closed Jackson County landfill is interpreted to be the ultimate source of the underlying impacted groundwater. The thickness of the waste is interpreted to vary and may range up to approximately 90 feet thick. The distance between the bottom of the waste and the groundwater is interpreted, based on limited data, to be roughly 40 feet (Figure 6). A synthetic liner and leachate collection system is not present between the bottom of waste and the groundwater. The contaminants are probably leached out of the waste and transported downward to the groundwater as a dissolved phase of the leachate.

As described in Section 2.2, typically, groundwater flow directions in saprolite and partially weathered rock zones reflect local surface topography. Monitoring wells MW-03, MW-04, and MW-05, located at the southern portion of the landfill (Figure 2), are completed in the saprolite or partially weathered bedrock. Groundwater in this area flows in a southwesterly direction and probably discharges into the Tuckasegee River. Based on drilling records of MW-01 and MW-06, it is interpreted that very little to no groundwater is present in the saprolite in the northern part of the landfill (Figure 4).

Groundwater flow directions in the underlying bedrock are typically not as strongly influenced by surface topography as is groundwater flow in the saprolite and partially weathered rock zones. Groundwater flow patterns in bedrock fractures may be influenced by predominant fracture and joint orientations or locally induced hydraulic gradients caused by nearby pumping of domestic wells. Monitoring wells MW-01, MW-02, MW-06, and the newly installed monitoring well MW-07, are completed in the fractured bedrock. As shown on Figure 8, groundwater flow within the fractured bedrock is in a general southwesterly direction at the landfill. It is probable that some of the groundwater in the shallower portions of the fractured bedrock discharges into the Tuckasegee River. However, on the basis of limited data (two measuring events), the vertical gradient between the saprolite and bedrock at the southern corner of the landfill (MW-04 and MW-07) appears to be downward.

The following sections present a discussion of the groundwater sampling results within the context of the site hydrogeologic conceptual site model.

As indicated on Table 4, the specific conductivity for groundwater from bedrock monitoring wells (MW-01, MW-02, MW-06, and MW-07) ranges between 61.4 and 396 micro-Siemens (µS). The specific conductivity of groundwater in the saprolite and partially weathered bedrock wells (MW-03, MW-04, and MW-05) ranges from 150 to 1085 µS. These data indicate that groundwater in the bedrock has a lower average specific conductivity than groundwater in the overlying saprolite and partially weathered bedrock. There was little variation in temperature and pH between the two water-bearing zones.

VOCs were detected in groundwater from monitoring wells in both the saprolite/partially weathered bedrock zone and the bedrock zone. As discussed above, the groundwater flow direction in the saprolite/partially weathered bedrock zone is predominately downslope toward the Tuckasegee River to the southwest. VOCs detected in this water-bearing zone can be expected to migrate toward the river. Although there are low level detections of VOCs in this water-bearing zone, monitoring well MW-04, which is the downgradient well for this zone, does not consistently have VOC concentrations in excess of the 2L standards.

Along the northern boundary of the landfill, groundwater was not encountered in the saprolite/partially weathered bedrock. Consequently, the first encountered groundwater is in the bedrock zone. Detections of VOCs above the 2L Standard in monitoring wells MW-01 and MW-06 indicate migration of VOC-impacted groundwater in the fractured bedrock. As previously discussed , groundwater flow directions in the bedrock zone are southwesterly. A fracture analysis conducted in 2004, indicated that groundwater could possibly migrate along the primary fracture orientation either to the northwest or southeast. Groundwater migrating from the landfill towards the northwest would encounter the Hayesville Fault, which was identified in 2004 (Altamont, 2004). The effect of the fault on the groundwater flow paths has not been determined. However, the absence of groundwater in the saprolite/partially weathered bedrock zone on the south side of the fault and the presence of a shallow well presumed to draw groundwater from the saprolite/partially weathered bedrock zone on the north side of the fault suggest this fault may serve as some type of hydraulic barrier.

Potential exposure pathways for the site include the following:

- Direct contact with waste or leachate. This exposure pathway is not complete, because of controlled access to the landfill and the vegetated soil cap that covers the entire waste footprint.
- Human exposure to contaminated saprolite or PWR groundwater. This pathway may be complete if an individual uses water from the saprolite or PWR. However, most water wells in this area of Jackson County access the bedrock groundwater.
- Human exposure to contaminated bedrock groundwater. Nearby residents have water wells that access groundwater from the fractured bedrock. The existing analytical data indicate that bedrock groundwater along the downgradient edge of the property does not contain concentrations of contaminants at concentrations above 2L Standards. This exposure pathway is considered most viable, and the corrective measures evaluation focuses on remedies that will reduce risk of individuals exposed to this pathway.
- Human/ecological exposure to contaminated groundwater discharging into the surface water. This pathway is considered incomplete because surface water samples collected from the Tuckasegee River have never exhibited detections of contaminants.

5.0 Corrective Action Objectives

In accordance with 15A NCAC 13B.1636, the corrective action objectives are as follows:

- Be protective of human health and environment.
- Attain the approved groundwater protection standards.
- Control the source of release so as to reduce or eliminate, to the maximum extent practical, further releases of Appendix II constituents into the environment that may pose a threat to human health or the environment.
- Comply with standards for management of wastes as specified in 15A NCAC 13B.1637(d).

The following discussion on the corrective measures alternatives are based on these objectives.

6.0 Corrective Measures Screening and Evaluation

As discussed above, the Jackson County Municipal Solid Waste Landfill closed in 2002. As part of the closure process, up to approximately six feet of vegetated soil cover was installed over the landfill. The waste is well above the underlying water table. A corrective measures assessment was performed in spring 2004 as part of the semiannual water quality monitoring at the landfill (Altamont, 2004). The recommended alternative was to implement the landfill gas extraction and observe the groundwater quality trends. As described in more detail above, detected concentrations of selected VOCs, for example benzene, 1,4-dichlorobenzene, vinyl chloride, and 1,1 dichloroethane persist.

To evaluate the groundwater quality in the bedrock at a compliance point, Altamont installed MW-07 (Section 3.0). A groundwater sample collected from this monitoring well in August 2010 yielded no exceedences of applicable groundwater standards (Table 3).

The following subsections describe individual corrective measure response actions. These actions are categorized into institutional controls, monitored natural attenuation, infiltration controls, landfill gas controls, and groundwater treatment/hydraulic control technologies. Section 7.0 identifies four corrective measure alternatives, some which include a combination of the individual response actions introduced here. Section 7.0 includes a detailed evaluation of each corrective measures alternative.

6.1 Institutional Controls

Corrective measures that involve institutional controls are discussed here. These activities do not actively modify the quality of the groundwater, but they represent safety measures to ensure that there are no risk pathways to human receptors.

6.1.1 Site Monitoring

Currently, groundwater and surface water samples are being collected semiannually and analyzed for organic compounds and metals. The spring analytical suite (VOCs and metals) is reduced relative to the fall analytical suite (VOCs, SVOCs, metals, etc.; Section 1.0). Only VOCs and metals have been detected at concentrations above the North Carolina groundwater quality standards. Therefore, this site monitoring alternative would maintain the frequency and analytical suite. Geochemical parameters may need to be included for baseline data if they are determined to be needed in the future (for instance to evaluate Monitored Natural Attenuation or insitu bioremediation). This alternative may be applicable at the Jackson County landfill because the monitoring data (MW-07, residential water well results, and surface water results) indicate that off-site migration of contaminated groundwater in the fractured bedrock is very likely not occurring.

6.1.2 Access Controls

Currently, the only potential human receptors at the site itself are workers and visitors. The workers include operators of the LFG extraction system and personnel monitoring landfill gas migration and collecting groundwater samples to monitor the groundwater quality. Visitors are infrequent and are escorted by landfill operators. These potential receptors access the landfill property via two locked gates. One of these is located in the northeast part of the property. The second is located west of the road and requires access across an easement owned by the GSMR (Figure 2).

The entire perimeter of the landfill property is not fenced. Access by the public from Haywood Road however is limited by rugged topography and heavy undergrowth. Access by the residents adjacent to the landfill to the north and east is inhibited by a ridgeline.

6.1.3 County Restrictions on Water Supply Wells

Potential exposure to impacted groundwater in the bedrock by human receptors is through drinking water wells. According to Jackson County Health Department (Section 2.5), single family potable water supply wells are located in the area surrounding the landfill, including on the far (west) side of the Tuckasegee River. Jackson County Green Energy Park and the County Maintenance Facility access potable water through municipality lines. County-mandated restrictions on nearby properties may limit or prohibit the installation of new water supply wells. Implementation of this alternative would be proactive in protecting new nearby, potential receptors from exposure to impacted bedrock groundwater if any migrates off-site in the future. However, this action could lower perceived land values and may affect lifestyles. For these reasons, this response action could encounter public resistance.

6.1.4 Alternate Water Supply

Potential human receptors at the landfill fall under the occupational and visitor scenarios. On the basis of the current understanding of site conditions, there is minimal risk of direct exposure to the impacted groundwater through inhalation, ingestion, or dermal contact. Located upgradient of the landfill, the drinking water wells that provide potable water to the neighboring residents are not impacted by the landfill-related contaminants. Therefore, providing alternative drinking water sources to the users of the facility and nearby residents at this time is unnecessary.

6.2 Monitored Natural Attenuation

Monitored natural attenuation (MNA) is an intrinsic remediation approach that relies on natural attenuation processes (for example, biodegradation, advection, dispersion, sorption, volatilization, abiotic degradation mechanisms, and dilution) to remediate contaminants in the subsurface to acceptable concentration levels before potential receptors are impacted. During the degradation processes, contaminants are ultimately transformed to innocuous byproducts, such as carbon dioxide and water. These transformation processes for petroleum-related compounds include aerobic processes; chlorinated compounds include anaerobic processes (EPA, 1998). MNA does not disturb the site and has low capital costs. The disadvantage to natural attenuation is that complete degradation of constituents can require an extended time period. Natural or human induced changes to the subsurface environment (for example, change in pH, electron acceptor concentrations, or potential future releases) could change the natural attenuation process (rates of degradation).

The criteria to evaluate the effectiveness of MNA are based on several physical and geochemical characteristics of the aquifer as follows:

- Stable plume or decreased contaminant concentration
- Presence of acceptable electron acceptors (for example, oxygen, sulfate, manganese, iron, and methane) and electron donors
- Physical properties of aquifer and soil matrix, such as heterogeneities and permeabilities

6.3 Infiltration Controls

As described above, the Jackson County Landfill lies within rugged steep topography with approximately 200 feet of relief. The landfill's waste footprint is covered with up to approximately six feet of low-permeability vegetated soil whose surface slopes moderately to the southwest toward Haywood Road and the Tuckasegee River.

The cap system on the landfill meets the requirements of Jackson County's permit. Installation of additional, lower permeable cap taking into account for best management practices with regard to modifying stormwater and sedimentation control would probably not improve the infiltration aspects appreciably.

6.4 Landfill Gas and Leachate Controls

As described in Section 2.3, Jackson County has operated a landfill gas extraction system (including nine LFG extraction wells) since early 2005. Since that time groundwater concentrations have generally declined, but exceedences remain (Appendices A and B). Jackson County plans to continue to operate the LFG extraction system.

As described in Section 4.0, the landfill leachate is interpreted to be a transport mechanism of dissolved contaminants from the landfill waste downward to the groundwater. The landfill gas extraction wells likely intersect leachate-bearing zones within the waste and as a result accumulate leachate. Any leachate that is present in the LFG extraction wells could be periodically removed by pumping and appropriate disposal. This pumping would reduce the volume of leachate available to transport the contaminants down to the groundwater. As such, it would represent a source control activity.

6.5 Groundwater Treatment/Hydraulic Influence Technologies

This section describes the response actions that include active treatment of groundwater quality and/or modifications of the groundwater flow paths.

6.5.1 Groundwater Recovery

Groundwater recovery (also referred to as pump and treat) encompasses removing groundwater from the aquifer through recovery wells and treating the groundwater aboveground. The treated groundwater is then disposed of off-site or re-injected into the aquifer. The groundwater recovery system can modify groundwater flow paths or even contain impacted groundwater from migrating off-site. However, given the complexity of the system of water-bearing bedrock fractures, it is unlikely that a system of recovery wells outside the footprint of the waste can be adequately designed to successfully capture all contaminants migrating from beneath the waste. This response action would be extremely costly and would require constructing extensive infrastructure (recovery wells, treatment system, and groundwater management basin) at the landfill. The groundwater extraction would be anticipated to operate in excess of 15 years.

6.5.2 Groundwater Barrier Wall

Groundwater barrier walls prevent or modify the migration of impacted groundwater in the unconsolidated (saprolite) aquifer. This method is not effective in the PWR or bedrock. Barrier types include slurry walls constructed of low-permeable materials, sheet piling, geomembrane, and in-situ reactive barriers (such as zero valent iron) that also treat the groundwater.

6.5.3 In Situ Groundwater Treatment

In situ groundwater treatment involves introducing material into the impacted groundwater to enhance either microbial or chemical degradation of contaminants. Microbial or bioremediation involves introducing appropriate nutrients or substrates and microbes (if necessary) to facilitate degradation of contaminants. Chemical methods (referred to as In Situ Chemical Oxidation [ISCO]) involve the introduction of an oxidizing agent (such as sodium permanganate) into the aquifer. Mechanical methods include air sparging, steam flushing, and vacuum extraction.

7.0 Detailed Evaluation of Corrective Measure Alternatives

This section includes a discussion of four corrective measure alternatives that were introduced in Section 6. Each of these alternatives is evaluated with regard to the following criteria:

- *Long-term and short-term reliability and effectiveness*—Long-term and short-term effectiveness and protectiveness of the potential corrective measures
- *Reduction of toxicity, mobility, or volume of contamination*—Effectiveness of the corrective measures in degrading and reducing the total mass of the contaminants
- *Implementability*—Ease or difficulty of implementing a potential corrective measure alternative

- *Time and Costs*—Estimate of time and costs needed to meet corrective action objectives outlined in Section 5.0.

Safety, cross-media impacts, control of exposure to residual contamination, and community factors are also taken into account in the evaluation below. Table 5 summarizes the evaluation.

Regardless of which corrective measure alternative is implemented, Jackson County will continue to collect surface water and groundwater quality samples semiannually. In addition, the LFG extraction system will continue to operate as long as the methane concentrations allow for the supply of energy to the Green Energy Park. Similarly the landfill will continue to be capped with vegetated low-permeable soil.

7.1 Alternative 1—Monitored Natural Attenuation

With the exception of benzene, most of the VOCs of concern at the Jackson County landfill are chlorinated aliphatic hydrocarbons which would typically naturally degrade via reductive dechlorination mechanisms (EPA 1998). The historical environmental work performed at the Jackson County Landfill gives some indication that natural attenuation is occurring at the site. The groundwater concentrations are generally decreasing (Table 3 and Appendix B) and the extent of the impacted groundwater appears to be stable. Both short-term and long-term effectiveness of this alternative would be strong as long as it is demonstrated that MNA is occurring. MNA would reflect a decrease in mass of contaminants as the compounds are degraded. Some of the degradation products would need to be monitored closely, for example, vinyl chloride. MNA is easy to implement—biogeochemical indicators of natural attenuation processes that may be occurring in the aquifer include alkalinity, chloride, ferrous iron, hydrogen, manganese, methane, ethane, ethene, nitrate, sulfate, total organic carbon (TOC). These parameters could be analyzed for during the semiannual water quality monitoring that occurs at the landfill and evaluated as part of the semiannual reports to monitor whether the geochemical environment is conducive to natural attenuation.

Altamont's opinion of probable annual cost (present worth) for this remedial alternative is $10,000. It is Altamont's opinion that a minimum of 10 years (likely much longer) will be required to meet the cleanup objectives using MNA.

7.2 Alternative 2—Monitored Natural Attenuation and Institutional Controls

This alternative includes the MNA described in Alternative 1 with the addition of institutional controls in the form of county-mandated restrictions of properties within a certain distance of the landfill. This restriction would reduce the risk of exposure to impacted groundwater by users of the water. The deed restrictions may, for instance, prohibit installation of new water supply wells within a specified radius of the landfill. (Currently 15A NCAC 2C.0107 prohibits drilling a water supply well within 500 feet of a landfill.)

The long-term and short-term reliability and effectiveness of Alternative 2 would be better than that for Alternative 1, because there would be another mechanism in place to minimize risk of exposure to potential new users of groundwater. The alternative's reliability would depend on the county's enforcement. The implementability of deed restrictions may be difficult, as there may be some community resistance, because of potential effects on land values and lifestyles.

Altamont's opinion of probable annual cost (present worth) for this remedial alternative is $15,000. It is Altamont's opinion that a minimum of 10 years (likely much longer) will be required to meet the cleanup objectives using MNA and institutional controls.

7.3 Alternative 3—Leachate Removal

Alternative 3 encompasses pumping leachate from the LFG extraction wells periodically (for example, monthly) to reduce the volume of leachate available to transport contaminants down to the groundwater. The short-term and long-term effectiveness of this alternative would be moderate. The leachate levels in the LFG extraction wells would be systematically monitored and based upon the measurements from systematic monitoring a routine removal process would be implemented. The routine removal process may be permanent, continuous, and automated. Following the implementation of a removal process, the volumes and contaminant concentrations removed from the LFG extraction wells would be monitored. The mass of contaminants in the waste would not be affected, but the mobility of the contaminants should be reduced. This alternative may be easy to implement. The time frame to achieve cleanup objectives would be on the order of tens of years, not dissimilar to MNA. Rough order of magnitude annual cost is could range from $16,000 for routine monthly pumping events to $100,000 for an automated pumping system.

7.4 Alternative 4—In Situ Treatment

Alternative 4 encompasses injecting a solution into the fractures of the bedrock to facilitate degradation of the contaminants. Injection wells would need to be installed into the fractured bedrock.

The short-term effectiveness of this alternative would be moderate pending on exposure to contaminants, but contaminant rebound could occur, which would compromise the long-term effectiveness. This alternative would decrease the mass of the contaminants. The implementability of Alternative 4 would be very difficult, because it would be difficult to gain access to all of the water-bearing fractures to allow the injected solution to contact the impacted groundwater. The terrain and access of the landfill property would also negatively impact the alternative's implementability. Furthermore, without removal of the source of contamination (i.e. the waste) this alternative would likely require several repetitive and costly injection events. The time frame would be approximately one to five years. Rough order of magnitude costs are $1.1 million for the first year and $0.9 million annually for the following years.

8.0 Summary and Recommended Alternative

Jackson County has been performing semiannual surface water and groundwater quality monitoring since at least 1999. No detections or exceedences of VOCs have been identified in the surface water samples from the Tuckasegee River. Low-level VOCs have been consistently detected in the groundwater over the years. An LFG extraction system, consisting of nine extraction wells, has been operating at the landfill since early 2005. Currently, four VOCs have been detected in the groundwater at the landfill at concentrations slightly above associated 2L Standards. However, no exceedences are present in the downgradient bedrock monitoring well (MW-07).

On the basis of these conditions, Altamont suggests implementing Alternative 1 MNA.

9.0 References

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TABLES

Table 1
Well Construction Details and Corresponding Elevations
Municipal Solid Waste Landfill
Jackson County, North Carolina

Facility Permit	Well ID	Date Drilled (mm/dd/yyyy)	Ground Surface Elevation[1] (feet above mean sea level)	TOC[2] Elevation (feet above mean sea level)	Stick Up (feet above ground surface)	Total Well Depth (feet bgs)	Depth To Water[7] (feet below TOC)	Groundwater Elevation (feet above mean sea level)	Approx. Depth to Bedrock[4,6] (feet bgs)	Approx. Top of Bedrock Elevation (feet above mean sea level)	Depth to Top of Screened Interval[4,5] (feet bgs)	Depth to Bottom of Screened Interval[4,5] (feet bgs)	Top Elevation of Screened Interval (feet above mean sea level)	Elevation of Bottom of Screened Interval (feet above mean sea level)	Geology of Screened Interval	Source of Well Construction Information
50-02	MW-01	4/23/1992	2169.4	2171.42	2.0	110.5	101.20	2070.22	83.0	2086	95.0	110.0	2074.4	2059.4	bedrock	S&ME, Inc.
50-02	MW-02	4/22/1992	2013.2	2015.38	2.2	63.0	29.16	1986.22	13.0	2000	45.0	60.0	1968.2	1953.2	bedrock	S&ME, Inc.
50-02	MW-03	4/21/1992	2044.2	2045.53	1.4	65.5	55.25	1990.28	57.0	1987	48.5	63.5	1995.7	1980.7	partially weathered bedrock	S&ME, Inc.
50-02	MW-04	4/21/1992	1978.7	1980.77	2.1	43.0	30.63	1950.14	NA[3]	NA	25.0	40.0	1953.7	1938.7	saprolite	S&ME, Inc.
50-02	MW-05	9/23/1994	2027.4	2028.97	1.6	60.0	NM	NM	NA	NA	50.0	60.0	1977.4	1967.4	saprolite	AAA Green Bros Well Drilling
50-02	MW-06	3/23/2004	2136.6	2139.57	3.0	94.0	85.12	2054.45	47.6	2089	84.6	94.6	2052.0	2042.0	bedrock	Altamont Environmental, Inc.
50-02	MW-07	7/30/2010	1978.7	1981.29	2.6	95.0	35.85	1945.44	43.7	1935	69.7	94.7	1909.0	1884.0	bedrock	Altamont Environmental, Inc.

Notes:

1. Ground surface and top of casing elevations are based on a survey completed on April 9, 1999 by Davenport & Assoc., Inc. for MW-01 through MW-06. Survey for MW-07 was performed by Wes Cole Surveying, PA (Appendix E).
2. TOC means Top of Casing. bgs means below ground surface.
3. NA means Not Applicable.
4. MW-01 through MW-04 Depth to Bedrock and Screened Interval taken from boring logs completed on April 21, 22, and 23, 1992 by S&ME.
5. MW-05 Screened Interval taken from boring log completed on September 23, 1994 by AAA Greene Bros. of Sylva.
6. MW-06 Depth to Bedrock and Screened Interval and elevation data taken from Altamont boring log completed March 23, 2004.
7. Depth to water measured on August 25, 2010.

Table 2
Historical Groundwater Level Elevations
Municipal Solid Waste Landfill
Jackson County, North Carolina

Well	Date	Depth to Water (feet bgs)	Depth to Water (feet below TOC)	Groundwater Elevation (feet above mean sea level)
MW-1	4/22/1999	92.5	94.49	2076.93
	10/21/1999	91.2	93.20	2078.22
	4/17/2000	93.6	95.60	2075.82
	10/9/2000	93.3	95.29	2076.13
	4/17/2001	95.3	97.30	2074.12
	10/9/2001	95.1	97.10	2074.32
	4/10/2002	96.2	98.15	2073.27
	10/9/2002	96.6	98.55	2072.87
	4/17/2003	95.7	97.70	2073.72
	10/20-21/2003	93.1	95.12	2076.3
	4/27/2004	95.4	97.40	2074.02
	10/18-19/2004	95.0	97.03	2074.39
	4/19/2005	93.6	95.62	2075.8
	10-12/2005	94.4	96.40	2075.02
	4/13/2006	96.7	98.69	2072.73
	10/10-11/2006	98.0	99.99	2071.43
	4/3/2007	99.6	101.56	2069.86
	10/9/2007	100.7	102.70	2068.72
	4/16/2008	102.9	104.89	2066.53
	10/2008	103.4	105.41	2066.01
	4/8/2009	104.4	106.41	2065.01
	10/6/2009	101.7	103.73	2067.69
	4/13/2010	96.1	98.10	2073.32
	8/18/2010	95.5	97.50	2073.92
	8/25/2010	99.2	101.20	2070.22
MW-2	4/22/1999	19.0	21.19	1994.19
	10/21/1999	24.3	26.45	1988.93
	4/17/2000	24.2	26.40	1988.98
	10/9/2000	24.3	26.50	1988.88
	4/17/2001	24.3	26.50	1988.88
	10/9/2001	24.5	26.70	1988.68
	4/10/2002	24.4	26.60	1988.78
	10/9/2002	24.7	26.92	1988.46
	4/17/2003	24.8	26.98	1988.4
	10/20-21/2003	27.9	30.14	1985.24
	4/27/2004	24.4	26.57	1988.81
	10/18-19/2004	24.6	26.82	1988.56
	4/19/2005	21.4	23.61	1991.77
	10-12/2005	23.4	25.63	1989.75
	4/13/2006	23.2	25.39	1989.99
	10/10-11/2006	24.2	26.38	1989
	4/3/2007	23.8	25.95	1989.43
	10/9/2007	25.2	27.41	1987.97
	4/15/2008	24.4	26.57	1988.81
	10/2008	24.9	27.14	1988.24
	4/8/2009	24.3	26.45	1988.93
	10/22/2009	23.1	25.30	1990.08
	4/13/2010	21.8	23.97	1991.41
	8/18/2010	23.2	25.40	1989.98
	8/25/2010	27.0	29.16	1986.22

Table 2
Historical Groundwater Level Elevations
Municipal Solid Waste Landfill
Jackson County, North Carolina

Well	Date	Depth to Water (feet bgs)	Depth to Water (feet below TOC)	Groundwater Elevation (feet above mean sea level)
MW-3	4/22/1999	50.2	51.64	1993.89
	10/21/1999	51.9	53.31	1992.22
	4/17/2000	49.9	51.25	1994.28
	10/9/2000	52.4	53.82	1991.71
	4/17/2001	49.5	50.90	1994.63
	10/9/2001	51.6	53.02	1992.51
	4/10/2002	50.8	52.20	1993.33
	10/9/2002	52.4	53.85	1991.68
	4/17/2003	47.1	48.48	1997.05
	10/20-21/2003	50.3	51.72	1993.81
	4/27/2004	49.1	50.47	1995.06
	10/18-19/2004	49.3	50.73	1994.8
	4/19/2005	46.4	47.83	1997.7
	10-12/2005	50.1	51.47	1994.06
	4/13/2006	48.9	50.29	1995.24
	10/10-11/2006	51.7	53.14	1992.39
	4/3/2007	49.1	50.50	1995.03
	10/9/2007	53.4	54.84	1990.69
	4/16/2008	49.4	50.84	1994.69
	10/2008	54.3	55.69	1989.84
	4/7/2009	48.7	50.11	1995.42
	10/6/2009	50.4	51.78	1993.75
	4/13/2010	46.8	48.20	1997.33
	8/18/2010	NMT	NMT	NMT
	8/25/2010	53.9	55.25	1990.28
MW-4	4/22/1999	26.5	28.63	1952.14
	10/21/1999	27.5	29.58	1951.19
	4/17/2000	26.0	28.05	1952.72
	10/9/2000	28.3	30.37	1950.4
	4/17/2001	26.9	28.95	1951.82
	10/9/2001	27.6	29.65	1951.12
	4/10/2002	26.5	28.60	1952.17
	10/9/2002	27.4	29.48	1951.29
	4/17/2003	25.4	27.47	1953.3
	10/20-21/2003	31.3	33.42	1947.35
	4/27/2004	26.2	28.25	1952.52
	10/18-19/2004	26.2	28.32	1952.45
	4/19/2005	25.1	27.19	1953.58
	10-12/2005	27.1	29.20	1951.57
	4/13/2006	26.7	28.79	1951.98
	10/10-11/2006	27.5	29.59	1951.18
	4/3/2007	26.4	28.49	1952.28
	10/9/2007	28.2	30.35	1950.42
	4/15/2008	26.4	28.51	1952.26
	10/2008	28.4	30.54	1950.23
	4/8/2009	26.4	28.45	1952.32
	10/7/2009	25.6	27.65	1953.12
	4/13/2010	24.7	26.82	1953.95
	8/18/2010	26.7	28.80	1951.97
	8/25/10	28.5	30.63	1950.14

Table 2
Historical Groundwater Level Elevations
Municipal Solid Waste Landfill
Jackson County, North Carolina

Well	Date	Depth to Water (feet bgs)	Depth to Water (feet below TOC)	Groundwater Elevation (feet above mean sea level)
MW-5	4/22/1999	46.7	48.25	1980.72
	10/21/1999	47.7	49.25	1979.72
	4/17/2000	48.6	50.20	1978.77
	10/9/2000	49.5	51.05	1977.92
	4/17/2001	50.2	51.75	1977.22
	10/9/2001	50.5	52.05	1976.92
	4/10/2002	50.8	52.40	1976.57
	10/9/2002	51.3	52.86	1976.11
	4/17/2003	48.9	50.48	1978.49
	10/20-21/2003	48.7	50.34	1978.63
	4/27/2004	48.6	50.20	1978.77
	10/18-19/2004	48.7	50.34	1978.63
	4/19/2005	48.7	50.34	1978.63
	10-12/2005	NMT	NMT	NMT
	4/13/2006	47.4	48.99	1979.98
	10/10-11/2006	48.9	50.54	1978.43
	4/3/2007	49.0	50.63	1978.34
	10/9/2007	50.0	51.62	1977.35
	4/16/2008	49.9	51.50	1977.47
	10/2008	50.8	52.40	1976.57
	4/7/2009	50.5	52.08	1976.89
	10/7/2009	48.5	50.12	1978.85
	4/13/2010	44.0	45.58	1983.39
	8/18/2010	NMT	NMT	NMT
	8/25/2010	NMT	NMT	NMT
MW-6	4/27/2004	81.7	84.65	2054.92
	10/18-19/2004	79.8	82.85	2056.72
	4/19/2005	75.8	78.80	2060.77
	10-12/2005	78.0	80.99	2058.58
	4/13/2006	82.3	85.26	2054.31
	10/10-11/2006	84.3	87.30	2052.27
	4/3/2007	86.3	89.25	2050.32
	10/9/2007	87.1	90.07	2049.5
	4/15/2008	89.2	92.23	2047.34
	10/2008	89.4	92.36	2047.21
	4/7/2009	90.3	93.35	2046.22
	10/6/2009	85.5	88.51	2051.06
	4/13/2010	75.8	78.77	2060.8
	8/18/2010	77.6	80.60	2058.97
	8/25/2010	82.1	85.12	2054.45
MW-7	8/18/2010	29.7	32.30	1948.99
	8/25/2010	33.2	35.85	1945.44

Notes:
1. NMT = no measurement taken.

Table 3
Historical Analytical Summary Table
Municipal Solid Waste Landfill
Jackson County, North Carolina

		Volatile Organic Compound						
Monitoring Well Identification	Sample Collection Date	1,1-Dichloroethane	1,4-Dichlorobenzene	Benzene	cis-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene	Vinyl chloride
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	NC 2L Standard	6	6	1.0	70	0.70	3	0.03
MW-1	4/22/1999	31	3.5	7.9	7.5	3.7	4.3	2.1
	10/21/1999	32	ND	8.9	13	ND	ND	ND
	4/17/2000	25	ND	6	9.8	ND	ND	ND
	10/9/2000	28	ND	9.8	17	ND	ND	ND
	4/17/2001	20	6.6	8.9	12	ND	ND	ND
	10/9/2001	21	9.7	9.9	18	ND	ND	ND
	4/10/2002	22	11	12	25	ND	ND	ND
	10/9/2002	20	18	14	31	ND	5.5	ND
	4/17/2003	12	ND	8.3	21	ND	ND	ND
	10/20-21/2003	13	8.6	9.6	24	ND	ND	ND
	4/27/2004	10	10	7.3	ND	1.8	ND	1.7
	10/18-19/2004	9.1	11	7.5	ND	ND	ND	ND
	4/19/2005	10	15	8.1	17	ND	ND	ND
	10-12/2005	9.5	13	7.6	18	ND	ND	ND
	4/13/2006	6.1	14	8	17	ND	ND	ND
	10/10-11/2006	5.4	13	6.7	13	ND	ND	ND
	4/3/2007	7.8	15	6.2	11	1.6	1.6	1
	10/9/2007	9.8	17.8	6.8	14.4	1.6	1.7	ND
	4/16/2008	9.0	ND	5.9	10.7	ND	0.95	0.67
	10/2008	7.9	7.6	5.5	8.7	0.70	1.2	ND
	4/8/2009	6.5	5.6	5.8	10	0.49	1.2	ND
	10/6/2009	7.4	5.3	5.0	9.1	0.48	1.0	ND
	4/13/2010	6.6	11.0	5.2	10.8	0.69	1.3	ND
MW-2	4/22/1999	3.7	ND	ND	ND	ND	1.1	ND
	10/21/1999	ND	ND	ND	ND	ND	ND	ND
	4/17/2000	ND	ND	ND	ND	ND	ND	ND
	10/9/2000	6.5	ND	ND	ND	ND	ND	ND
	4/17/2001	ND	ND	ND	5.5	ND	ND	ND
	10/9/2001	5.8	ND	ND	ND	ND	ND	ND
	4/10/2002	ND	ND	ND	ND	ND	ND	ND
	10/9/2002	6.7	ND	ND	ND	ND	ND	ND
	4/17/2003	ND	ND	ND	ND	ND	ND	ND
	10/20-21/2003	ND	ND	ND	ND	ND	ND	ND
	4/27/2004	2.6	ND	ND	ND	ND	ND	ND
	10/18-19/2004	ND	ND	ND	ND	ND	ND	ND
	4/19/2005	ND	ND	ND	ND	ND	ND	ND
	10-12/2005	ND	ND	ND	ND	ND	ND	ND
	4/13/2006	ND	ND	ND	ND	ND	ND	ND
	10/10-11/2006	ND	ND	ND	ND	ND	ND	ND
	4/3/2007	1.1	0.68	ND	1.2	ND	ND	1
	10/9/2007	3.3	1.8	0.42	5.8	ND	ND	ND
	4/15/2008	1.1	ND	ND	1.2	ND	ND	ND
	10/2008	ND	0.58	ND	1.4	ND	ND	ND
	4/8/2009	0.67	ND	ND	0.56	ND	ND	ND
	10/22/2009	0.57	ND	ND	0.82	ND	ND	ND
	4/13/2010	0.43	ND	ND	0.87	ND	0.62	ND

Table 3
Historical Analytical Summary Table
Municipal Solid Waste Landfill
Jackson County, North Carolina

Monitoring Well Identification	Sample Collection Date	1,1-Dichloroethane	1,4-Dichlorobenzene	Benzene	cis-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene	Vinyl chloride
		Volatile Organic Compound						
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	NC 2L Standard	6	6	1.0	70	0.70	3	0.03
MW-3	4/22/1999	7.0	4.8	4.8	5.5	1.0	1.3	1.2
	10/21/1999	ND	ND	ND	5.8	ND	ND	ND
	4/17/2000	ND	5.1	ND	ND	ND	ND	ND
	10/9/2000	8.2	10.0	6.1	9.4	ND	ND	ND
	4/17/2001	5.4	7.2	ND	7.6	ND	ND	ND
	10/9/2001	6.5	11.0	ND	7.3	ND	ND	ND
	4/10/2002	6.0	8.7	ND	7.8	ND	ND	ND
	10/9/2002	10.0	ND	ND	10.0	ND	ND	ND
	4/17/2003	ND	8.3	ND	ND	ND	ND	ND
	10/20-21/2003	5.8	17.0	ND	8.9	ND	ND	ND
	4/27/2004	5.4	14.0	3.6	6.7	ND	ND	ND
	10/18-19/2004	6.5	18.0	ND	6.3	ND	ND	ND
	4/19/2005	ND	14.0	ND	5.2	ND	ND	ND
	10-12/2005	6.3	19.0	ND	7.3	ND	ND	ND
	4/13/2006	ND	12.0	ND	5.4	ND	ND	ND
	10/10-11/2006	ND	ND	ND	6.7	ND	ND	ND
	4/3/2007	2.6	11.0	2.0	4.4	0.23	0.27	1.0
	10/9/2007	5.9	18.4	1.7	10.6	ND	ND	ND
	4/16/2008	1.1	ND	1.1	2.8	ND	ND	ND
	10/2008	2.7	12.6	1.3	5.1	ND	ND	ND
	4/7/2009	1.0	4.9	0.79	2.2	ND	ND	ND
	10/6/2009	1.7	8.3	1.7	3.6	ND	ND	ND
	4/13/2010	0.47	3.5	1.3	1.0	ND	0.52	ND
MW-4	4/22/1999	4	7.9	2.8	24	3.9	3.5	2
	10/21/1999	ND	6.7	ND	20	ND	ND	ND
	4/17/2000	ND	6.2	ND	15	ND	ND	ND
	10/9/2000	ND	5.7	ND	19	ND	ND	ND
	4/17/2001	ND	6.2	ND	9.6	ND	ND	ND
	10/9/2001	ND	7.8	ND	17	ND	ND	ND
	4/10/2002	ND	7.2	ND	16	ND	ND	ND
	10/9/2002	ND	ND	ND	19	ND	ND	ND
	4/17/2003	ND	ND	ND	ND	ND	ND	ND
	10/20-21/2003	ND	6.3	ND	18	ND	ND	ND
	4/27/2004	ND	7.5	ND	13	ND	ND	ND
	10/18-19/2004	ND	6.6	ND	9.7	ND	ND	ND
	4/19/2005	ND	ND	ND	8.3	ND	ND	ND
	10-12/2005	ND	8.9	ND	14	ND	ND	ND
	4/13/2006	ND	7.8	ND	11	ND	ND	ND
	10/10-11/2006	ND	ND	ND	13	ND	ND	ND
	4/3/2007	0.50	8.4	1.3	11	0.38	0.38	1
	10/9/2007	3.1	11.3	1.8	18.7	ND	ND	0.97
	4/15/2008	0.57	ND	1.2	11.0	ND	ND	0.76
	10/2008	0.52	9.3	1.5	10.7	ND	ND	0.97
	4/8/2009	0.44	7.1	1.2	9.6	ND	ND	0.78
	10/7/2009	0.37	5.6	1.1	8.8	ND	ND	0.90
	4/13/2010	ND	2.9	0.55	4.3	ND	0.47	ND

Table 3
Historical Analytical Summary Table
Municipal Solid Waste Landfill
Jackson County, North Carolina

Monitoring Well Identification	Sample Collection Date	Volatile Organic Compound						
		1,1-Dichloroethane ug/L	1,4-Dichlorobenzene ug/L	Benzene ug/L	cis-1,2-Dichloroethene ug/L	Tetrachloroethene ug/L	Trichloroethene ug/L	Vinyl chloride ug/L
	NC 2L Standard	6	6	1.0	70	0.70	3	0.03
MW-5	4/22/1999	3	**14**	**3.4**	36	ND	ND	**2.2**
	10/21/1999	ND	**14**	ND	44	ND	ND	ND
	4/17/2000	ND	**13**	ND	44	ND	ND	ND
	10/9/2000	ND	**12**	ND	44	ND	ND	ND
	4/17/2001	ND	**15**	ND	43	ND	ND	ND
	10/9/2001	ND	**13**	ND	30	ND	ND	ND
	4/10/2002	ND	ND	ND	41	ND	ND	ND
	10/9/2002	ND	ND	ND	38	ND	ND	ND
	4/17/2003	ND	**13**	ND	32	ND	ND	ND
	10/20-21/2003	ND	**11**	ND	32	ND	ND	ND
	4/27/2004	ND	**16**	**2.3**	35	ND	ND	**2.4**
	10/18-19/2004	ND	**15**	ND	27	ND	ND	ND
	4/19/2005	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	10-12/2005	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	4/13/2006	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	10/10-11/2006	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	4/3/2007	0.49	**17**	**1.9**	32	ND	ND	**1**
	10/9/2007	ND	**18.8**	**1.6**	38.1	ND	ND	**1.4**
	4/16/2008	0.35	ND	0.56	27.4	ND	ND	**0.93**
	10/2008	ND	**16.2**	**1.2**	21.6	ND	ND	**0.78**
	4/7/2009	0.32	**15.9**	1	21.6	ND	ND	**0.99**
	10/7/2009	ND	**13.1**	**1.2**	18.4	ND	ND	**0.93**
	4/13/2010	ND	**12.1**	**2**	17.8	ND	0.55	**1.5**
MW-6	4/27/2004	**13**	**14**	**6.3**	18	**1.8**	ND	ND
	10/18-19/2004	**12**	**9.5**	**5.7**	13	ND	ND	ND
	4/19/2005	**10**	**11**	**6.4**	22	ND	ND	ND
	10-12/2005	**7.9**	**11**	ND	16	ND	ND	ND
	4/13/2006	**7.3**	**14**	**6.3**	17	ND	ND	ND
	10/10-11/2006	**7.9**	ND	**5.5**	15	ND	ND	ND
	4/3/2007	**9.7**	**13**	**4.7**	12	**1.3**	1.5	**1**
	10/9/2007	**11.3**	**11.2**	**3.3**	13.2	**1.5**	1.5	ND
	4/15/2008	**11.8**	ND	**1.9**	7.7	ND	ND	ND
	10/2008	**12.4**	2.1	**1.8**	7.2	ND	0.86	ND
	4/7/2009	**13**	3.2	**1.4**	7.1	**0.81**	1.4	ND
	10/6/2009	2.7	1.3	0.56	4.2	ND	ND	ND
	4/13/2010	1.1	3.9	**1.7**	5.9	ND	ND	ND
MW-07	8/11/2010	0.87	0.51	0.76	4.9	ND	1	ND

Notes
1. NC 2L Standard - Groundwater quality standard promulgated under Title 15 North Carolina Administrative Code Subchapter 2L (Department of Environment and Natural Resources). Last amended January 1, 2010.
2. µg/L - micrograms per liter
3. ND - not detected
4. N/S - not sampled
5. Bold values indicate concentrations above associated North Carolina GW Standards.
6. The VOCs shown on this table have historically been detected more frequently and at higher concentrations than other VOCs analyzed during the semiannual monitoring. See specific semiannual monitoring reports for the complete datasets. See Appendix F for the laboratory report for MW-07.

Table 4
Summary of Historical Field Parameter Data
Municipal Solid Waste Landfill
Jackson County, North Carolina

Well ID	Date	Dissolved Oxygen mg/l	Oxygen Reduction Potential mV	pH standard	Specific Conductivity uS	Temperature °C	Turbidity NTU
MW-01	4/17/2003	---	---	5.26	156.2	14.0	---
	10/20/2003	---	---	4.91	131.7	17.1	---
	4/27/2004	---	---	5.21	112.0	15.4	---
	10/18/2004	---	---	5.12	150.0	14.7	---
	4/19/2005	---	---	4.53	120.4	16.8	---
	10/27/2005	---	---	5.52	174.6	14.1	---
	4/13/2006	---	---	5.47	128.9	16.2	---
	10/10/2006	---	---	5.32	128.7	16.5	---
	4/3/2007	1.35	146	5.58	155.4	16.1	0.00
	10/9/2007	0.85	129.5	5.38	125	16.4	17.4
	4/16/2008	1.19	58.7	5.44	231	16.08	30.14
	10/9/2008	0.84	-78.3	5.92	154	16.9	1.22
	4/8/2009	1.21	28.1	5.59	236	17.51	1.47
	10/6/2009	2.43	145.1	5.37	107	17.78	0.00
	4/13/2010	2.26	30.6	5.66	109	16.15	7.32
MW-02	4/17/2003	---	---	5.47	121.6	13.8	---
	10/21/2003	---	---	5.59	102.6	15.2	---
	4/27/2004	---	---	5.76	98.7	14.6	---
	10/18/2004	---	---	5.40	137.7	14.8	---
	4/19/2005	---	---	5.19	95.3	19.3	---
	10/27/2005	---	---	5.89	166.0	14.2	---
	4/13/2006	---	---	6.13	126.4	15.9	---
	10/10/2006	---	---	5.77	125.7	15.2	---
	4/3/2007	6.44	142	6.12	167.8	16.0	5.98
	10/9/2007	1.66	197.9	5.59	121	15.0	19.91
	4/16/2008	3.74	164.1	5.79	213	14.23	15.23
	10/9/2008	6.21	225.8	5.83	148	16.2	16.2
	4/8/2009	56.8	301.1	5.97	158	12.77	0.93
	10/6/2009	4.38	221.7	5.96	115	15.10	0.00
	4/13/2010	11.91	181.8	5.78	83	16.20	18.90
MW-03	4/17/2003	---	---	5.26	214.0	15.2	---
	10/20/2003	---	---	5.65	249.0	20.2	---
	4/27/2004	---	---	5.19	194.2	15.1	---
	10/18/2004	---	---	5.12	285	15.2	---
	4/19/2005	---	---	4.55	188.1	19.1	---
	10/27/2005	---	---	5.64	421	15.9	---
	4/13/2006	---	---	5.69	286.0	17.4	---
	10/10/2006	---	---	5.59	270.0	16.6	---
	4/3/2007	1.63	166	5.58	377	17.4	0.00
	10/9/2007	1.14	134.7	5.63	307	16.2	17.69
	4/16/2008	0.90	171.7	5.58	445	15.31	0.39
	10/9/2008	0.89	160.6	6.01	327	15.6	0.77
	4/8/2009	1.15	211.6	5.45	320	13.85	0.00
	10/6/2009	0.83	189.1	5.38	256	16.73	0.00
	4/13/2010	3.64	195.8	5.35	150	16.16	10.18

Table 4
Summary of Historical Field Parameter Data
Municipal Solid Waste Landfill
Jackson County, North Carolina

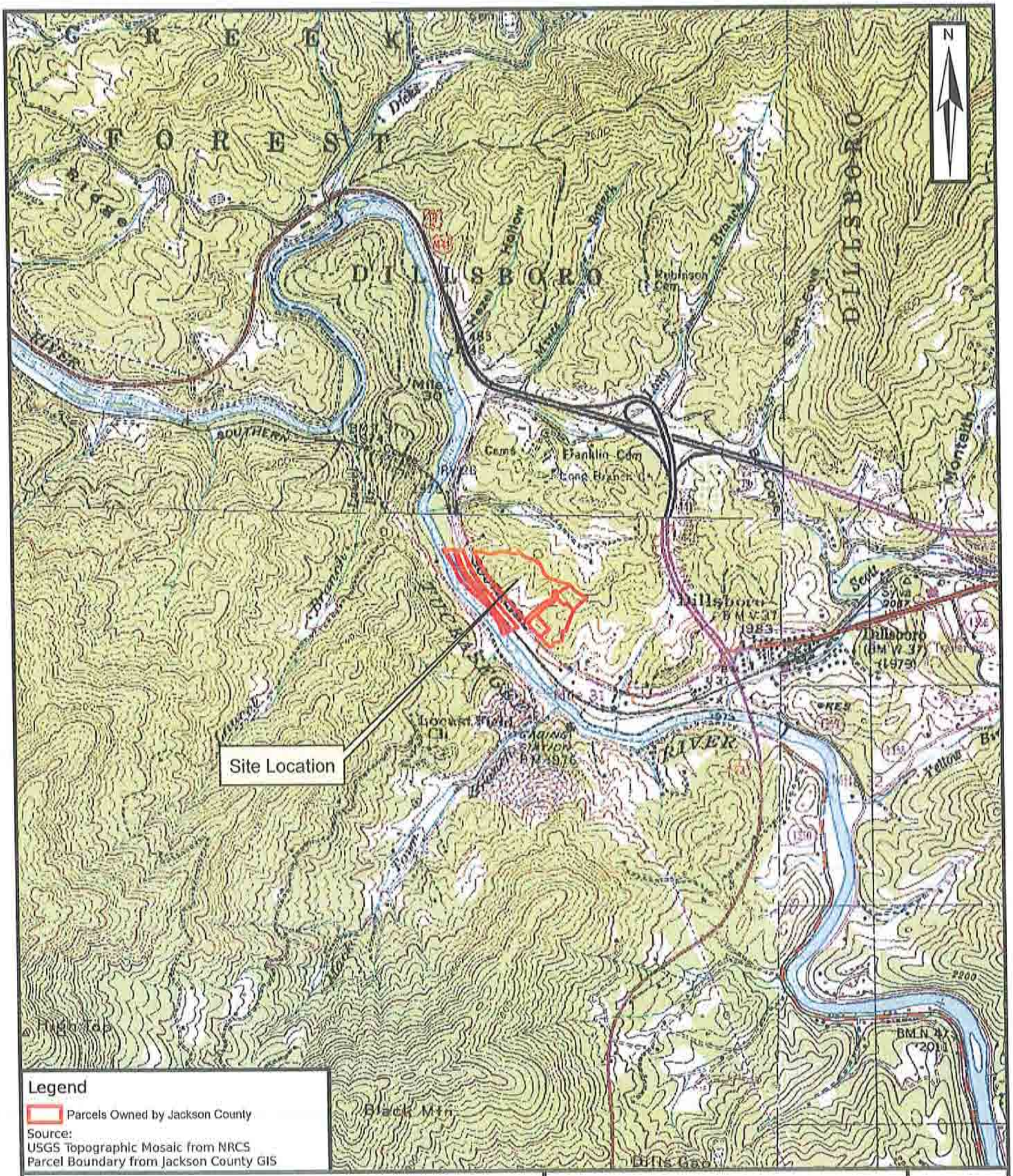
Well ID	Date	Dissolved Oxygen mg/l	Oxygen Reduction Potential mV	pH standard	Specific Conductivity uS	Temperature °C	Turbidity NTU
MW-04	4/17/2003	---	---	5.15	288.0	14.4	---
	10/21/2003	---	---	4.95	359.0	14.1	---
	4/27/2004	---	---	5.12	371.0	15.2	---
	10/18/2004	---	---	4.76	414	14.1	---
	4/19/2005	---	---	5.23	309	18.0	---
	10/27/2005	---	---	5.42	615	15.0	---
	4/13/2006	---	---	5.49	445.0	16.4	---
	10/10/2006	---	---	5.32	428.0	15.2	---
	4/3/2007	2.54	201	5.47	602	16.3	21.53
	10/9/2007	1.68	259.4	5.34	456	15.7	81.32
	4/16/2008	3.07	482.3	5.36	719	15.11	16.59
	10/9/2008	9.48	573.7	5.33	481	15.4	0.42
	4/8/2009	0.39	528.2	5.29	540	14.35	0.53
	10/6/2009	0.93	300.4	5.30	370	15.28	0.00
	4/13/2010	2.02	183.6	5.65	253	15.49	10.09
MW-05	4/17/2003	---	---	5.89	407.0	15.5	---
	10/20/2003	---	---	5.54	326.0	17.3	---
	4/27/2004	---	---	5.54	354.0	15.7	---
	10/18/2004	---	---	5.71	393	16.8	---
	4/19/2005	---	---	NS	NS	NS	---
	10/27/2005	---	---	NS	NS	NS	---
	4/13/2006	---	---	NS	NS	NS	---
	10/10/2006	---	---	NS	NS	NS	---
	4/3/2007	3.98	71	5.98	616	15.5	391.4
	10/9/2007	3.88	65.7	6.17	618	16.6	620.5
	4/16/2008	2.55	38.0	6.28	1085	16.19	149.9
	10/9/2008	3.8	43.6	7.19	673	18.0	4.06
	4/8/2009	2.46	26.5	6.09	745	14.02	3.3
	10/6/2009	3.26	23.5	6.37	558	16.84	6.90
	4/13/2010	10.96	-58.7	6.76	468	17.72	30.59
MW-06	4/27/2004	---	---	5.2	128.3	16.0	---
	10/18/2004	---	---	4.80	81.2	14.3	---
	4/19/2005	---	---	4.68	61.4	17.3	---
	10/27/2005	---	---	5.12	79.4	14.9	---
	4/13/2006	---	---	5.33	70.5	16.4	---
	10/10/2006	---	---	5.14	77.9	16.1	---
	4/3/2007	1.78	152	5.44	105.7	15.7	136.3
	10/9/2007	0.90	60.4	5.39	92	16.46	297.4
	4/16/2008	1.28	138.1	5.45	161	18.30	56.85
	10/9/2008	2.27	141.6	5.77	109	19.1	24.2
	4/8/2009	0.86	72.9	5.60	182	14.10	5.96
	10/6/2009	1.38	-37.0	6.01	396	17.17	144.9
	4/13/2010	1.82	-61.8	6.03	110	15.14	25.70
MW-07	8/10/2010	2.10	9.9	6.3	200	20.0	10.39

Notes:
1. mg/l indicates milligrams per liter
2. mV indicates millivolts
3. uS indicates microSiemens
4. °C indicates degrees Celcius
5. NTU indicates Nephelometric Turbidity Units
6. --- indicates parameter predates collection
7. NS indicates no sample collected

Table 5
Summary of Corrective Measures Alternatives
Municipal Solid Waste Landfill
Jackson County, North Carolina

Alternative No.	Corrective Measures Alternative	Effects of Aquifer Heterogeneities	Short Term Reliability and Effectiveness	Long Term Reliability and Effectiveness	Reduction of Toxicity, Mobility, or Mass of Contaminants in Groundwater	Implementability	Time	Rough Order of Magnitude Cost (Above County's Current Semiannual Water Quality Monitoring)
1	Monitored Natural Attenuation (MNA)	Moderate effect	Moderate	Moderate	Yes	Easy	Extended (10s of years)	$10,000 annually
2	MNA with Institutional Controls	Moderate effect	Moderate to good	Moderate to good	Yes	Potentially difficult due to community opposition	Extended (10s of years)	$15,000 annually
3	Leachate Removal	Small effect	Moderate	Moderate	Yes	Easy	Extended (10s of years)	$16,000 to $100,000 annually (some capital cost if an automated system is used)
4	In-Situ Treatment (ISCO)	Large effect	Good	Low to moderate	Yes	Technologically Difficult	Less extended (up to 10 years)	$1.1 million first year; $0.9 million annually thereafter

FIGURES



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SITE LOCATION MAP

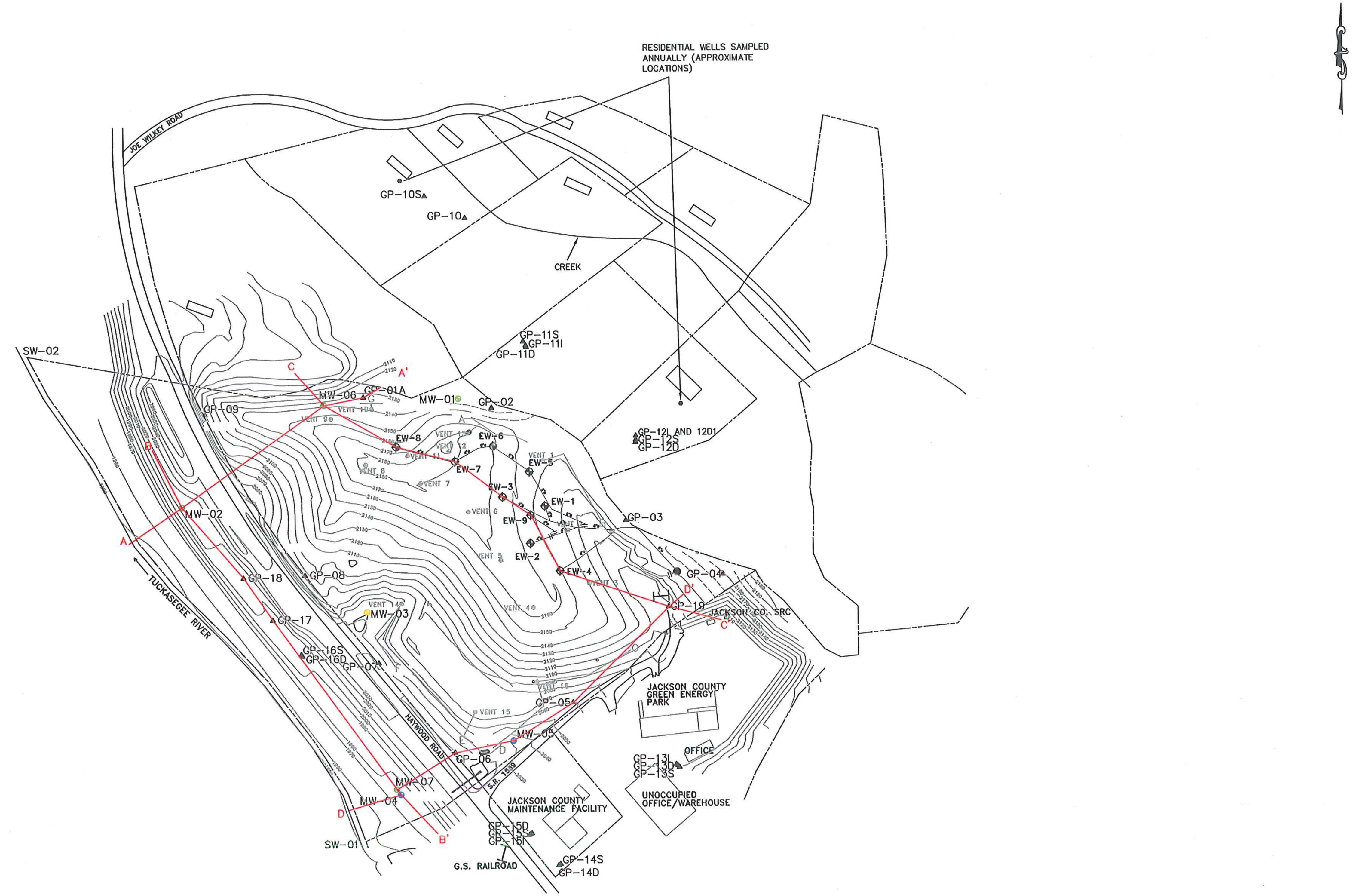
MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE 1

Drawn By: Anna Saylor
Project Manager: Alec Macbeth
Client: Jackson County
Date: 09/07/2010

Scale: 0 500 1,000 2,000 Feet

P:\Jackson County\Dillsboro GW\Reports\2010\ACM\Figures\GIS\Site Location Map.mxd



LEGEND:

- BEDROCK MONITORING WELL LOCATION
- SAPROLITE MONITORING WELL LOCATION
- PARTIALLY WEATHERED ROCK MONITORING WELL LOCATION
- GAS PROBE LOCATION
- RESIDENTIAL WELLS
- BUILDING/STRUCTURE
- EW-2 LFG EXTRACTION VERTICAL WELL
- PROPERTY BOUNDARY
- PASSIVE LANDFILL GAS VENTS (CAPPED)
- CURRENT TOPOGRAPHY
- LOCKED ACCESS GATES
- A—A' CROSS SECTION TRACES

NOTES:

1. BASED ON A METHANE GAS VENTING SITE PLAN BY MCGILL AND ASSOCIATES DATED FEB. 1999 AND A SURVEY COMPLETED BY HUTCHINSON-BIGGS & ASSOC. MARCH 6, 2002. EXTRACTION WELLS LOCATIONS FROM CARLSON ENVIRONMENTAL, LFG SYSTEM ASBUILT (APRIL 2005) MW-07 SURVEYED BY WES COLE SURVEYORS, PA (AUGUST 2010)

2. TOPOGRAPHIC LINES ARE APPROXIMATE.

REV.	DATE	DESCRIPTION	BY	CHK	APV

ALTAMONT ENVIRONMENTAL, INC.
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231 HAYWOOD STREET, ASHEVILLE, NC 28801
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DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

SCALE
100 0 200
(IN FEET)

MONITORING WELL, LFG EXTRACTION WELL, AND LFG PROBE LOCATION MAP

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE 2

P:\JACKSON COUNTY\DILLSBORO GW\REPORTS\2010\ACM\FIGURES\CAD\ACM FIGURES.DWG

Source:
Parcels, Floodway - Jackson County GIS
Roads, Rail Roads - DOT
Contours - 2007 LIDAR
Hydrology - NC One Map
2009 Orthophoto - NRCS

Legend

- Parcels Owned by Jackson County
- Parcel Boundaries
- Roads
- 20-Foot Interval Contours
- Jackson County Hydrology
- Floodway
- Rail Road
- 7621-97-3543 Property Identification Number

ALTAMONT ENVIRONMENTAL, INC.
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Drawn By: Anna Saylor
Project Manager: Alec Macbeth
Client: Jackson County
Date: 09/07/2010

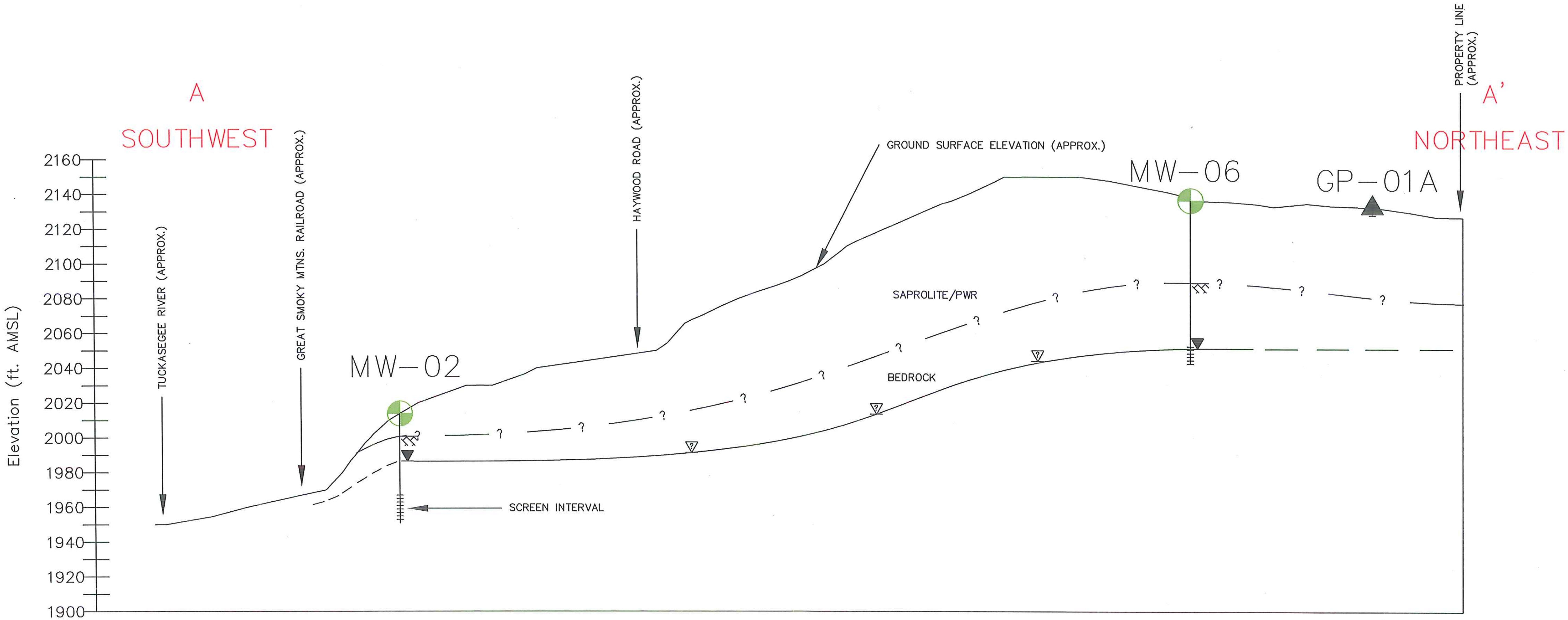
Scale
0 130 260 520 Feet

PROPERTY MAP

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE
3

P:\Jackson County\Dillsboro GW\Reports\2010\ACM\Figures\GIS\Property Map.mxd



LEGEND:

- BEDROCK MONITORING WELL LOCATION
- BEDROCK
- GROUNDWATER ELEVATION (AMSL; MEAS. 8/25/2010)
- GAS PROBE
- SCREENED INTERVAL

NOTES:

1. PWR = PARTIALLY WEATHERED ROCK
2. AMSL = ABOVE MEAN SEA LEVEL

REV.	DATE	DESCRIPTION	BY	CHK	APV

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DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

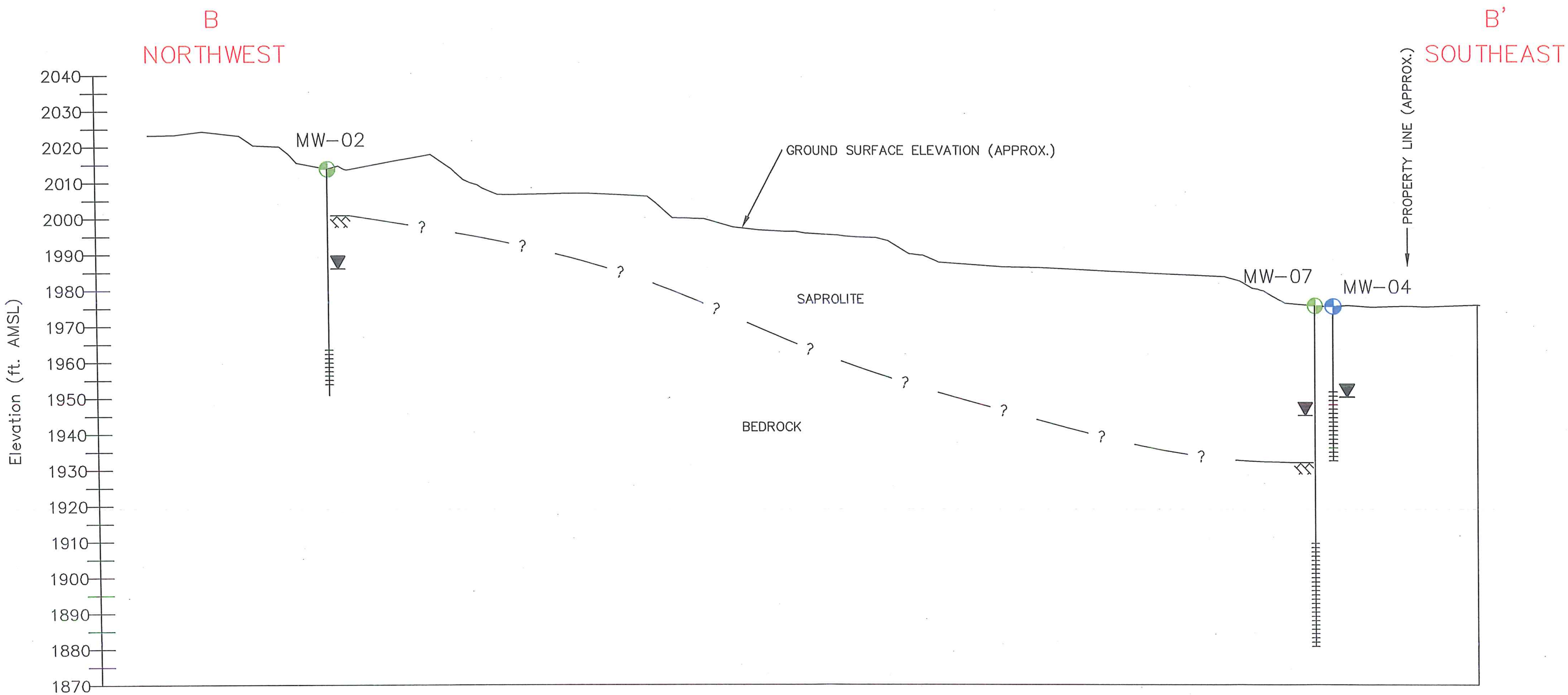
HORIZONTAL SCALE 1 INCH = 60 FEET
VERTICAL SCALE 1 INCH = 60 FEET

CROSS SECTION A - A'

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE 4

P:\JACKSON COUNTY\DILLSBORO GW\REPORTS\2010\ACM\FIGURES\CAD\ACM FIGURES.DWG



LEGEND:
- BEDROCK MONITORING WELL LOCATION
- SAPROLITE MONITORING WELL LOCATION
- BEDROCK
- GROUNDWATER ELEVATION (AMSL; MEAS. 8/25/2010)
- SCREENED INTERVAL

NOTES:
1. AMSL = ABOVE MEAN SEA LEVEL

REV.	DATE	DESCRIPTION	BY	CHK	APV

ALTAMONT ENVIRONMENTAL, INC.
ENGINEERING & HYDROGEOLOGY
231 HAYWOOD STREET, ASHEVILLE, NC 28801
TEL.828.281.3350 FAC.828.281.3351
WWW.ALTAMONTENVIRONMENTAL.COM

DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

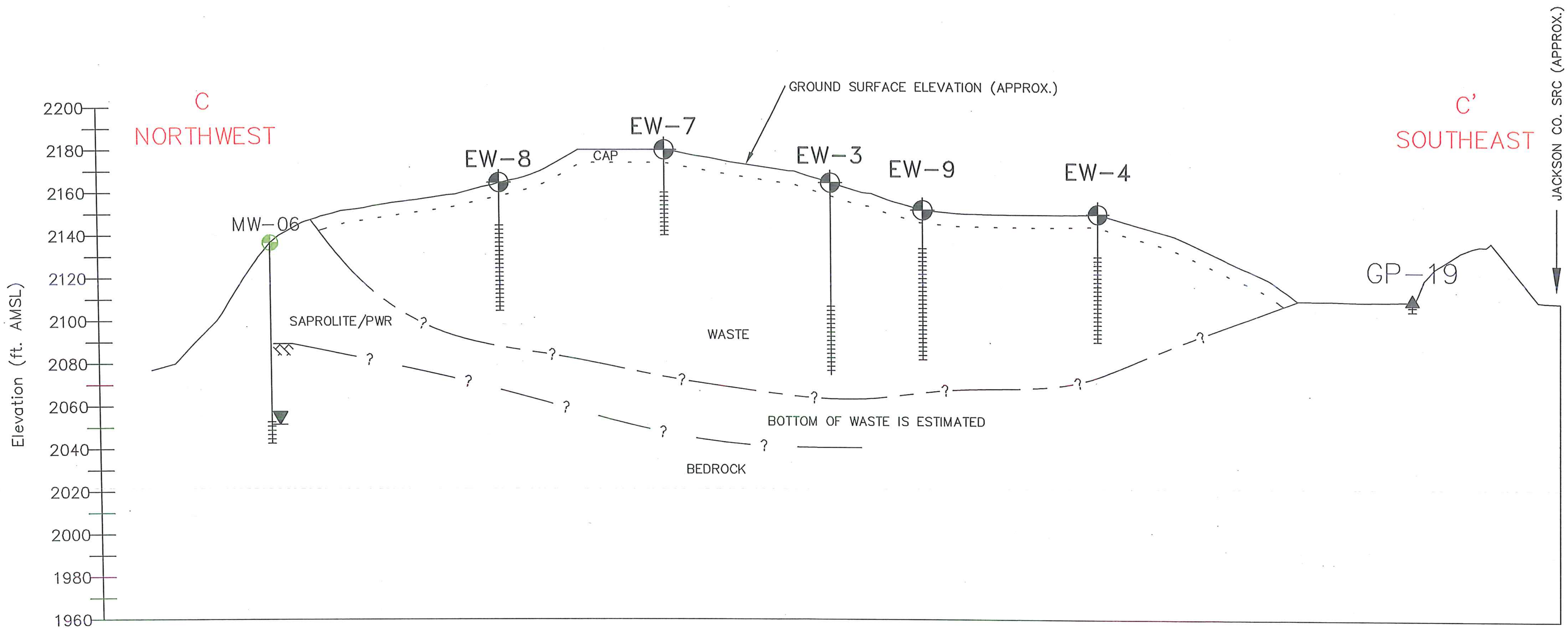
HORIZONTAL SCALE 1 INCH = 100 FEET
VERTICAL SCALE 1 INCH = 30 FEET

CROSS SECTION B - B'

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE
5

P:\JACKSON COUNTY\DILLSBORO GW\REPORTS\2010\ACM\FIGURES\CAD\ACM FIGURES.DWG



LEGEND:

- BEDROCK MONITORING WELL LOCATION
- SAPROLITE MONITORING WELL LOCATION
- LFG EXTRACTION VERTICAL WELL
- BEDROCK
- GROUNDWATER ELEVATION (AMSL; MEAS. 8/25/2010)
- GAS PROBE
- SCREENED INTERVAL

NOTES:

1. PWR = PARTIALLY WEATHERED ROCK
2. AMSL = ABOVE MEAN SEA LEVEL

REV.	DATE	DESCRIPTION	BY	CHK	APV

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DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

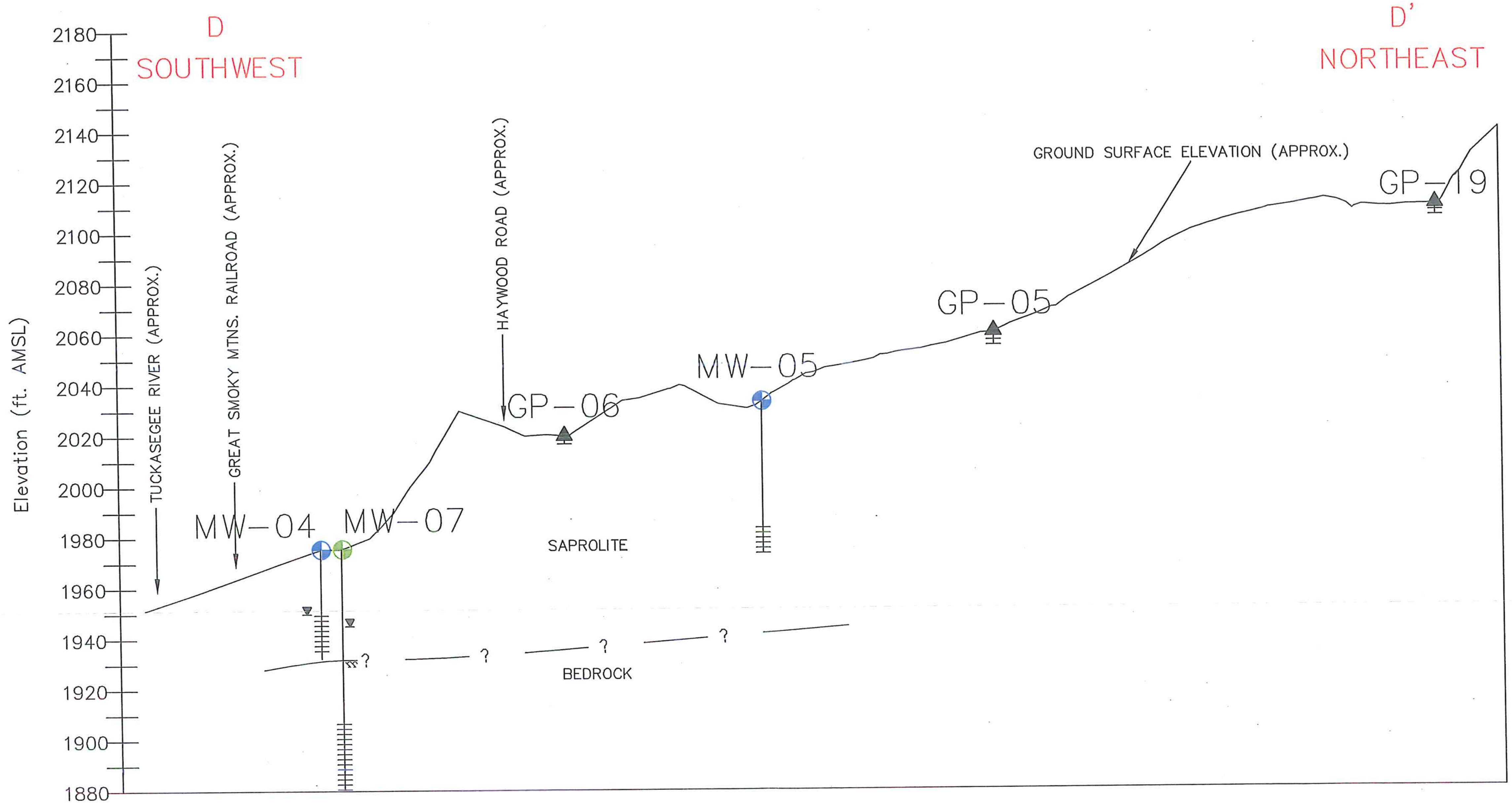
HORIZONTAL SCALE 1 INCH = 100 FEET
VERTICAL SCALE 1 INCH = 50 FEET

CROSS SECTION C - C'

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE 6

P:\JACKSON COUNTY\DILLSBORO GW\REPORTS\2010\ACM\FIGURES\CAD\ACM FIGURES.DWG



LEGEND:
- BEDROCK MONITORING WELL LOCATION
- SAPROLITE MONITORING WELL LOCATION
- BEDROCK
- GROUNDWATER ELEVATION (AMSL; MEAS. 8/25/2010)
- GAS PROBE
- SCREENED INTERVAL

NOTES:
1. AMSL = ABOVE MEAN SEA LEVEL

2. MW-05 WAS NOT GAUGED ON 08/25/2010 BECAUSE THE WELL COULD NOT BE ACCESSED.

REV.	DATE	DESCRIPTION	BY	CHK	APV

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DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

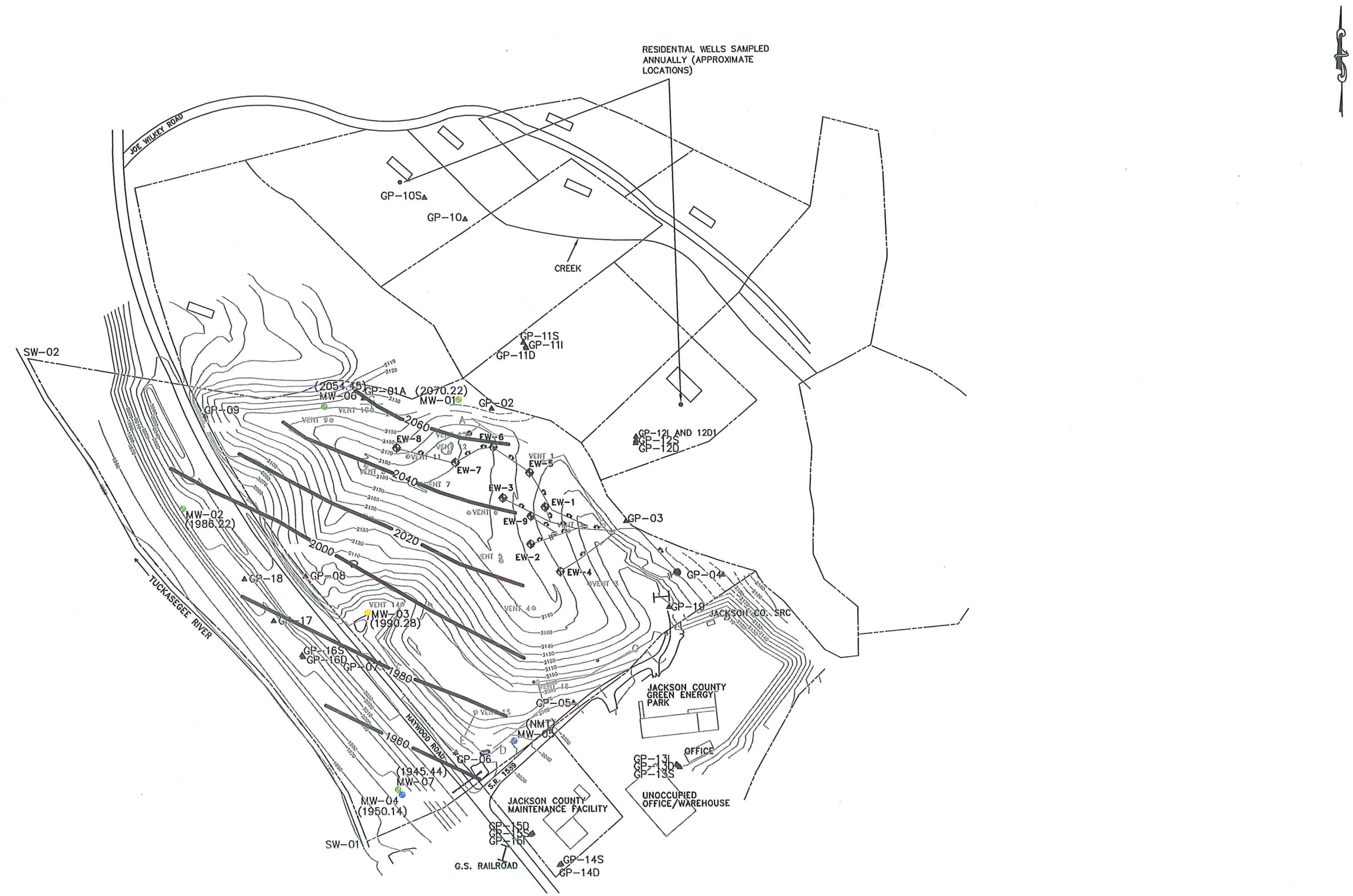
HORIZONTAL SCALE 1 INCH = 100 FEET
VERTICAL SCALE 1 INCH = 50 FEET

CROSS SECTION D - D'

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE 7

P:\JACKSON COUNTY\DILLSBORO GW\REPORTS\2010\ACM\FIGURES\CAD\ACM FIGURES.DWG



LEGEND:

- BEDROCK MONITORING WELL LOCATION
- SAPROLITE MONITORING WELL LOCATION
- PARTIALLY WEATHERED ROCK MONITORING WELL LOCATION
- GAS PROBE LOCATION
- RESIDENTIAL WELLS
- BUILDING/STRUCTURE
- EW-2 LFG EXTRACTION VERTICAL WELL
- PROPERTY BOUNDARY
- PASSIVE LANDFILL GAS VENTS (CAPPED)
- CURRENT TOPOGRAPHY
- LOCKED ACCESS GATES
- 1960 POTENTIOMETRIC SURFACE CONTOUR LINE, BEDROCK (C.I. = 20 FT)

NOTES:

1. BASED ON A METHANE GAS VENTING SITE PLAN BY MCGILL AND ASSOCIATES DATED FEB. 1999 AND A SURVEY COMPLETED BY HUTCHINSON-BIGGS & ASSOC. MARCH 6, 2002.
   EXTRACTION WELLS LOCATIONS FROM CARLSON ENVIRONMENTAL, LFG SYSTEM ASBUILT (APRIL 2005)
   MW-07 SURVEYED BY WES COLE SURVEYORS, PA (AUGUST 2010)
2. TOPOGRAPHIC LINES ARE APPROXIMATE.
3. NMT = NO MEASURE TAKEN (THICK VEGETATION PREVENTED ACCESS TO MONITORING WELL)
4. (1990.28) POTENTIOMETRIC SURFACE ELEVATIONS (FT MSL) MEASURED AUGUST 25, 2010.

REV.	DATE	DESCRIPTION	BY	CHK	APV

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DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

SCALE
100 0 200
(IN FEET)

POTENTIOMETRIC SURFACE MAP - BEDROCK

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE 8

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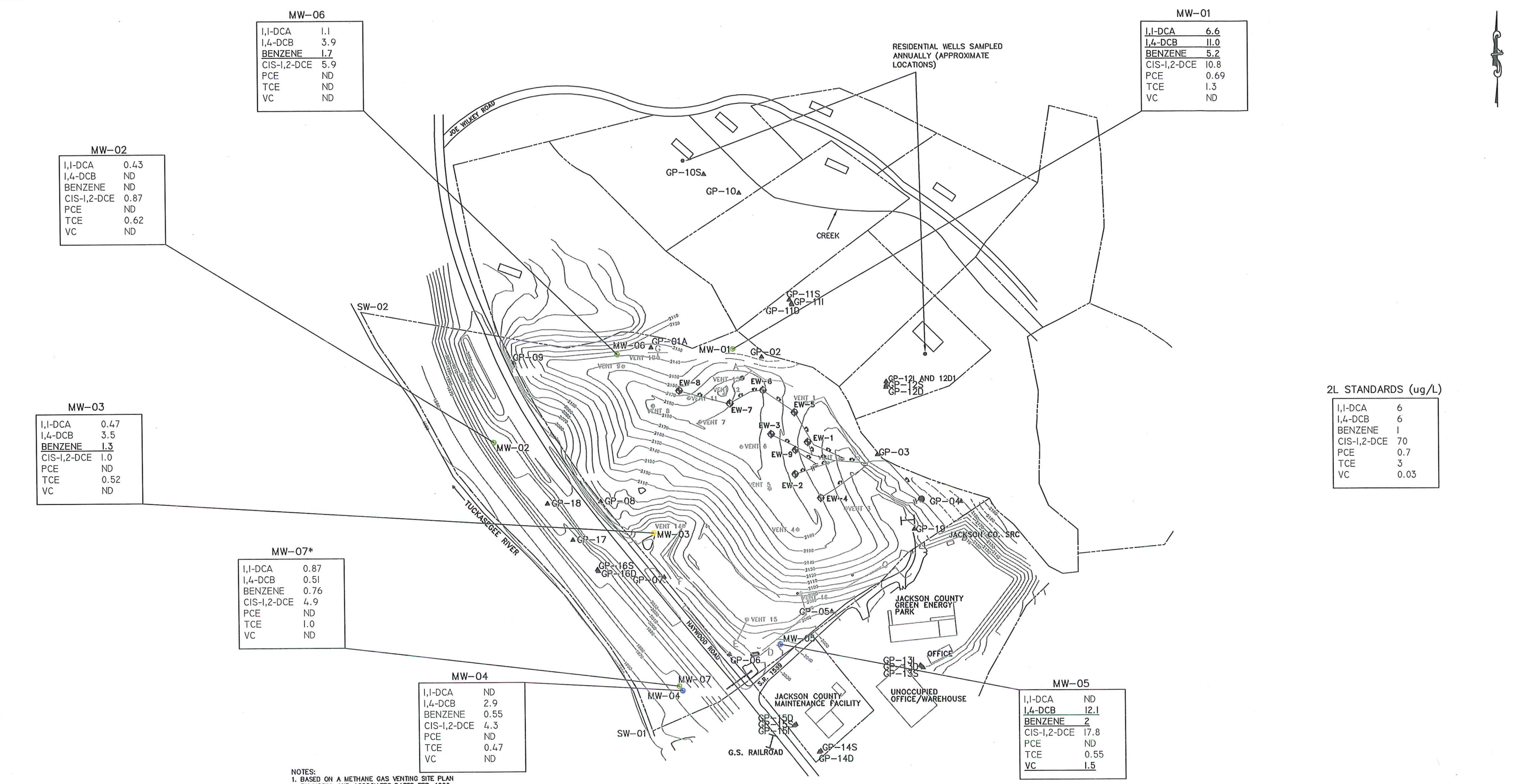

MW-06

1,1-DCA	1.1
1,4-DCB	3.9
<u>BENZENE</u>	**<u>1.7</u>**
CIS-1,2-DCE	5.9
PCE	ND
TCE	ND
VC	ND

MW-01

<u>1,1-DCA</u>	**<u>6.6</u>**
<u>1,4-DCB</u>	**<u>11.0</u>**
<u>BENZENE</u>	**<u>5.2</u>**
CIS-1,2-DCE	10.8
PCE	0.69
TCE	1.3
VC	ND

MW-02

1,1-DCA	0.43
1,4-DCB	ND
BENZENE	ND
CIS-1,2-DCE	0.87
PCE	ND
TCE	0.62
VC	ND

MW-03

1,1-DCA	0.47
1,4-DCB	3.5
<u>BENZENE</u>	**<u>1.3</u>**
CIS-1,2-DCE	1.0
PCE	ND
TCE	0.52
VC	ND

2L STANDARDS (ug/L)

1,1-DCA	6
1,4-DCB	6
BENZENE	1
CIS-1,2-DCE	70
PCE	0.7
TCE	3
VC	0.03

MW-07*

1,1-DCA	0.87
1,4-DCB	0.51
BENZENE	0.76
CIS-1,2-DCE	4.9
PCE	ND
TCE	1.0
VC	ND

MW-04

1,1-DCA	ND
1,4-DCB	2.9
BENZENE	0.55
CIS-1,2-DCE	4.3
PCE	ND
TCE	0.47
VC	ND

MW-05

1,1-DCA	ND
<u>1,4-DCB</u>	**<u>12.1</u>**
<u>BENZENE</u>	**<u>2</u>**
CIS-1,2-DCE	17.8
PCE	ND
TCE	0.55
<u>VC</u>	**<u>1.5</u>**

LEGEND:

- BEDROCK MONITORING WELL LOCATION
- SAPROLITE MONITORING WELL LOCATION
- PARTIALLY WEATHERED ROCK MONITORING WELL LOCATION
- GAS PROBE LOCATION
- RESIDENTIAL WELLS
- BUILDING/STRUCTURE
- EW-2 LFG EXTRACTION VERTICAL WELL
- PROPERTY BOUNDARY
- PASSIVE LANDFILL GAS VENTS (CAPPED)
- CURRENT TOPOGRAPHY
- LOCKED ACCESS GATES

NOTES:

1. BASED ON A METHANE GAS VENTING SITE PLAN BY MCGILL AND ASSOCIATES DATED FEB. 1999 AND A SURVEY COMPLETED BY HUTCHINSON-BIGGS & ASSOC. MARCH 6, 2002. EXTRACTION WELLS LOCATIONS FROM CARLSON ENVIRONMENTAL, LFG SYSTEM ASBUILT (APRIL 2005) MW-07 SURVEYED BY WES COLE SURVEYORS, PA (AUGUST 2010)
2. TOPOGRAPHIC LINES ARE APPROXIMATE.
3. POSTED DATA ARE SELECT VOCs DETECTED DURING THE SPRING 2010 SAMPLING EVENT (MICROGRAMS PER LITER (ug/L)).
4. BOLD AND UNDERLINED VALUES EXCEED THE 2L STANDARD
5. * INDICATES DATA COLLECTED 8/11/2010
6. 1,1-DCA = 1,1-DICHLOROETHANE
   1,4-DCB = 1,4-DICHLOROBENZENE
   CIS-1,2-DCE = CIS-1,2-DICHLOROETHENE
   PCE = TETRACHLOROETHENE
   TCE = TRICHLOROETHENE
   VC = VINYL CHLORIDE
7. ND = NOT DETECTED ABOVE LABORATORY METHOD DETECTION LIMIT.

REV.	DATE	DESCRIPTION	BY	CHK	APV

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DRAWN BY: ANNA SAYLOR
PROJECT MANAGER: CHRIS GILBERT
CLIENT: JACKSON COUNTY
DATE: 09/03/2010

SCALE
100 0 200
(IN FEET)

POSTED DATA SPRING 2010 SEMIANNUAL MONITORING EVENT

MUNICIPAL SOLID WASTE LANDFILL
JACKSON COUNTY
NORTH CAROLINA

FIGURE
9

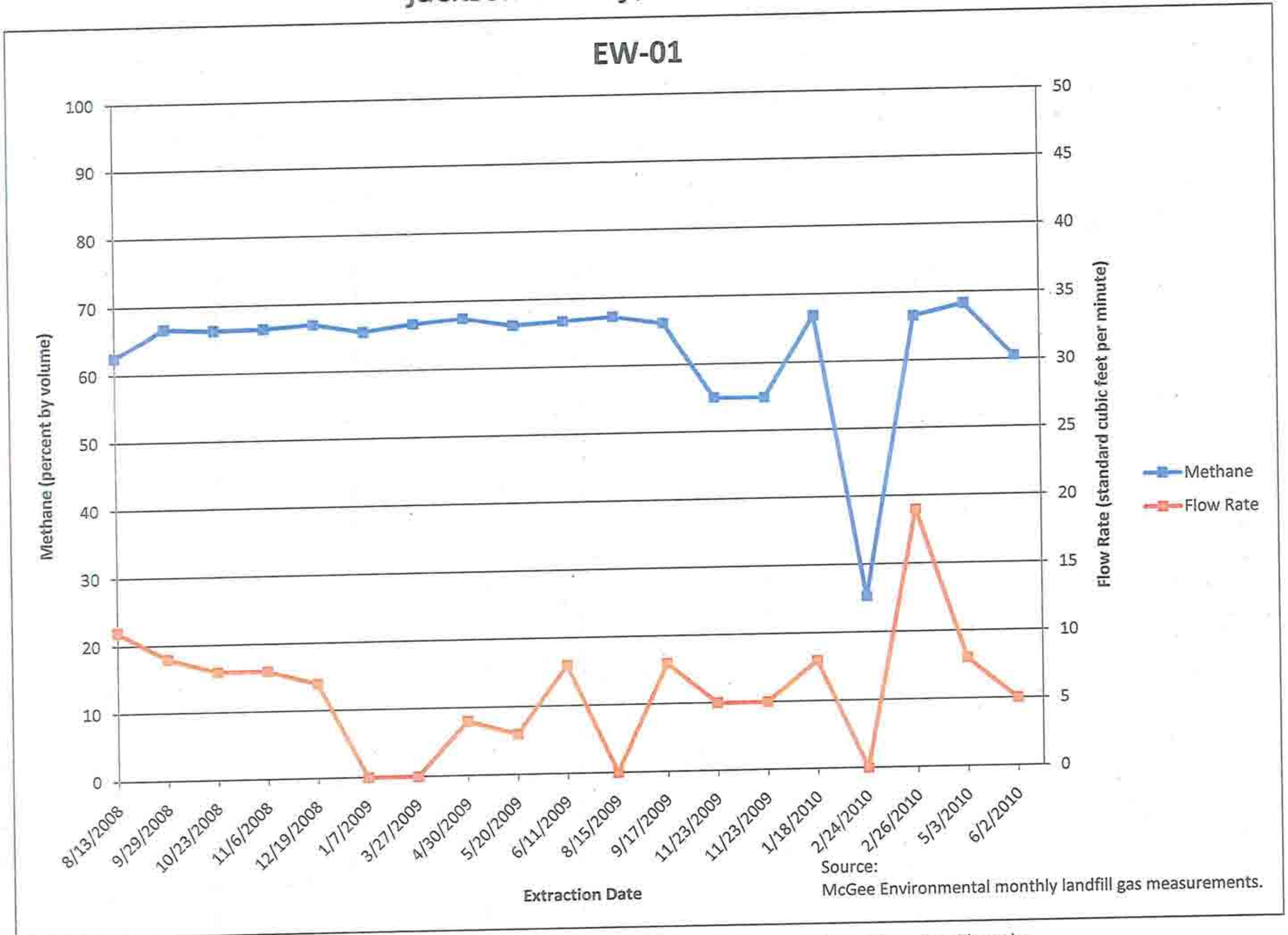
P:\JACKSON COUNTY\DILLSBORO GW\REPORTS\2010\ACM\FIGURES\CAD\ACM FIGURES.DWG

APPENDICES

APPENDIX A

Historical Landfill Gas Trend Plots

Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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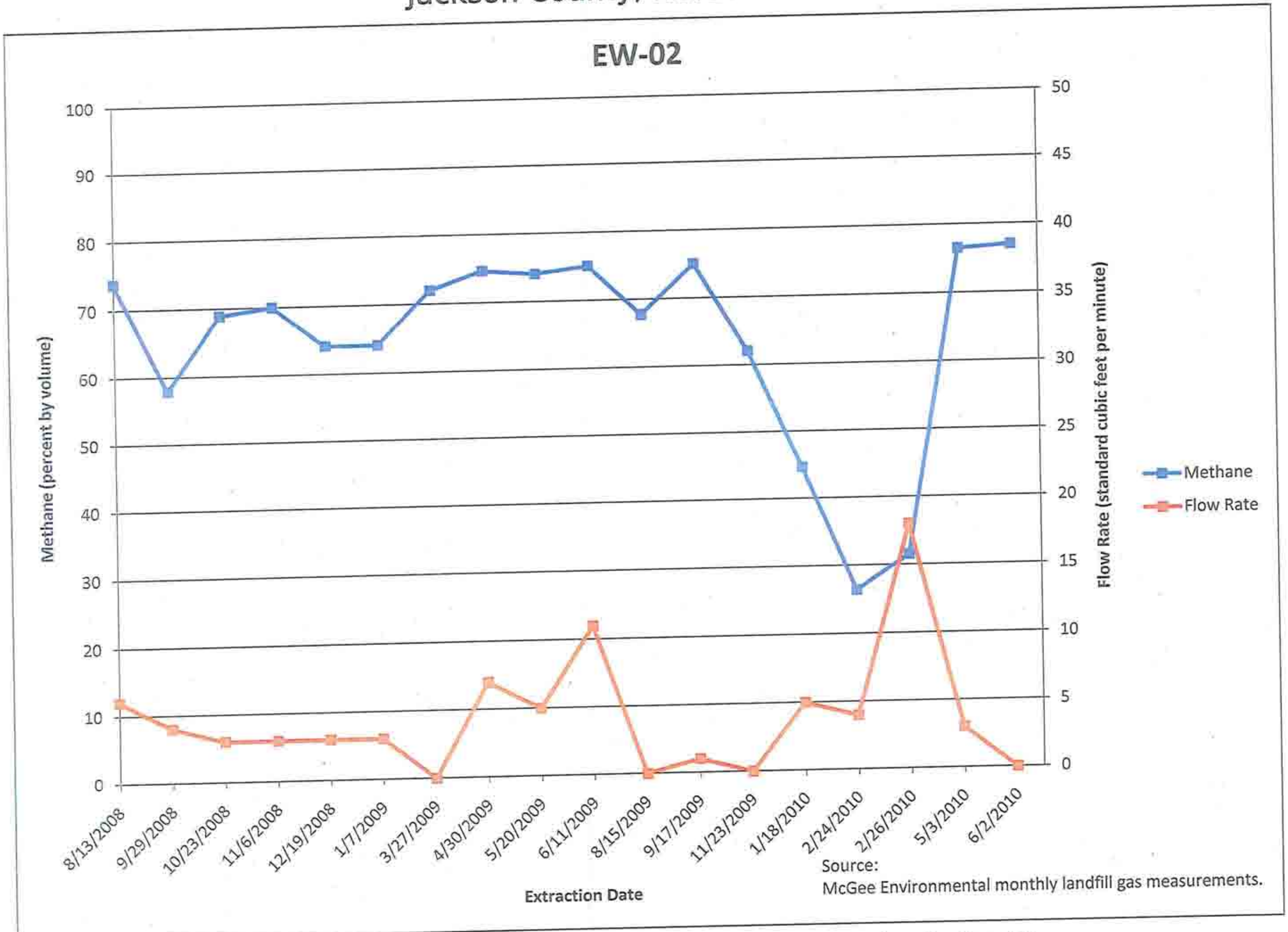
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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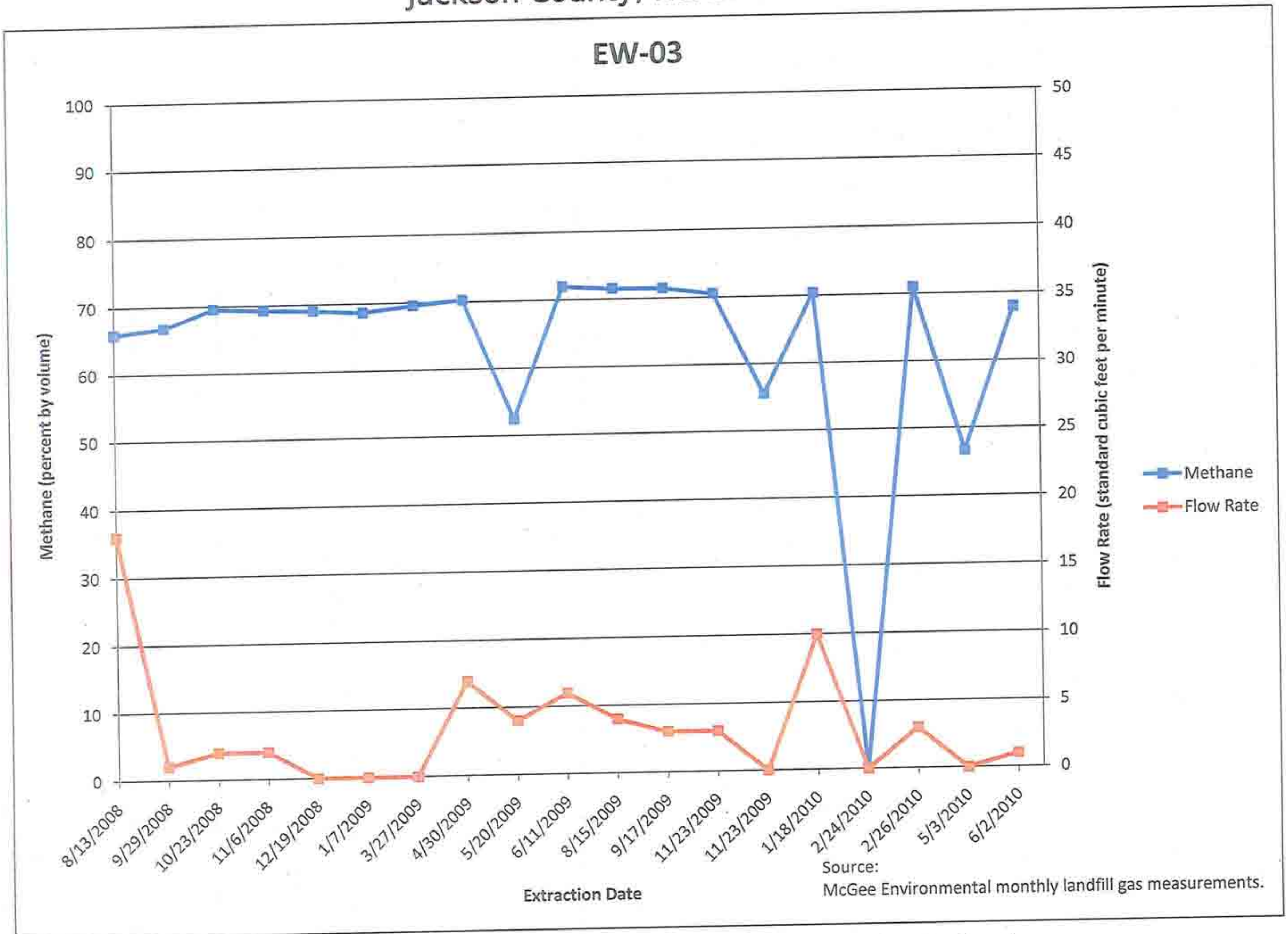
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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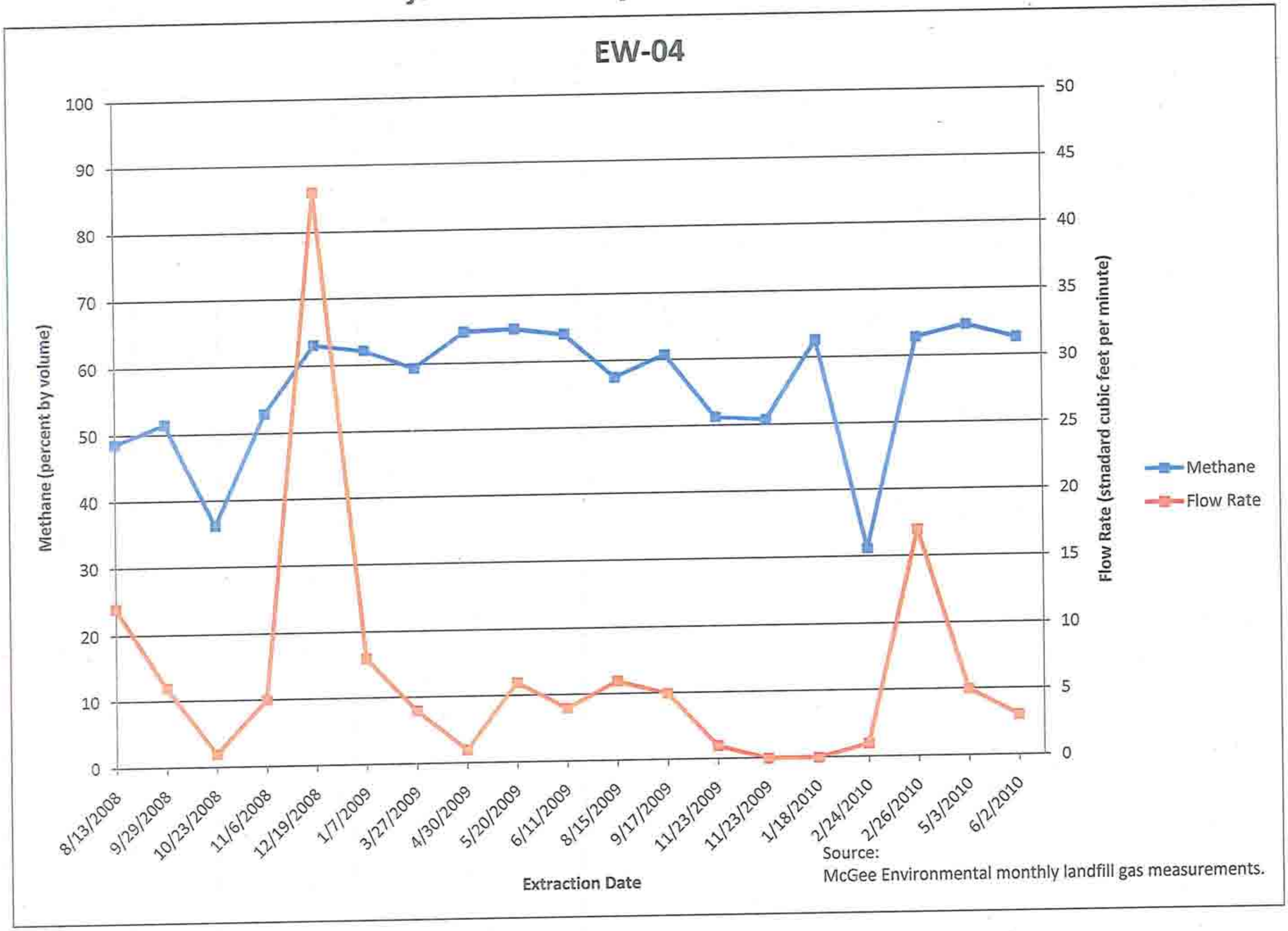
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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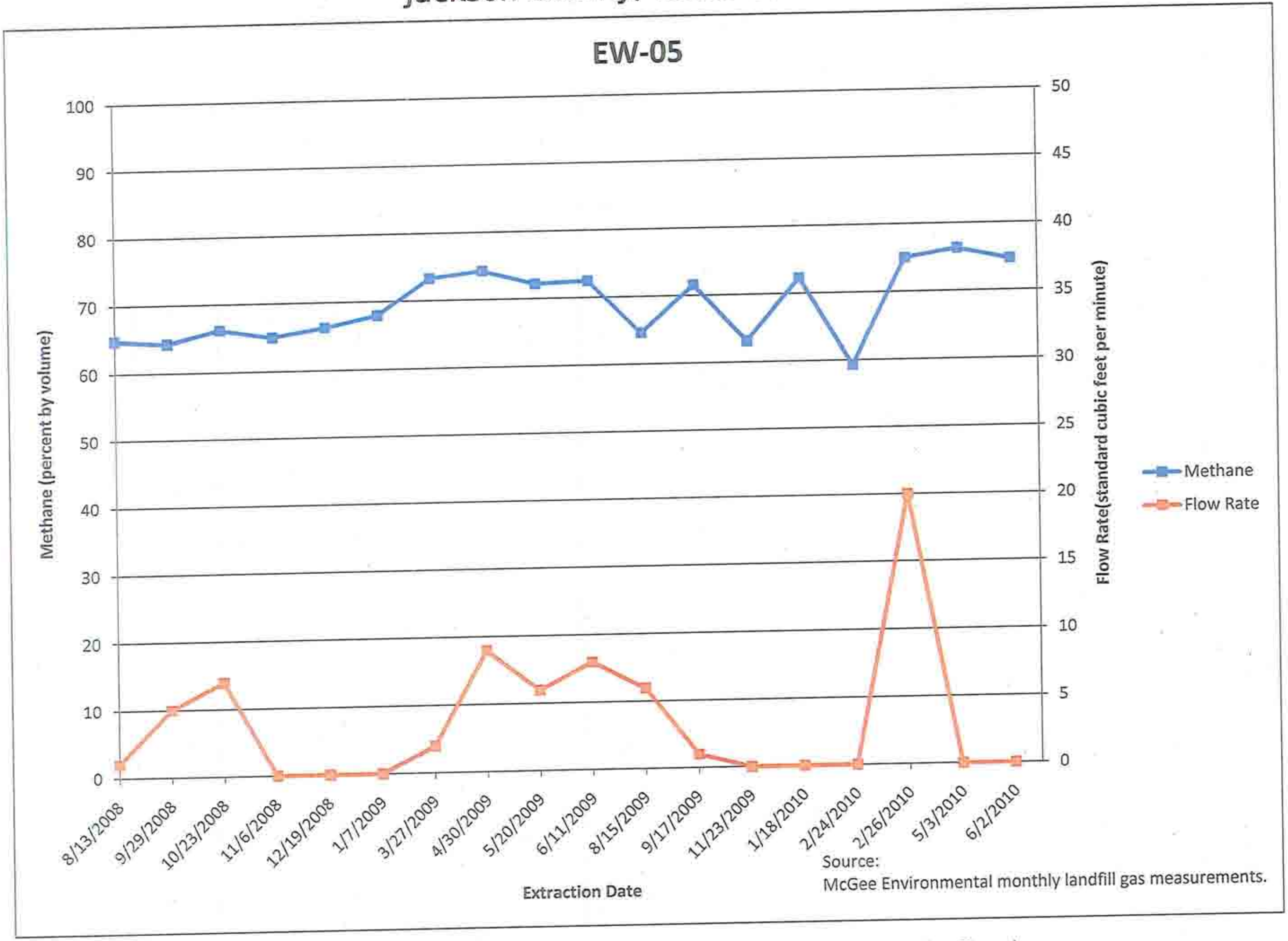
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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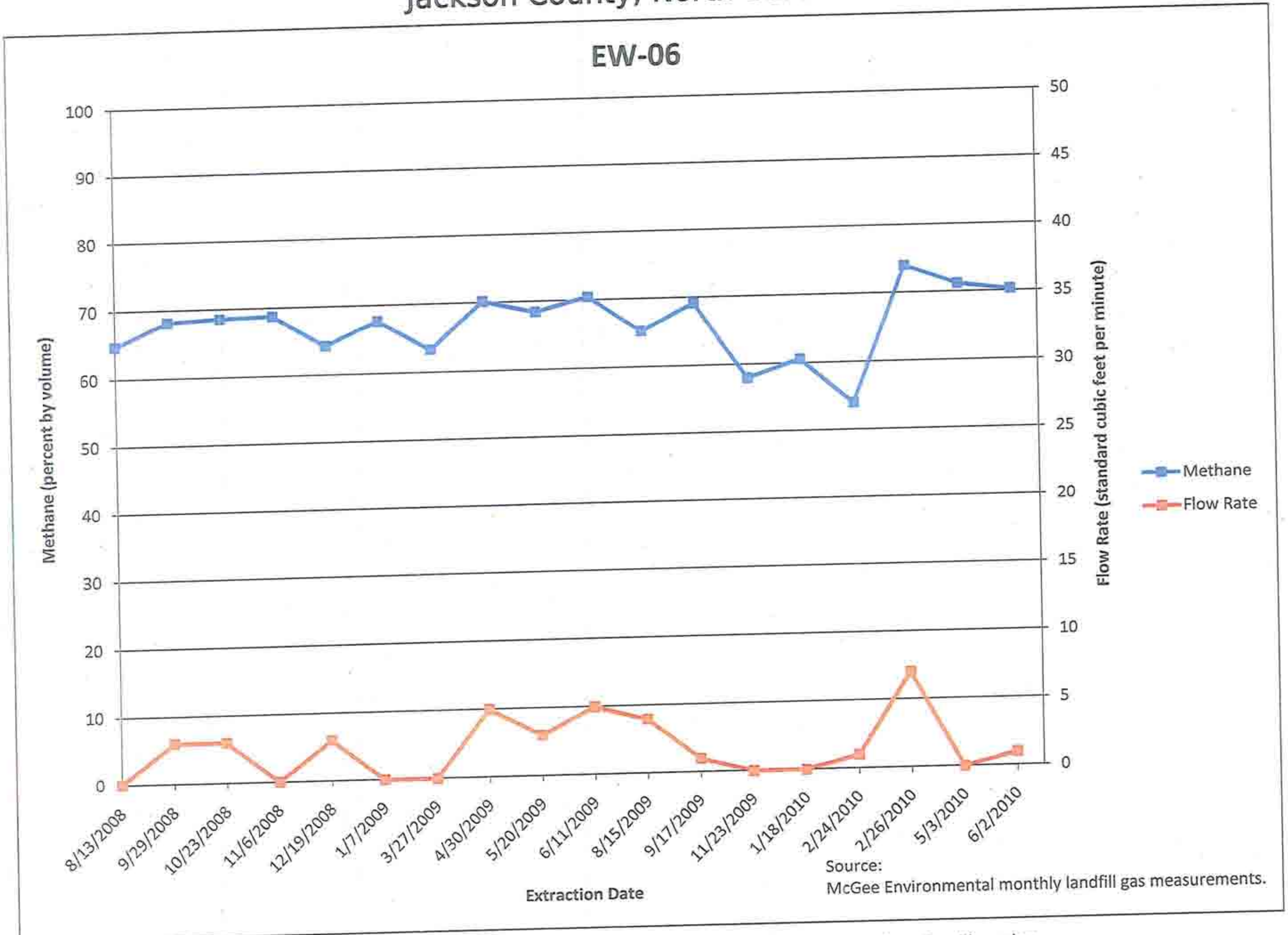
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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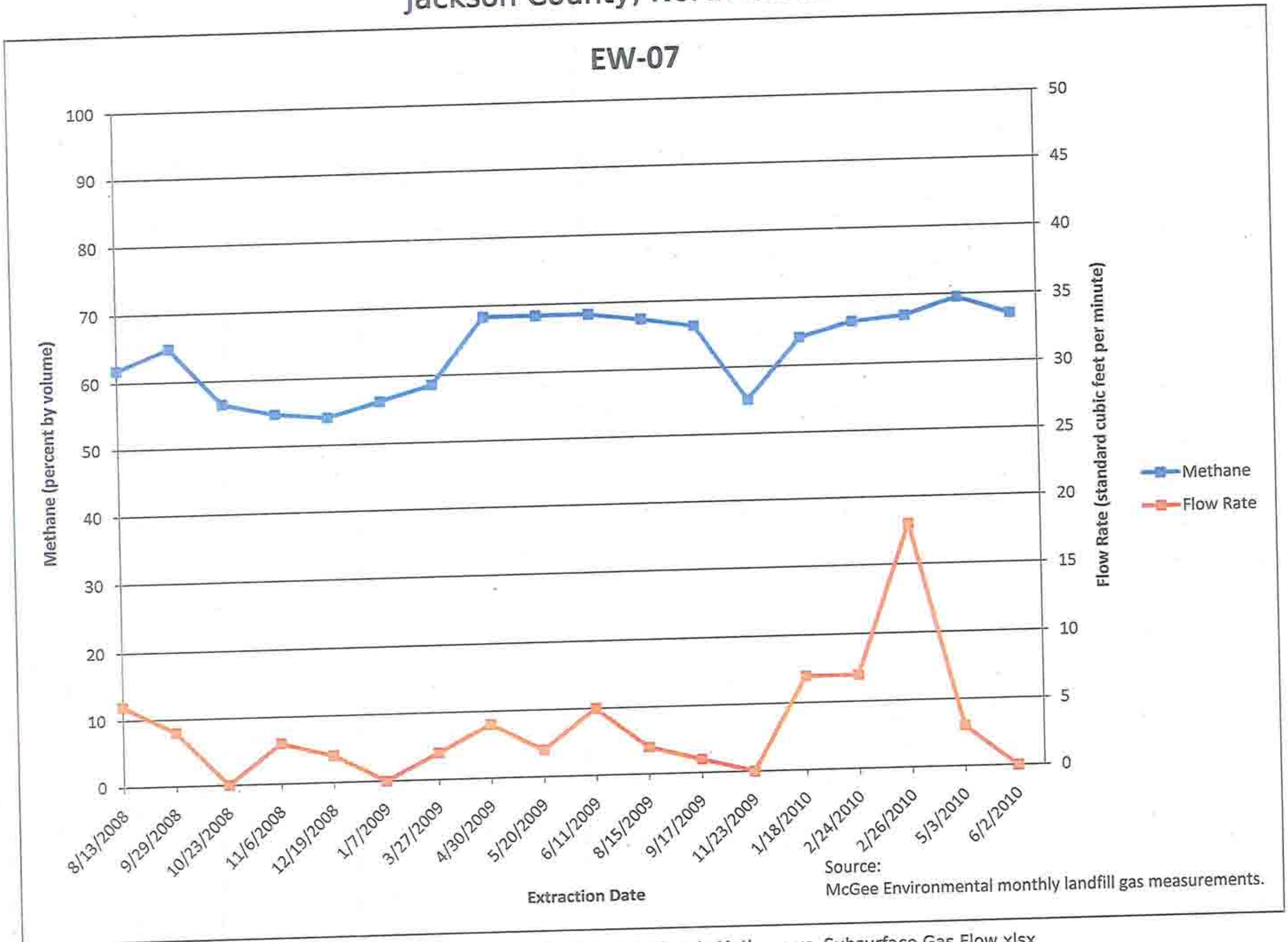
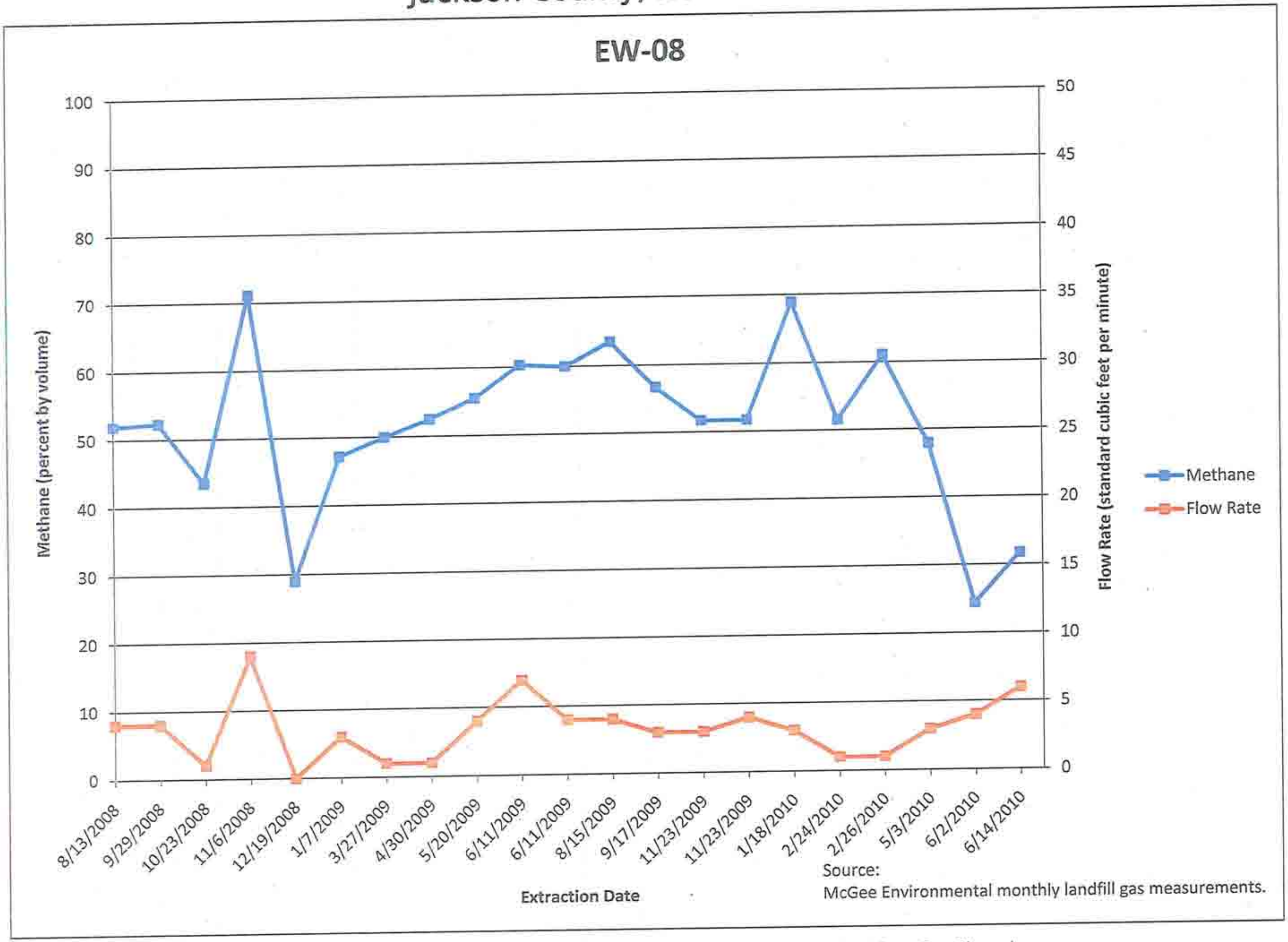
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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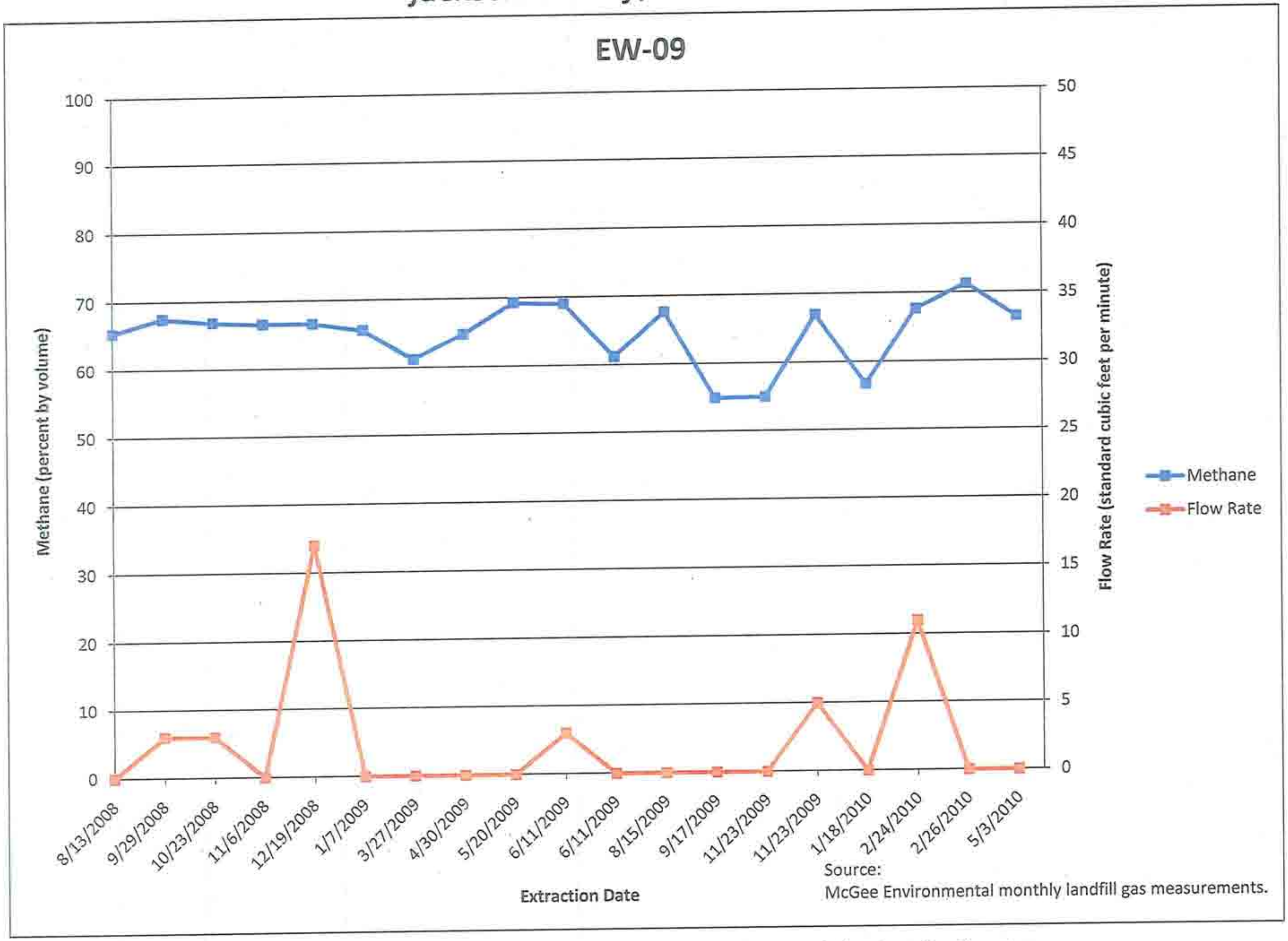
Methane vs. Flow Rate
Closed Dillsboro Landfill
Jackson County, North Carolina



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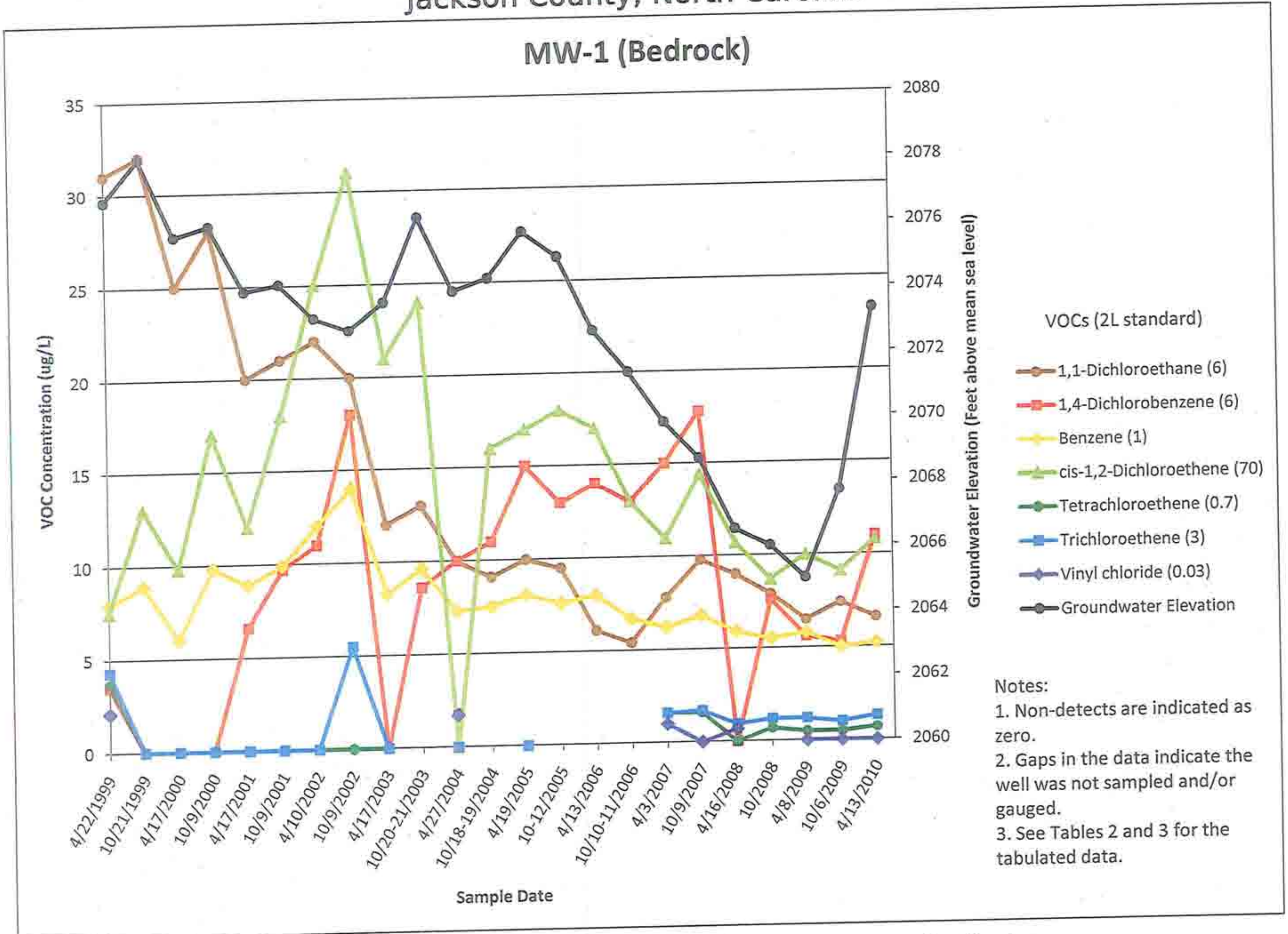
APPENDIX B

Historical Groundwater Concentration Trend Plots

Historical Water Quality vs. Groundwater Elevation
Closed Dillsboro Landfill
Jackson County, North Carolina



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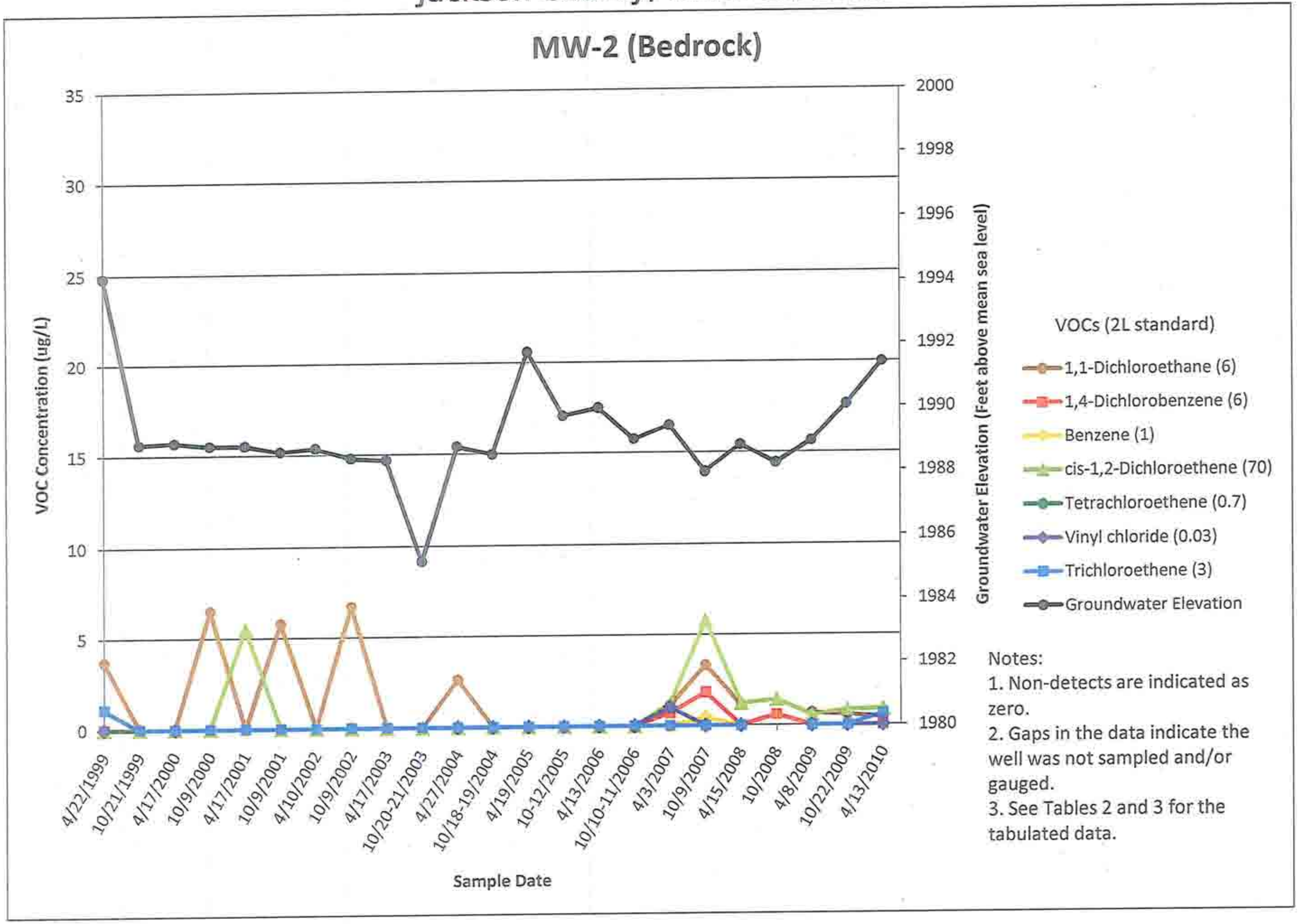
Historical Water Quality vs. Groundwater Elevation
Closed Dillsboro Landfill
Jackson County, North Carolina



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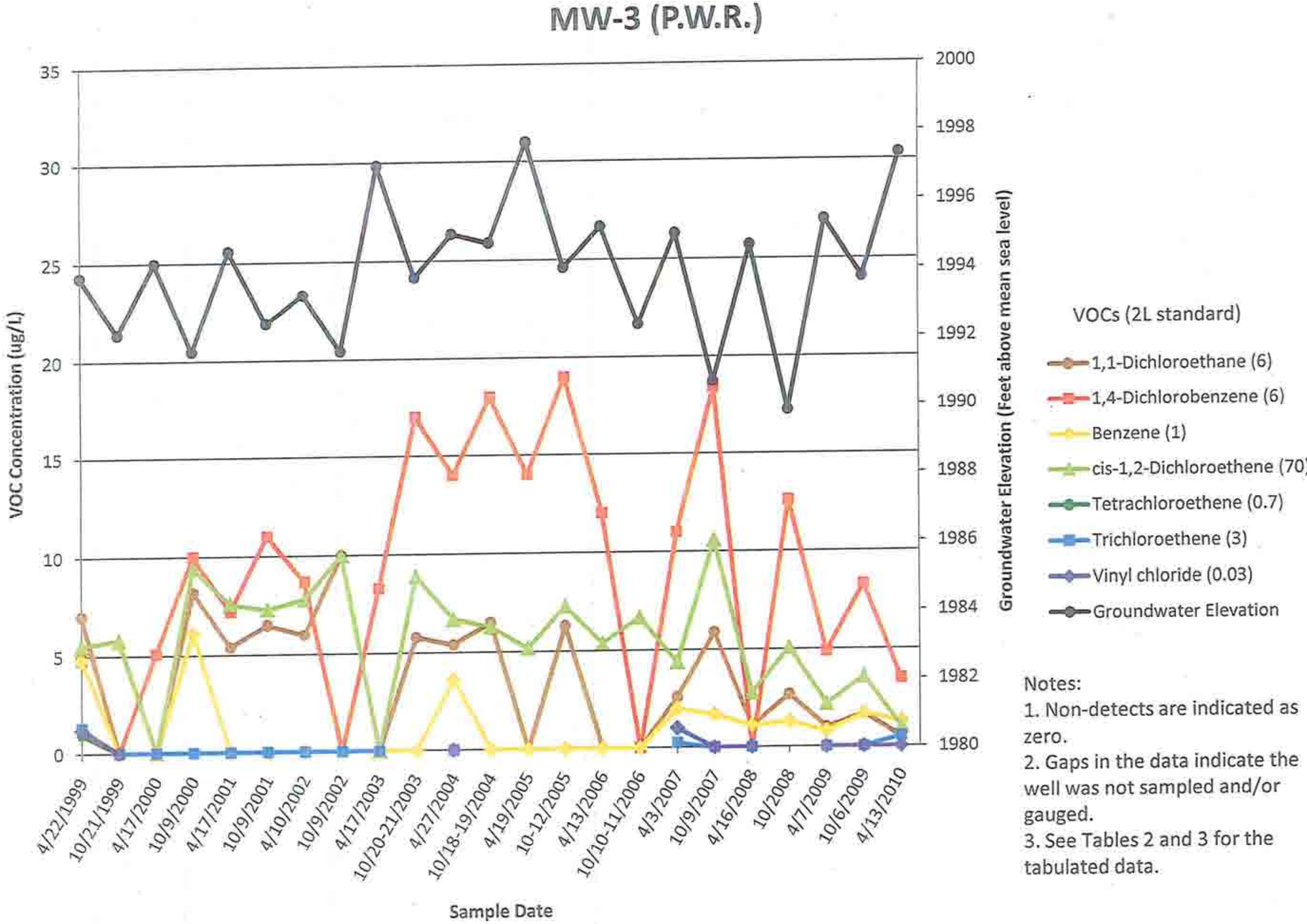
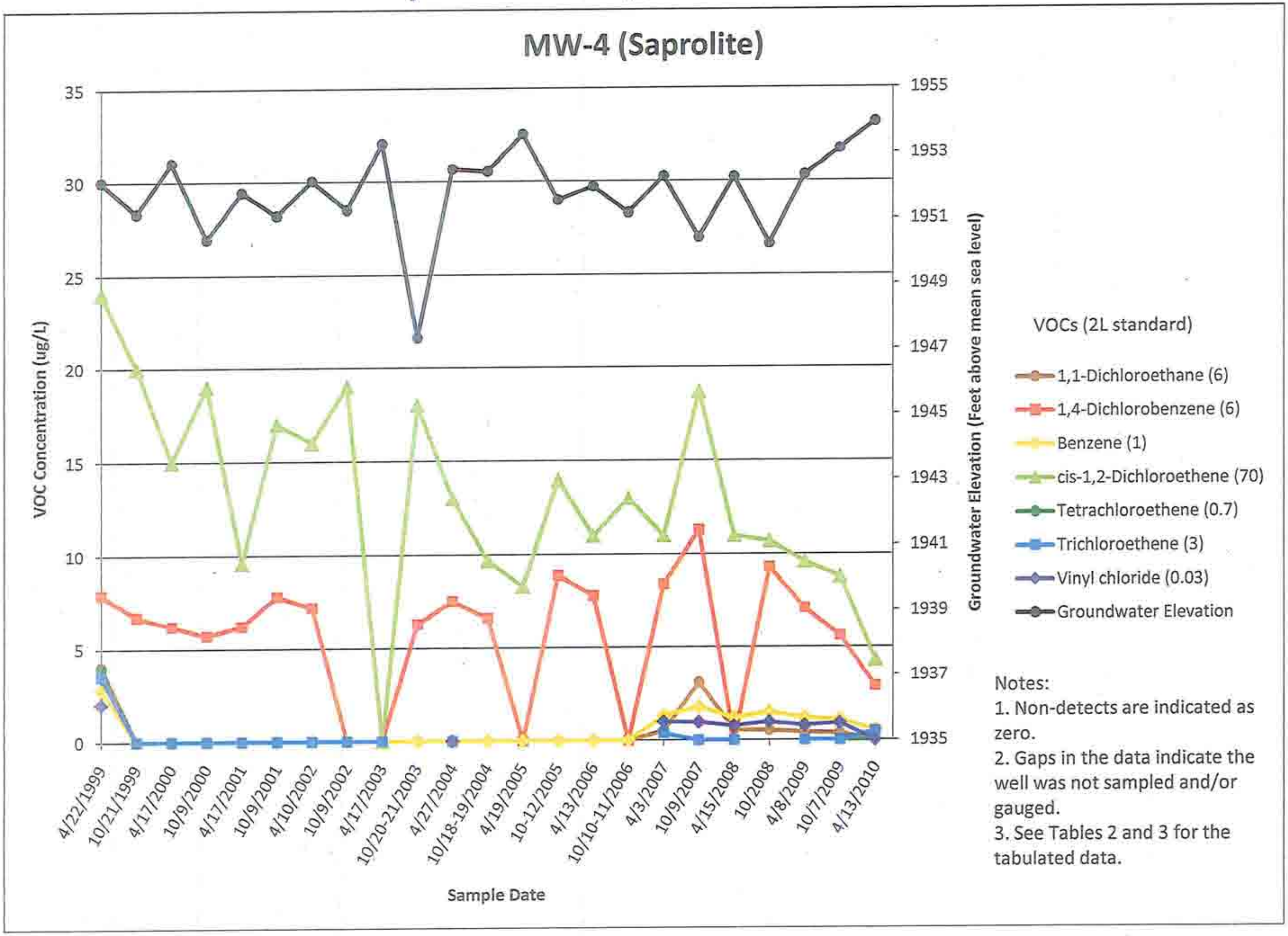
Historical Water Quality vs. Groundwater Elevation
Closed Dillsboro Landfill
Jackson County, North Carolina



Notes:
1. Non-detects are indicated as zero.
2. Gaps in the data indicate the well was not sampled and/or gauged.
3. See Tables 2 and 3 for the tabulated data.

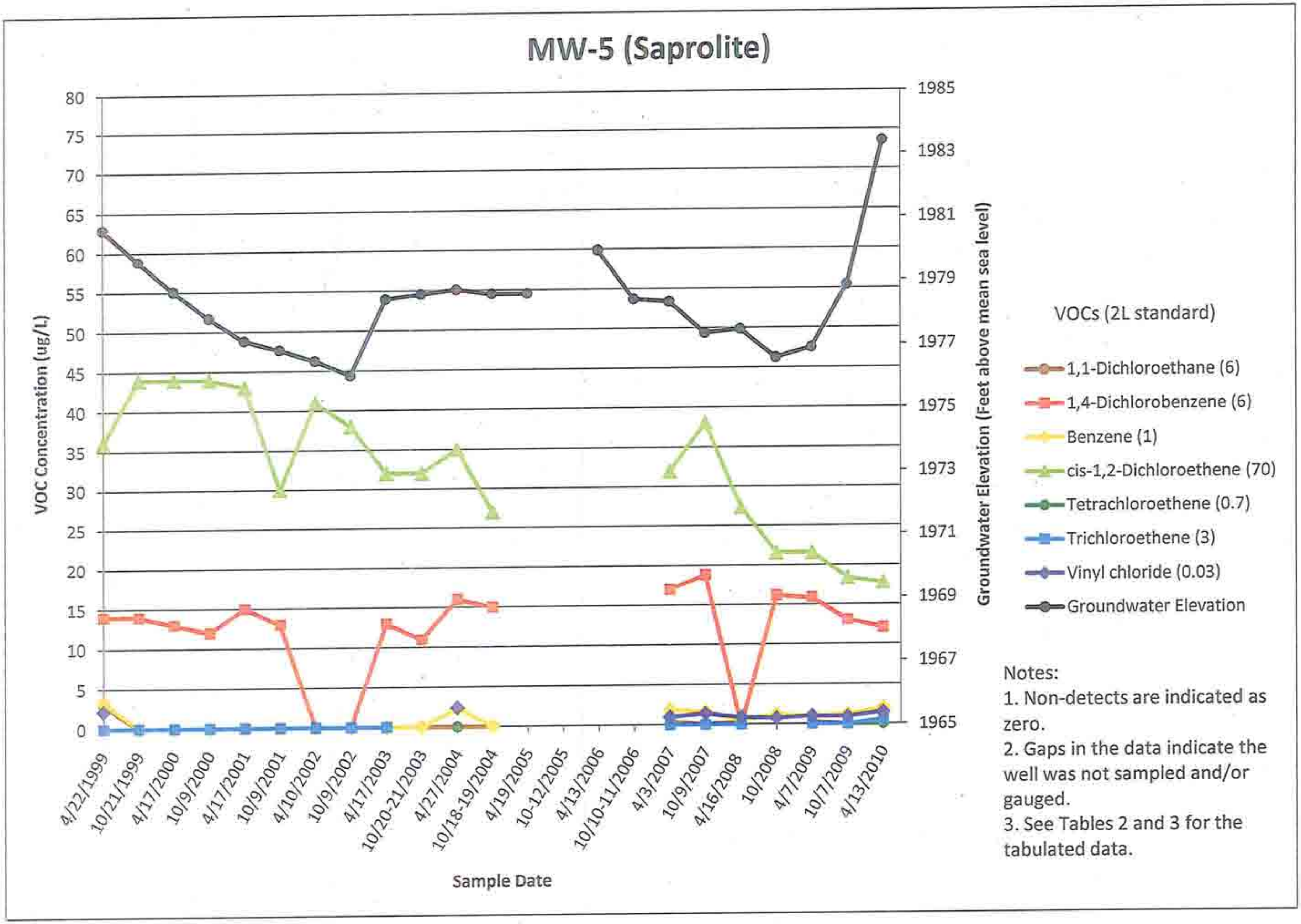
P:\Jackson County\Dillsboro GW\Reports\2010\ACM\Appendices\Appendix B Historic Water Quality vs. Water Elevation.xlsx

Historical Water Quality vs. Groundwater Elevation
Closed Dillsboro Landfill
Jackson County, North Carolina



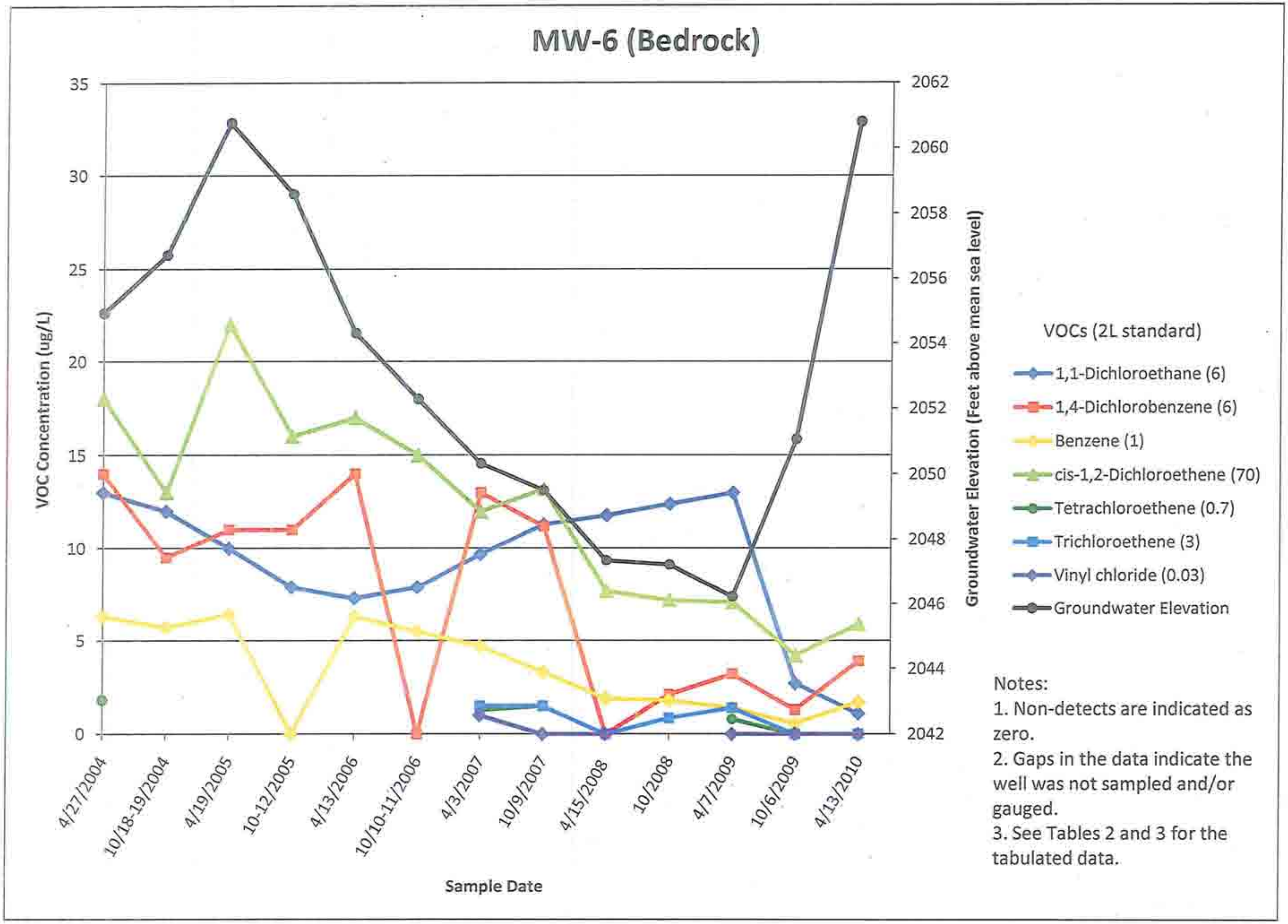
Notes:
1. Non-detects are indicated as zero.
2. Gaps in the data indicate the well was not sampled and/or gauged.
3. See Tables 2 and 3 for the tabulated data.

Historical Water Quality vs. Groundwater Elevation
Closed Dillsboro Landfill
Jackson County, North Carolina



P:\Jackson County\Dillsboro GW\Reports\2010\ACM\Appendices\Appendix B Historic Water Quality vs. Water Elevation.xlsx

Historical Water Quality vs. Groundwater Elevation
Closed Dillsboro Landfill
Jackson County, North Carolina



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APPENDIX C

Boring Log and Well Construction Diagram

ALTAMONT ENVIRONMENTAL, INC.
ENGINEERING & HYDROGEOLOGY

WELL NUMBER MW-07

CLIENT Jackson County
PROJECT NUMBER 2040.30
DATE STARTED 7/29/10 COMPLETED 7/30/10
DRILLING CONTRACTOR Geologic Exploration
DRILLING METHOD Drilltech D25KW-Air Rig
LOGGED BY Amy Bondurant CHECKED BY Alec Macbeth
NOTES Sunny and hot, 90's

PROJECT NAME Closed Jackson County Landfill
PROJECT LOCATION Dillsboro, NC
GROUND ELEVATION ____ HOLE SIZE 10-inch/6-inch
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

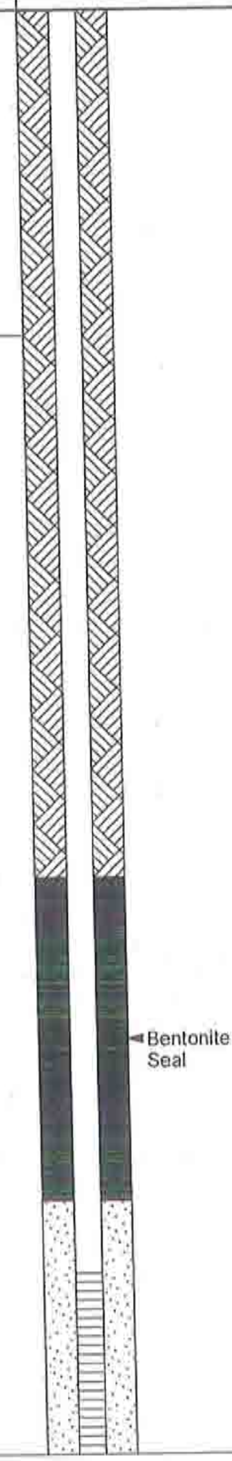
DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PID (ppm)	WELL DIAGRAM
0			SP-SM		WELL GRADED SAND WITH SILT - soft, red orange brown, dry, mostly fine sand, little silt, trace clay, locally gravel present, micaceous.		
5							
10							
15							
20							
21.0			SP-SC		increase in clay and increase in gravels to cobbles		
25							
30							Cement Grout
33			SC-SM		SILTY SAND WITH CLAY - light red brown, mostly fine sand, some silt, little clay, locally cobbles present.		
35							

(Continued Next Page)

ALTAMONT ENVIRONMENTAL, INC.
ENGINEERING & HYDROGEOLOGY

CLIENT Jackson County
PROJECT NUMBER 2040.30
PROJECT NAME Closed Jackson County Landfill
PROJECT LOCATION Dillsboro, NC

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PID (ppm)	WELL DIAGRAM
35			SC-SM		SILTY SAND WITH CLAY - light red brown, mostly fine sand, some silt, little clay, locally cobbles present. *(continued)*		
44.0					BEDROCK-light gray, micaceous, gneiss hard drilling		
54		Set 8-inch surface casing to 54 feet bgs. Begin drill with 6-inch air hammer on 7/30/10.			fracture at 67.0 feet bgs		
					fracture at 72.0 feet bgs		
75					fracture at 89.0 feet bgs, moist to wet cuttings		



(Continued Next Page)

ALTAMONT ENVIRONMENTAL, INC.
ENGINEERING & HYDROGEOLOGY

WELL NUMBER MW-07

CLIENT Jackson County
PROJECT NUMBER 2040.30
PROJECT NAME Closed Jackson County Landfill
PROJECT LOCATION Dillsboro, NC

DEPTH (ft)	SAMPLE TYPE NUMBER	REMARKS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PID (ppm)	WELL DIAGRAM
75					fracture at 89.0 feet bgs, moist to wet cuttings *(continued)*		
80							Sand #2; 2" PVC Sch. 40 0.010" slot
85							
90							
95				95.0	Bottom of hole at 95.0 feet.		

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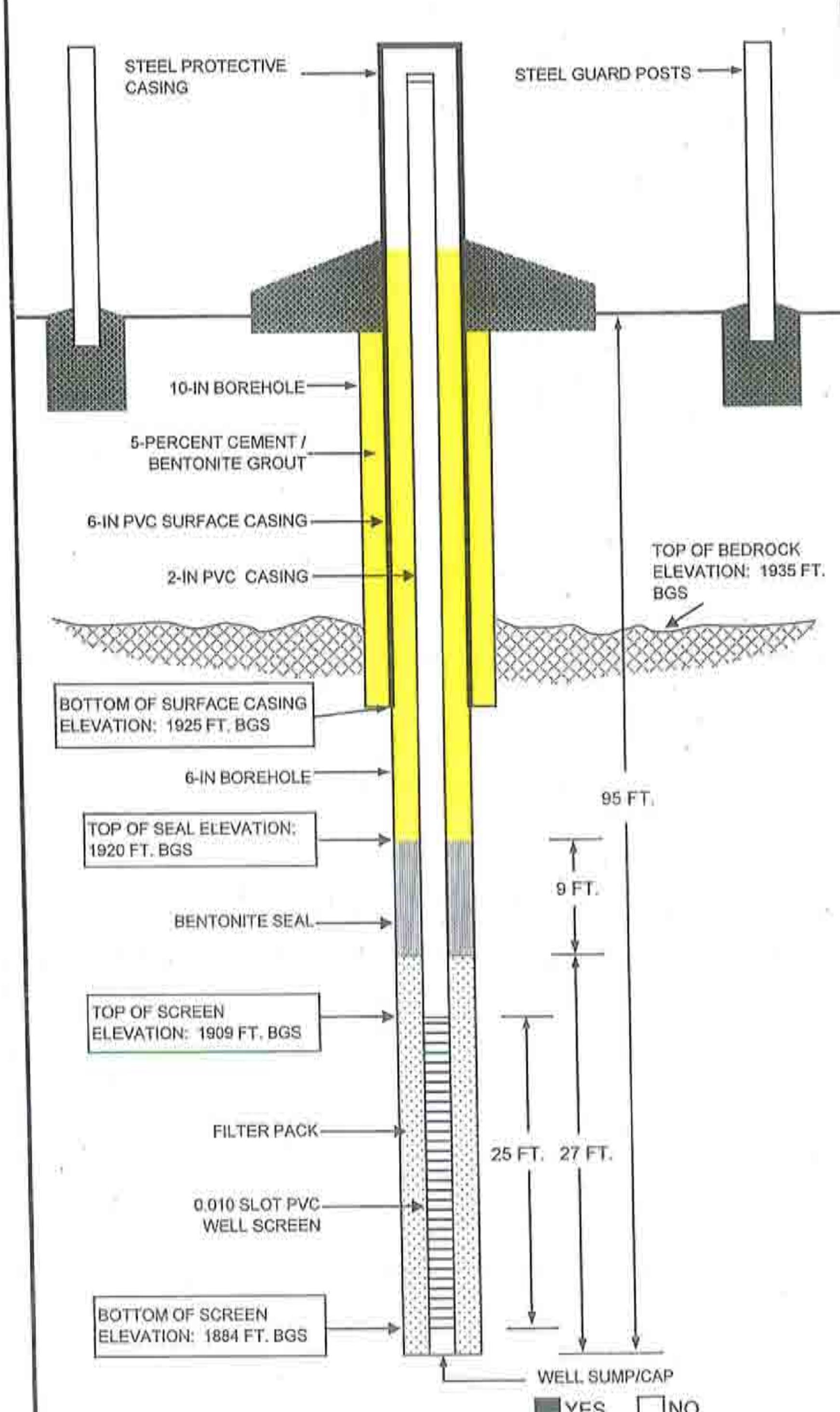
WWW.ALTAMONTENVIRONMENTAL.COM

MONITORING WELL CONSTRUCTION DETAILS

Project Name	Jackson County	Boring Name	MW-07
Project No.	2040.30	Grade Elevation	1978.71 FT. MSL
Geologist	A. Bondurant	TOC Elevation	1981.29 FT. MSL
Driller	Geologic Exploration, Inc.	Date of Installation	7/30/2010
Drilling Method	Air Rotary		

WELL CONSTRUCTION DIAGRAM



■ YES ☐ NO

LENGTH 0.3 FT.

(NOTE: NOT TO SCALE)

CONSTRUCTION DATA

CASING INFORMATION

MATERIAL: ■ PVC ☐ STAINLESS ☐ CARBON ☐ OTHER ______

DIAMETER: ■ 2" ☐ 4" ■ 6" ☐ OTHER ______ IN.

JOINTS: ■ THREADED ☐ WELDED ☐ SCREWED ☐ COUPLED ☐ OTHER ______

SCHEDULE: 40

SCREEN INFORMATION

MATERIAL: ■ PVC ☐ STAINLESS ☐ TEFLON ☐ OTHER ______

DIAMETER: ■ 2" ☐ 4" ☐ 6" ☐ OTHER ______ IN.

SLOT: ■ 0.010 ☐ 0.020 ☐ OTHER ______ IN.

CENTRALIZER: ☐ YES ■ NO

FILTER PACK MATERIAL

☐ 20/40 SAND
■ OTHER Sand #2

BENTONITE WELL SEAL

☐ 1/2-INCH PELLETS
☐ 1/4-INCH PELLETS
■ CHIPS
☐ OTHER ______

SURFACE PROTECTION

CONCRETE PAD: ☐ 5'X5' ■ 4'X4' ☐ OTHER ______ FT.

STEEL POSTS: ■ 2" ☐ 4" ☐ OTHER ______ IN.

P:\Jackson County\Dillsboro GW\Reports\2010\ACM\Dillsboro MW-7 Well Construction Log.xls

APPENDIX D

Well Development Log, Well Sampling Log, and Equipment Calibration Data Sheet

photos ~5 ft of fence 5x5

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WWW.ALTAMONTENVIRONMENTAL.COM

Well Development Log

FACILITY NAME: Jackson Co. Closed Landfill
LOCATION: Jackson Co - Dillsboro
FIELD PERSONNEL: A Boundurant

DATE: ~~8/10/10~~ 8/9/10
ARRIVE TIME: ~~1403~~ 1239
WEATHER: sunny + hot

WELL NUMBER: MW-07
WELL DIAMETER: 2"
TYPE OF CASING: PVC
MEASURING POINT:
FLUSH MOUNT / STICK-UP (circled) 3.0'
COMMENTS:

WELL DEPTH IN FEET (WD): 95 START TIME: 1258
WATER LEVEL IN FEET (WL): 32.7 ~~bgs~~ TOC
LENGTH OF WATER COLUMN: 62.3 FEET
(WD) - (WL) = (LWC)
ONE CASING VOLUME: 10.6 GALLONS
(LWC) x (WCV)
THREE CASING VOLUMES: 31.7 GALLONS 5 vol. = 53 gal.
ACTUAL VOLUME DEVELOPED: ~65 GALLONS

WELL CASING VOLUMES (WCV)
2" = 0.17 Gal/Ft 3" = 0.38 Gal/Ft 4" = 0.66 Gal/Ft 6" = 1.5 Gal/Ft 8" = 2.6 Gal/Ft 12" = 5.8 Gal/Ft

TIME	DEVELOPMENT METHOD	ESTIMATED FLOW RATE (gpm)	GALLONS PURGED	pH UNITS	SPECIFIC COND. (µS)	TEMP (C°)	DISSOLVED OXYGEN (mg/L)	OXIDATION REDUCTION POTENTIAL (mV)	TURBIDITY (NTU)	DEPTH TO WATER (feet TOC)
1301	pump	2 gpm	2	6.68	265	17.46	10.11	88.7	260.0	41.0
1306	"	"	12	6.65	223	16.81	3.70	6.5	51.86	57.5
1311	"	"	22	6.51	204	17.37	3.16	-16.9	37.19	67.0
1316	"	"	32	6.57	~~19~~ 195	17.51	3.81	-23.6	22.65	69.9
1321	"	"	42	6.54	181	17.19	2.22	-20.6	14.73	71.8
1326	"	"	52	6.55	173	17.23	3.34	-32.0	10.24	73.5
1331	"	"	62	6.59	168	17.27	3.23	-31.8	8.45	73.5

PROTECTIVE CASING: ✓ PAD: ✓ LOCK: ✓ VEGETATION: good ACCESS: good

Field Personnel Signature: [signature] **Date:** 08/09/2010

Comments:

21.4 VO

pumped bottom then pulled up ~ 5.0'

Notes: µS = micro-Siemen
C° = degrees Celsius
mg/L = milligrams per liter
mV = millivolt
NTU = nephelometric turbidity units

2 gal / 1 min = 53 gal / x min
x = ~25 minutes

→ pulled pump up screen 3-5' every 1/2 well volume during development until water level met in drawdown to pump entire length of screen then put back down

1354 off site

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Arrive 1143
Start 1211
1319 off-site

Well Sampling Log

PROJECT NAME:	Jackson Co. Closed Landfill	DATE:	08/10/10
PROJECT NUMBER:	2140.30	WEATHER:	sunny + hot (90s)
SAMPLING PERSONNEL:	A Bonhimant	SAMPLE TIME:	1247

WELL NUMBER:	MW-07	WELL DEPTH IN FEET (WD):	95	
WELL DIAMETER:	2"	WATER LEVEL IN FEET (WL):	32.52	
TYPE OF CASING:	PVC	LENGTH OF WATER COLUMN : (WD) - (WL) = (LWC)		FEET
MEASURING POINT:	TOC	ONE CASING VOLUME: (LWC) x (WCV)		GALLONS
FLUSH MOUNT / STICK-UP (circled)		THREE CASING VOLUMES:		GALLONS
COMMENTS:		ACTUAL VOLUME PURGED:	~5	GALLONS

WELL CASING VOLUMES (WCV)
1" = 0.041 Gal/Ft 2" = 0.17 Gal/Ft 3" = 0.38 Gal/Ft 4" = 0.66 Gal/Ft 6" = 1.5 Gal/Ft 8" = 2.6 Gal/Ft 12" = 5.8 Gal/Ft

PURGE METHOD: BAILER-DISP. BAILER-TEFLON DEDICATED PUMP WHALE PUMP GRUNDFOS OTHER:
SAMPLE METHOD: BAILER-DISP. BAILER-TEFLON DEDICATED PUMP WHALE PUMP GRUNDFOS OTHER:

READING	TIME	GALLONS PURGED	TEMP (°C)	SPECIFIC COND. (µS)	DISSOLVED OXYGEN (mg/L)	pH (S.U.) *report to 0.1 S.U.*	OXIDATION REDUCTION POTENTIAL (mV)	TURBIDITY (NTU)	COMMENTS DTW
1	1224		21.06	217	4.43	6.20	5.3	41.05	33.00 TOC
2	1227		21.22	218	3.28	6.18	0.8	31.89	"
3	1230		20.86	219	2.70	6.26	-0.3	26.14	"
4	1233		20.96	218	2.60	6.28	-0.2	23.18	"
5	1236		20.39	213	2.38	6.29	3.4	17.22	"
6	1239		20.29	205	2.20	6.30	8.8	15.14	"
7	1242		20.02	202	2.14	6.30	9.4	11.30	"
8	1245		20.00	200	2.10	6.30	9.9	10.39	"
9									
10									

SAMPLING CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSIS
500 mL PLASTIC		
250 mL PLASTIC	~~3~~ 1	Metals by 6010
125 mL PLASTIC		
40 mL GLASS	3	App I Volatiles
1 L GLASS		
OTHER	2	trip blanks, 40 mL vial HCl + DI

PROTECTIVE CASING: ✓ PAD: ✓ LOCK: ✓ VEGETATION: good ACCESS: good

Sampling Personnel Signature: [signature] Date: 08/10/10

Notes: °C = degrees Celsius
µS = micro-Siemen
mg/L = milligrams per liter
~~S.U. = Standard Units~~
mV = millivolt
NTU = nephelometric turbidity units
Samples are analyzed immediately upon collection.

18 sec recharge @ 32.82' TOC
flow thru cell issue
23 sec recharge
Cond 2 @ 33.00' TOC

screen = 25 (95-70)
95-12.5 = 82.5 + stick-up
depth of pump = 8

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Equipment Documentation & Instrument Calibration Data Sheet

Calibration Documentation

Project Name: Jackson Co. Closed Landfill
Project Number: 2040.30
Project Location: Jackson Co.

Person Conducting Calibration: A. Bondurant
Date of Calibration: 8/9/10
Date of Field Measurements: 8/9/10

Equipment Documentation
Equipment or meters used to take measurements (e.g. water level meters, survey equipment, etc.):

Equipment Type	Serial Number	Brand	Date of Use
150-ft Water Level	26154	Solinist	
150-ft Water Level	22754	Solinist	
150-ft Water Level	150	Testwell	
150-ft Drawdown	MP30-1527	QED	
Other			

Micro TPW Turbidity Meter

Calibration Standards Exp Date	Instrument Serial #	Instrument Reading		
		0.02 NTU	10.0 NTU	1000 NTU
Aug 2011	200601045	Initial: 0.02	Initial: 10.07	Initial: 1004
		Cal: 0.02	Cal: 10.03	Cal: 999.9
		Time: 914	Time: 914	Time: 915

YSI 556 Multiparameter Meter

Instrument Serial Number	07D100979						
	Instrument Readings						Calibration Expiration Date
Dissolved Oxygen	Initial: 8.30	Cal: 8.29	mmHg: 708.2	Time: 943			NA
QC*	AM Time:	Meas:	Mid Day Time:	Check:	PM Time:	Check:	NA
pH 7 S.U. *report to 0.1 S.U.*	Initial: 6.82	Cal: 7.00	Time: 914				9/2011
pH 4 S.U. *report to 0.1 S.U.*	Initial: 4.27	Cal: 4.00	Time: 921				↓
pH 10 S.U. *report to 0.1 S.U.*	Initial: 10.31	Cal: 10.06	Time: 924				↓
QC* pH 7 S.U. *report to 0.1 S.U.*	AM Time: 930	Meas: 7.10	Mid Day Time:	Check:	PM Time:	Check:	↓
Spec. Cond. 447/84/23 mS**	Initial: 445	Cal: 447	Time: 907				
QC* 84 mS	AM Time: 932	Meas: 87	Mid Day Time:	Check:	PM Time:	Check:	
ORP 200 mV	Initial: 201.3	Cal: 200.0	Time: 935				

Comments:
Signature: [signature] Date: 08/09/10

Notes:
1. Electronic equipment calibrated according to the manufacturer's operation manual.
2. Specific Conductivity should be calibrated according to values representative of historic range.
3. Order of Calibration is as follows : Specific Conductivity, pH 7, pH 4, pH 10, ORP, QC checks.
4. QC Acceptable Ranges: pH +/- 0.1 S.U. and Specific Conductivity 10% of the true value. If readings are out of these ranges, meter needs to be recalibrated.
5. * indicates that a QC check must be performed in the morning, afternoon, and the end of the day, or every four hours.
6. ** Indicates to choose a Specific Conductivity buffer of 447, 84, or 23 mS which is closest to historical readings from the project locatic

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Equipment Documentation & Instrument Calibration Data Sheet

Project Name: Jackson Co. Landfill - Closed
Project Number: 2040.30
Project Location: Jackson Co.

Calibration Documentation
Person Conducting Calibration: A Bondurant
Date of Calibration: 08/10/10
Date of Field Measurements: 08/10/10

Equipment Documentation
Equipment or meters used to take measurements (e.g. water level meters, survey equipment, etc.):

Equipment Type	Serial Number	Brand	Date of Use
150-ft Water Level	26154	Solinist	
150-ft Water Level	22754	Solinist	
150-ft Water Level	150	Testwell	
150-ft Drawdown	MP30-1527	QED	08/10/10
Other			

Micro TPW Turbidity Meter

Calibration Standards Exp Date	Instrument Serial #	Instrument Reading		
		0.02 NTU	10.0 NTU	1000 NTU
Aug 2011	200601045	Initial: 0.01	Initial: 9.97	Initial: 982.3
		Cal: 0.02	Cal: 10.0	Cal: 1000
		Time: 1020	Time: 1020	Time: 1020

YSI 556 Multiparameter Meter

Instrument Serial Number	07D100979						Calibration Expiration Date
Instrument Readings							
Dissolved Oxygen	Initial: 7.71	Cal: 8.06	mmHg: 708.0	Time:			NA
QC*	AM Time:	Meas:	Mid Day Time:	Check:	PM Time:	Check:	NA
pH 7 S.U. *report to 0.1 S.U.*	Initial: 6.94	Cal: 7.00	Time: 1005				~~Dec~~ Sept 2010
pH 4 S.U. *report to 0.1 S.U.*	Initial: 4.27	Cal: 4.00	Time: 1007				Dec 2010
pH 10 S.U. *report to 0.1 S.U.*	Initial: 10.90	Cal: 10.01	Time: 1019				↓
QC* pH 7 S.U. *report to 0.1 S.U.*	AM Time: 1027	Meas: 7.08	Mid Day Time:	Check:	PM Time:	Check:	
Spec. Cond. 447/84/23 mS**	Initial: 441	Cal: 447	Time: 1000				Jun 2011
QC* 84 mS	AM Time: 1029	Meas: 83	Mid Day Time:	Check:	PM Time:	Check:	May 2011
ORP 200 mV	Initial: 193.6	Cal: 200.0	Time: 1022				Jan 2011

Comments:
Signature: [signature] Date: 08/10/10

Notes:
1. Electronic equipment calibrated according to the manufacturer's operation manual.
2. Specific Conductivity should be calibrated according to values representative of historic range.
3. Order of Calibration is as follows : Specific Conductivity, pH 7, pH 4, pH 10, ORP, QC checks.
4. QC Acceptable Ranges: pH +/- 0.1 S.U. and Specific Conductivity 10% of the true value. If readings are out of these ranges, meter needs to be recalibrated.
5. * Indicates that a QC check must be performed in the morning, afternoon, and the end of the day, or every four hours.
6. ** Indicates to choose a Specific Conductivity buffer of 447, 84, or 23 mS which is closest to historical readings from the project locatic

APPENDIX E

Well Survey Data

Wes Cole Land Surveying, PA
Municipal Solid Waste Landfill, Jackson County, NC
Groundwater Monitoring Well Information 8-18-10
For Altamont Environmental, Inc.

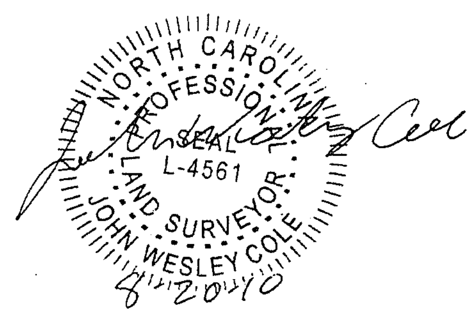
Point Desc	Northing	Easting	Concrete Pad Elevation	PVC Elevation	BM Elevation
MW 04	617105.43	729406.00	1978.69 (GROUND ELEV.)	1980.77*	1980.77
MW 07	617118.83	729395.81	1978.71	1981.29	N/A

GLOBAL POSITIONING SYSTEM CERTIFICATION (RTK)

THE NETWORK POSITIONAL ACCURACY OF THE RTK DERIVED POSITIONAL INFORMATION IS 0.01' HORIZONTAL

HORIZONTAL POSITIONS ARE REFERENCED TO NAD 83 (NSRS 2007)
*VERTICAL POSITIONS ARE REFERENCED TO EXISTING ELEVATION FOR MW 04. DATA PROVIDED TO WCLS, PA BY ALTAMONT ENVIRONMENTAL AND IS SUBJECT TO THE ACCURACY THEREOF
COMBINED FACTOR 0.9997823

COORDINATES SHOWN ARE NC GRID COORDINATES IN US SURVEY FEET



APPENDIX F

Laboratory Analytical Reports and Chain-of-Custody Documentation

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
2225 Riverside Dr.
Asheville, NC 28804
(828)254-7176

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

September 01, 2010

Mr. Joel Lenk
Altamont Environmental
321 Haywood Street
Asheville, NC 28801

RE: Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Dear Mr. Lenk:

Enclosed are the analytical results for sample(s) received by the laboratory on August 11, 2010. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

Inorganic Wet Chemistry and Metals analyses were performed at our Pace Asheville laboratory and Organic testing was performed at our Pace Huntersville laboratory unless otherwise footnoted. All Microbiological analyses were performed at the laboratory where the samples were received.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Lorri Patton

lorri.patton@pacelabs.com
Project Manager

Enclosures

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CERTIFICATIONS

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
Alaska Certification #: UST-078
Alaska Certification #MN00064
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
EPA Region 8 Certification #: Pace
Florida/NELAP Certification #: E87605
Georgia Certification #: 959
Idaho Certification #: MN00064
Illinois Certification #: 200011
Iowa Certification #: 368
Kansas Certification #: E-10167
Louisiana Certification #: 03086
Louisiana Certification #: LA080009
Maine Certification #: 2007029
Maryland Certification #: 322
Michigan DEQ Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT CERT0092
Nebraska Certification #: Pace
Nevada Certification #: MN_00064
New Jersey Certification #: MN-002
New Mexico Certification #: Pace
New York Certification #: 11647
North Carolina Certification #: 530
North Dakota Certification #: R-036
North Dakota Certification #: R-036A
Ohio VAP Certification #: CL101
Oklahoma Certification #: D9921
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Tennessee Certification #: 02818
Texas Certification #: T104704192
Washington Certification #: C754
Wisconsin Certification #: 999407970

Charlotte Certification IDs
9800 Kincey Ave. Ste 100, Huntersville, NC 28078
Louisiana/LELAP Certification #: 04034
New Jersey Certification #: NC012
North Carolina Drinking Water Certification #: 37706
North Carolina Field Services Certification #: 5342
North Carolina Wastewater Certification #: 12
Pennsylvania Certification #: 68-00784
South Carolina Certification #: 99006001
South Carolina Drinking Water Cert. #: 99006003
Virginia Certification #: 00213
Connecticut Certification #: PH-0104
Florida/NELAP Certification #: E87627
Kentucky UST Certification #: 84
Louisiana DHH Drinking Water # LA 100031

Asheville Certification IDs
2225 Riverside Dr., Asheville, NC 28804
Connecticut Certification #: PH-0106
Florida/NELAP Certification #: E87648
Massachusetts Certification #: M-NC030
New Jersey Certification #: NC011
North Carolina Bioassay Certification #: 9
North Carolina Drinking Water Certification #: 37712
North Carolina Wastewater Certification #: 40
Pennsylvania Certification #: 68-03578
South Carolina Bioassay Certification #: 99030002
South Carolina Certification #: 99030001
Virginia Certification #: 00072

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SAMPLE SUMMARY

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Lab ID	Sample ID	Matrix	Date Collected	Date Received
9275289001	**MW-07**	Water	08/11/10 12:47	08/11/10 13:40
9275289002	**TRIP BLANK**	Water	08/11/10 12:47	08/11/10 13:40

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SAMPLE ANALYTE COUNT

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
9275289001	**MW-07**	EPA 6010	JMW	14	PASI-A
		EPA 6020	RJS	1	PASI-M
		EPA 7470	SHB	1	PASI-A
		EPA 8260	MCK	53	PASI-C
9275289002	**TRIP BLANK**	EPA 8260	MCK	53	PASI-C

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ANALYTICAL RESULTS

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Sample: MW-07 **Lab ID: 9275289001** Collected: 08/11/10 12:47 Received: 08/11/10 13:40 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 ICP Groundwater	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
Antimony	ND	ug/L	5.0	2.6	1	08/12/10 12:45	08/13/10 15:46	7440-36-0	
Arsenic	**2.8J**	ug/L	5.0	2.7	1	08/12/10 12:45	08/13/10 15:46	7440-38-2	
Barium	**109**	ug/L	5.0	0.20	1	08/12/10 12:45	08/13/10 15:46	7440-39-3	
Beryllium	ND	ug/L	1.0	0.10	1	08/12/10 12:45	08/13/10 15:46	7440-41-7	
Cadmium	ND	ug/L	1.0	0.50	1	08/12/10 12:45	08/13/10 15:46	7440-43-9	
Chromium	**5.9**	ug/L	5.0	0.40	1	08/12/10 12:45	08/13/10 15:46	7440-47-3	
Cobalt	**0.81J**	ug/L	5.0	0.60	1	08/12/10 12:45	08/13/10 15:46	7440-48-4	
Copper	**0.43J**	ug/L	5.0	0.30	1	08/12/10 12:45	08/13/10 15:46	7440-50-8	
Lead	ND	ug/L	5.0	4.0	1	08/12/10 12:45	08/13/10 15:46	7439-92-1	
Nickel	**1.9J**	ug/L	5.0	1.7	1	08/12/10 12:45	08/13/10 15:46	7440-02-0	
Selenium	ND	ug/L	10.0	3.8	1	08/12/10 12:45	08/13/10 15:46	7782-49-2	
Silver	**0.51J**	ug/L	5.0	0.10	1	08/12/10 12:45	08/13/10 15:46	7440-22-4	
Vanadium	**1.9J**	ug/L	5.0	0.20	1	08/12/10 12:45	08/13/10 15:46	7440-62-2	
Zinc	**2.6J**	ug/L	10.0	0.40	1	08/12/10 12:45	08/13/10 15:46	7440-66-6	
6020 MET ICPMS	Analytical Method: EPA 6020								
Thallium	ND	ug/L	0.10	0.050	1	08/13/10 10:43	08/16/10 13:16	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
Mercury	ND	ug/L	0.20	0.070	1	08/19/10 17:20	08/20/10 10:41	7439-97-6	
8260 MSV Low Level	Analytical Method: EPA 8260								
Acetone	ND	ug/L	25.0	2.2	1		08/14/10 00:17	67-64-1	
Acrylonitrile	ND	ug/L	10.0	1.9	1		08/14/10 00:17	107-13-1	
Benzene	**0.76J**	ug/L	1.0	0.25	1		08/14/10 00:17	71-43-2	
Bromochloromethane	ND	ug/L	1.0	0.17	1		08/14/10 00:17	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		08/14/10 00:17	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		08/14/10 00:17	75-25-2	
Bromomethane	ND	ug/L	2.0	0.29	1		08/14/10 00:17	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		08/14/10 00:17	78-93-3	
Carbon disulfide	ND	ug/L	2.0	1.2	1		08/14/10 00:17	75-15-0	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		08/14/10 00:17	56-23-5	
Chlorobenzene	**0.97J**	ug/L	1.0	0.23	1		08/14/10 00:17	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		08/14/10 00:17	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		08/14/10 00:17	67-66-3	
Chloromethane	ND	ug/L	1.0	0.11	1		08/14/10 00:17	74-87-3	
1,2-Dibromo-3-chloropropane	ND	ug/L	5.0	2.5	1		08/14/10 00:17	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		08/14/10 00:17	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/L	1.0	0.27	1		08/14/10 00:17	106-93-4	
Dibromomethane	ND	ug/L	1.0	0.21	1		08/14/10 00:17	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		08/14/10 00:17	95-50-1	
1,4-Dichlorobenzene	**0.51J**	ug/L	1.0	0.33	1		08/14/10 00:17	106-46-7	
trans-1,4-Dichloro-2-butene	ND	ug/L	1.0	1.0	1		08/14/10 00:17	110-57-6	
1,1-Dichloroethane	**0.87J**	ug/L	1.0	0.32	1		08/14/10 00:17	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		08/14/10 00:17	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		08/14/10 00:17	75-35-4	

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ANALYTICAL RESULTS

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Sample: MW-07 **Lab ID: 9275289001** Collected: 08/11/10 12:47 Received: 08/11/10 13:40 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level	Analytical Method: EPA 8260								
cis-1,2-Dichloroethene	**4.9**	ug/L	1.0	0.19	1		08/14/10 00:17	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		08/14/10 00:17	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		08/14/10 00:17	78-87-5	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		08/14/10 00:17	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		08/14/10 00:17	10061-02-6	
Ethylbenzene	ND	ug/L	1.0	0.30	1		08/14/10 00:17	100-41-4	
2-Hexanone	ND	ug/L	5.0	0.46	1		08/14/10 00:17	591-78-6	
Iodomethane	ND	ug/L	5.0	0.32	1		08/14/10 00:17	74-88-4	
Methylene Chloride	ND	ug/L	2.0	0.97	1		08/14/10 00:17	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		08/14/10 00:17	108-10-1	
Styrene	ND	ug/L	1.0	0.26	1		08/14/10 00:17	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		08/14/10 00:17	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		08/14/10 00:17	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		08/14/10 00:17	127-18-4	
Toluene	ND	ug/L	1.0	0.26	1		08/14/10 00:17	108-88-3	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		08/14/10 00:17	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		08/14/10 00:17	79-00-5	
Trichloroethene	**1.0**	ug/L	1.0	0.47	1		08/14/10 00:17	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		08/14/10 00:17	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		08/14/10 00:17	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		08/14/10 00:17	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		08/14/10 00:17	75-01-4	
Xylene (Total)	ND	ug/L	2.0	0.66	1		08/14/10 00:17	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		08/14/10 00:17	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		08/14/10 00:17	95-47-6	
4-Bromofluorobenzene (S)	104	%	70-130		1		08/14/10 00:17	460-00-4	
Dibromofluoromethane (S)	116	%	70-130		1		08/14/10 00:17	1868-53-7	
1,2-Dichloroethane-d4 (S)	123	%	70-130		1		08/14/10 00:17	17060-07-0	
Toluene-d8 (S)	101	%	70-130		1		08/14/10 00:17	2037-26-5	

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ANALYTICAL RESULTS

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Sample: TRIP BLANK **Lab ID: 9275289002** Collected: 08/11/10 12:47 Received: 08/11/10 13:40 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level	Analytical Method: EPA 8260								
Acetone	**5.4J**	ug/L	25.0	2.2	1		08/14/10 04:44	67-64-1	
Acrylonitrile	ND	ug/L	10.0	1.9	1		08/14/10 04:44	107-13-1	
Benzene	ND	ug/L	1.0	0.25	1		08/14/10 04:44	71-43-2	
Bromochloromethane	ND	ug/L	1.0	0.17	1		08/14/10 04:44	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		08/14/10 04:44	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		08/14/10 04:44	75-25-2	
Bromomethane	ND	ug/L	2.0	0.29	1		08/14/10 04:44	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		08/14/10 04:44	78-93-3	
Carbon disulfide	ND	ug/L	2.0	1.2	1		08/14/10 04:44	75-15-0	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		08/14/10 04:44	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.23	1		08/14/10 04:44	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		08/14/10 04:44	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		08/14/10 04:44	67-66-3	
Chloromethane	**0.22J**	ug/L	1.0	0.11	1		08/14/10 04:44	74-87-3	
1,2-Dibromo-3-chloropropane	ND	ug/L	5.0	2.5	1		08/14/10 04:44	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		08/14/10 04:44	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/L	1.0	0.27	1		08/14/10 04:44	106-93-4	
Dibromomethane	ND	ug/L	1.0	0.21	1		08/14/10 04:44	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		08/14/10 04:44	95-50-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.33	1		08/14/10 04:44	106-46-7	
trans-1,4-Dichloro-2-butene	ND	ug/L	1.0	1.0	1		08/14/10 04:44	110-57-6	
1,1-Dichloroethane	ND	ug/L	1.0	0.32	1		08/14/10 04:44	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		08/14/10 04:44	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		08/14/10 04:44	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		08/14/10 04:44	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		08/14/10 04:44	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		08/14/10 04:44	78-87-5	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		08/14/10 04:44	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		08/14/10 04:44	10061-02-6	
Ethylbenzene	ND	ug/L	1.0	0.30	1		08/14/10 04:44	100-41-4	
2-Hexanone	ND	ug/L	5.0	0.46	1		08/14/10 04:44	591-78-6	
Iodomethane	ND	ug/L	5.0	0.32	1		08/14/10 04:44	74-88-4	
Methylene Chloride	ND	ug/L	2.0	0.97	1		08/14/10 04:44	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		08/14/10 04:44	108-10-1	
Styrene	ND	ug/L	1.0	0.26	1		08/14/10 04:44	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		08/14/10 04:44	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		08/14/10 04:44	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		08/14/10 04:44	127-18-4	
Toluene	ND	ug/L	1.0	0.26	1		08/14/10 04:44	108-88-3	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		08/14/10 04:44	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		08/14/10 04:44	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.47	1		08/14/10 04:44	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		08/14/10 04:44	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		08/14/10 04:44	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		08/14/10 04:44	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		08/14/10 04:44	75-01-4	

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ANALYTICAL RESULTS

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

Sample: TRIP BLANK **Lab ID: 9275289002** Collected: 08/11/10 12:47 Received: 08/11/10 13:40 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level	Analytical Method: EPA 8260								
Xylene (Total)	ND	ug/L	2.0	0.66	1		08/14/10 04:44	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		08/14/10 04:44	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		08/14/10 04:44	95-47-6	
4-Bromofluorobenzene (S)	97	%	70-130		1		08/14/10 04:44	460-00-4	
Dibromofluoromethane (S)	109	%	70-130		1		08/14/10 04:44	1868-53-7	
1,2-Dichloroethane-d4 (S)	107	%	70-130		1		08/14/10 04:44	17060-07-0	
Toluene-d8 (S)	98	%	70-130		1		08/14/10 04:44	2037-26-5	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

QC Batch: MPRP/6837 | Analysis Method: EPA 6010
QC Batch Method: EPA 3010 | Analysis Description: 6010 MET NC Groundwater
Associated Lab Samples: 9275289001

METHOD BLANK: 481771 | Matrix: Water
Associated Lab Samples: 9275289001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	ND	5.0	08/13/10 15:14	
Arsenic	ug/L	ND	5.0	08/13/10 15:14	
Barium	ug/L	ND	5.0	08/13/10 15:14	
Beryllium	ug/L	ND	1.0	08/13/10 15:14	
Cadmium	ug/L	ND	1.0	08/13/10 15:14	
Chromium	ug/L	ND	5.0	08/13/10 15:14	
Cobalt	ug/L	ND	5.0	08/13/10 15:14	
Copper	ug/L	ND	5.0	08/13/10 15:14	
Lead	ug/L	ND	5.0	08/13/10 15:14	
Nickel	ug/L	ND	5.0	08/13/10 15:14	
Selenium	ug/L	ND	10.0	08/13/10 15:14	
Silver	ug/L	ND	5.0	08/13/10 15:14	
Vanadium	ug/L	ND	5.0	08/13/10 15:14	
Zinc	ug/L	0.98J	10.0	08/13/10 15:14	

LABORATORY CONTROL SAMPLE: 481772

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	500	549	110	80-120	
Arsenic	ug/L	500	561	112	80-120	
Barium	ug/L	500	538	108	80-120	
Beryllium	ug/L	500	548	110	80-120	
Cadmium	ug/L	500	593	119	80-120	
Chromium	ug/L	500	574	115	80-120	
Cobalt	ug/L	500	558	112	80-120	
Copper	ug/L	500	536	107	80-120	
Lead	ug/L	500	574	115	80-120	
Nickel	ug/L	500	574	115	80-120	
Selenium	ug/L	500	572	114	80-120	
Silver	ug/L	250	265	106	80-120	
Vanadium	ug/L	500	550	110	80-120	
Zinc	ug/L	500	568	114	80-120	

MATRIX SPIKE SAMPLE: 481921

Parameter	Units	9274924002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	ND	500	538	108	75-125	
Arsenic	ug/L	ND	500	542	108	75-125	
Barium	ug/L	ND	500	540	108	75-125	
Beryllium	ug/L	0.10J	500	560	112	75-125	

QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

MATRIX SPIKE SAMPLE: 481921

Parameter	Units	9274924002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Cadmium	ug/L	ND	500	567	113	75-125	
Chromium	ug/L	ND	500	545	109	75-125	
Cobalt	ug/L	ND	500	544	109	75-125	
Copper	ug/L	2.6J	500	541	108	75-125	
Lead	ug/L	ND	500	554	111	75-125	
Nickel	ug/L	ND	500	553	111	75-125	
Selenium	ug/L	ND	500	556	111	75-125	
Silver	ug/L	0.45J	250	259	103	75-125	
Vanadium	ug/L	0.63J	500	541	108	75-125	
Zinc	ug/L	2.4J	500	547	109	75-125	

SAMPLE DUPLICATE: 481774

Parameter	Units	9274924001 Result	Dup Result	RPD	Max RPD	Qualifiers
Antimony	ug/L	ND	ND		25	
Arsenic	ug/L	2.7J	ND		25	
Barium	ug/L	4.3J	4.3J		25	
Beryllium	ug/L	ND	ND		25	
Cadmium	ug/L	ND	ND		25	
Chromium	ug/L	0.46J	0.58J		25	
Cobalt	ug/L	0.89J	ND		25	
Copper	ug/L	7.8J	2.1J		25	
Lead	ug/L	ND	ND		25	
Nickel	ug/L	ND	ND		25	
Selenium	ug/L	ND	ND		25	
Silver	ug/L	ND	0.44J		25	
Vanadium	ug/L	ND	0.57J		25	
Zinc	ug/L	0.95J	4.5J		25	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

QC Batch: ICPM/21829 — Analysis Method: EPA 6020
QC Batch Method: EPA 6020 — Analysis Description: 6020 MET
Associated Lab Samples: 9275289001

METHOD BLANK: 837284 — Matrix: Water
Associated Lab Samples: 9275289001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Thallium	ug/L	ND	0.10	08/16/10 04:12	

LABORATORY CONTROL SAMPLE: 837285

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Thallium	ug/L	80	83.5	104	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 837286 837287

Parameter	Units	10135139001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Thallium	ug/L	ND	80	80	96.6	95.5	121	119	75-125	1	20	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

QC Batch: MERP/2963
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Associated Lab Samples: 9275289001

METHOD BLANK: 485306
Matrix: Water
Associated Lab Samples: 9275289001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	08/20/10 10:41	

LABORATORY CONTROL SAMPLE: 485307

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	2.5	2.3	94	80-120	

MATRIX SPIKE SAMPLE: 485308

Parameter	Units	9275289001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	ND	2.5	2.0	77	75-125	

SAMPLE DUPLICATE: 485309

Parameter	Units	9274639023 Result	Dup Result	RPD	Max RPD	Qualifiers
Mercury	ug/L	0.47	0.47	0	25	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

QC Batch: MSV/11870 — Analysis Method: EPA 8260
QC Batch Method: EPA 8260 — Analysis Description: 8260 MSV Low Level
Associated Lab Samples: 9275289001

METHOD BLANK: 482583 — Matrix: Water
Associated Lab Samples: 9275289001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	08/13/10 23:26	
1,1,1-Trichloroethane	ug/L	ND	1.0	08/13/10 23:26	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	08/13/10 23:26	
1,1,2-Trichloroethane	ug/L	ND	1.0	08/13/10 23:26	
1,1-Dichloroethane	ug/L	ND	1.0	08/13/10 23:26	
1,1-Dichloroethene	ug/L	ND	1.0	08/13/10 23:26	
1,2,3-Trichloropropane	ug/L	ND	1.0	08/13/10 23:26	
1,2-Dibromo-3-chloropropane	ug/L	ND	5.0	08/13/10 23:26	
1,2-Dibromoethane (EDB)	ug/L	ND	1.0	08/13/10 23:26	
1,2-Dichlorobenzene	ug/L	ND	1.0	08/13/10 23:26	
1,2-Dichloroethane	ug/L	ND	1.0	08/13/10 23:26	
1,2-Dichloropropane	ug/L	ND	1.0	08/13/10 23:26	
1,4-Dichlorobenzene	ug/L	ND	1.0	08/13/10 23:26	
2-Butanone (MEK)	ug/L	ND	5.0	08/13/10 23:26	
2-Hexanone	ug/L	ND	5.0	08/13/10 23:26	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	08/13/10 23:26	
Acetone	ug/L	ND	25.0	08/13/10 23:26	
Acrylonitrile	ug/L	ND	10.0	08/13/10 23:26	
Benzene	ug/L	ND	1.0	08/13/10 23:26	
Bromochloromethane	ug/L	ND	1.0	08/13/10 23:26	
Bromodichloromethane	ug/L	ND	1.0	08/13/10 23:26	
Bromoform	ug/L	ND	1.0	08/13/10 23:26	
Bromomethane	ug/L	ND	2.0	08/13/10 23:26	
Carbon disulfide	ug/L	ND	2.0	08/13/10 23:26	
Carbon tetrachloride	ug/L	ND	1.0	08/13/10 23:26	
Chlorobenzene	ug/L	ND	1.0	08/13/10 23:26	
Chloroethane	ug/L	ND	1.0	08/13/10 23:26	
Chloroform	ug/L	ND	1.0	08/13/10 23:26	
Chloromethane	ug/L	ND	1.0	08/13/10 23:26	
cis-1,2-Dichloroethene	ug/L	ND	1.0	08/13/10 23:26	
cis-1,3-Dichloropropene	ug/L	ND	1.0	08/13/10 23:26	
Dibromochloromethane	ug/L	ND	1.0	08/13/10 23:26	
Dibromomethane	ug/L	ND	1.0	08/13/10 23:26	
Ethylbenzene	ug/L	ND	1.0	08/13/10 23:26	
Iodomethane	ug/L	ND	5.0	08/13/10 23:26	
m&p-Xylene	ug/L	ND	2.0	08/13/10 23:26	
Methylene Chloride	ug/L	4.4	2.0	08/13/10 23:26	C9
o-Xylene	ug/L	ND	1.0	08/13/10 23:26	
Styrene	ug/L	ND	1.0	08/13/10 23:26	
Tetrachloroethene	ug/L	ND	1.0	08/13/10 23:26	
Toluene	ug/L	ND	1.0	08/13/10 23:26	
trans-1,2-Dichloroethene	ug/L	ND	1.0	08/13/10 23:26	
trans-1,3-Dichloropropene	ug/L	ND	1.0	08/13/10 23:26	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

METHOD BLANK: 482583 Matrix: Water
Associated Lab Samples: 9275289001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
trans-1,4-Dichloro-2-butene	ug/L	ND	1.0	08/13/10 23:26	
Trichloroethene	ug/L	ND	1.0	08/13/10 23:26	
Trichlorofluoromethane	ug/L	ND	1.0	08/13/10 23:26	
Vinyl acetate	ug/L	ND	2.0	08/13/10 23:26	
Vinyl chloride	ug/L	ND	1.0	08/13/10 23:26	
Xylene (Total)	ug/L	ND	2.0	08/13/10 23:26	
1,2-Dichloroethane-d4 (S)	%	116	70-130	08/13/10 23:26	
4-Bromofluorobenzene (S)	%	105	70-130	08/13/10 23:26	
Dibromofluoromethane (S)	%	114	70-130	08/13/10 23:26	
Toluene-d8 (S)	%	100	70-130	08/13/10 23:26	

LABORATORY CONTROL SAMPLE: 482584

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	52.1	104	70-130	
1,1,1-Trichloroethane	ug/L	50	50.6	101	70-130	
1,1,2,2-Tetrachloroethane	ug/L	50	51.3	103	70-130	
1,1,2-Trichloroethane	ug/L	50	56.9	114	70-130	
1,1-Dichloroethane	ug/L	50	49.6	99	70-130	
1,1-Dichloroethene	ug/L	50	54.5	109	70-132	
1,2,3-Trichloropropane	ug/L	50	47.1	94	70-130	
1,2-Dibromo-3-chloropropane	ug/L	50	41.8	84	70-130	
1,2-Dibromoethane (EDB)	ug/L	50	48.6	97	70-130	
1,2-Dichlorobenzene	ug/L	50	48.4	97	70-130	
1,2-Dichloroethane	ug/L	50	52.4	105	70-130	
1,2-Dichloropropane	ug/L	50	46.8	94	70-130	
1,4-Dichlorobenzene	ug/L	50	46.1	92	70-130	
2-Butanone (MEK)	ug/L	100	98.6	99	70-145	
2-Hexanone	ug/L	100	85.8	86	70-144	
4-Methyl-2-pentanone (MIBK)	ug/L	100	96.7	97	70-140	
Acetone	ug/L	100	105	105	50-175	
Acrylonitrile	ug/L	250	241	96	70-143	
Benzene	ug/L	50	45.7	91	70-130	
Bromochloromethane	ug/L	50	48.3	97	70-130	
Bromodichloromethane	ug/L	50	54.1	108	70-130	
Bromoform	ug/L	50	51.8	104	70-130	
Bromomethane	ug/L	50	48.0	96	54-130	
Carbon disulfide	ug/L	50	55.6	111	70-131	
Carbon tetrachloride	ug/L	50	54.6	109	70-132	
Chlorobenzene	ug/L	50	46.7	93	70-130	
Chloroethane	ug/L	50	53.3	107	64-134	
Chloroform	ug/L	50	49.9	100	70-130	
Chloromethane	ug/L	50	38.6	77	64-130	
cis-1,2-Dichloroethene	ug/L	50	49.3	99	70-131	
cis-1,3-Dichloropropene	ug/L	50	50.5	101	70-130	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

LABORATORY CONTROL SAMPLE: 482584

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Dibromochloromethane	ug/L	50	50.1	100	70-130	
Dibromomethane	ug/L	50	54.2	108	70-131	
Ethylbenzene	ug/L	50	46.2	92	70-130	
Iodomethane	ug/L	100	111	111	49-180	
m&p-Xylene	ug/L	100	96.9	97	70-130	
Methylene Chloride	ug/L	50	47.4	95	63-130	
o-Xylene	ug/L	50	49.1	98	70-130	
Styrene	ug/L	50	49.6	99	70-130	
Tetrachloroethene	ug/L	50	46.2	92	70-130	
Toluene	ug/L	50	50.3	101	70-130	
trans-1,2-Dichloroethene	ug/L	50	49.2	98	70-130	
trans-1,3-Dichloropropene	ug/L	50	49.5	99	70-132	
trans-1,4-Dichloro-2-butene	ug/L	50	44.1	88	70-141	
Trichloroethene	ug/L	50	51.5	103	70-130	
Trichlorofluoromethane	ug/L	50	51.5	103	62-133	
Vinyl acetate	ug/L	100	96.6	97	66-157	
Vinyl chloride	ug/L	50	47.9	96	69-130	
Xylene (Total)	ug/L	150	146	97	70-130	
1,2-Dichloroethane-d4 (S)	%			103	70-130	
4-Bromofluorobenzene (S)	%			105	70-130	
Dibromofluoromethane (S)	%			99	70-130	
Toluene-d8 (S)	%			104	70-130	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

QC Batch: MSV/11876
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV Low Level
Associated Lab Samples: 9275289002

METHOD BLANK: 482802
Matrix: Water
Associated Lab Samples: 9275289002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	08/14/10 04:19	
1,1,1-Trichloroethane	ug/L	ND	1.0	08/14/10 04:19	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	08/14/10 04:19	
1,1,2-Trichloroethane	ug/L	ND	1.0	08/14/10 04:19	
1,1-Dichloroethane	ug/L	ND	1.0	08/14/10 04:19	
1,1-Dichloroethene	ug/L	ND	1.0	08/14/10 04:19	
1,2,3-Trichloropropane	ug/L	ND	1.0	08/14/10 04:19	
1,2-Dibromo-3-chloropropane	ug/L	ND	5.0	08/14/10 04:19	
1,2-Dibromoethane (EDB)	ug/L	ND	1.0	08/14/10 04:19	
1,2-Dichlorobenzene	ug/L	ND	1.0	08/14/10 04:19	
1,2-Dichloroethane	ug/L	ND	1.0	08/14/10 04:19	
1,2-Dichloropropane	ug/L	ND	1.0	08/14/10 04:19	
1,4-Dichlorobenzene	ug/L	ND	1.0	08/14/10 04:19	
2-Butanone (MEK)	ug/L	ND	5.0	08/14/10 04:19	
2-Hexanone	ug/L	ND	5.0	08/14/10 04:19	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	08/14/10 04:19	
Acetone	ug/L	ND	25.0	08/14/10 04:19	
Acrylonitrile	ug/L	ND	10.0	08/14/10 04:19	
Benzene	ug/L	ND	1.0	08/14/10 04:19	
Bromochloromethane	ug/L	ND	1.0	08/14/10 04:19	
Bromodichloromethane	ug/L	ND	1.0	08/14/10 04:19	
Bromoform	ug/L	ND	1.0	08/14/10 04:19	
Bromomethane	ug/L	ND	2.0	08/14/10 04:19	
Carbon disulfide	ug/L	ND	2.0	08/14/10 04:19	
Carbon tetrachloride	ug/L	ND	1.0	08/14/10 04:19	
Chlorobenzene	ug/L	ND	1.0	08/14/10 04:19	
Chloroethane	ug/L	ND	1.0	08/14/10 04:19	
Chloroform	ug/L	ND	1.0	08/14/10 04:19	
Chloromethane	ug/L	ND	1.0	08/14/10 04:19	
cis-1,2-Dichloroethene	ug/L	ND	1.0	08/14/10 04:19	
cis-1,3-Dichloropropene	ug/L	ND	1.0	08/14/10 04:19	
Dibromochloromethane	ug/L	ND	1.0	08/14/10 04:19	
Dibromomethane	ug/L	ND	1.0	08/14/10 04:19	
Ethylbenzene	ug/L	ND	1.0	08/14/10 04:19	
Iodomethane	ug/L	ND	5.0	08/14/10 04:19	
m&p-Xylene	ug/L	ND	2.0	08/14/10 04:19	
Methylene Chloride	ug/L	ND	2.0	08/14/10 04:19	
o-Xylene	ug/L	ND	1.0	08/14/10 04:19	
Styrene	ug/L	ND	1.0	08/14/10 04:19	
Tetrachloroethene	ug/L	ND	1.0	08/14/10 04:19	
Toluene	ug/L	ND	1.0	08/14/10 04:19	
trans-1,2-Dichloroethene	ug/L	ND	1.0	08/14/10 04:19	
trans-1,3-Dichloropropene	ug/L	ND	1.0	08/14/10 04:19	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

METHOD BLANK: 482802 Matrix: Water
Associated Lab Samples: 9275289002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
trans-1,4-Dichloro-2-butene	ug/L	ND	1.0	08/14/10 04:19	
Trichloroethene	ug/L	ND	1.0	08/14/10 04:19	
Trichlorofluoromethane	ug/L	ND	1.0	08/14/10 04:19	
Vinyl acetate	ug/L	ND	2.0	08/14/10 04:19	
Vinyl chloride	ug/L	ND	1.0	08/14/10 04:19	
Xylene (Total)	ug/L	ND	2.0	08/14/10 04:19	
1,2-Dichloroethane-d4 (S)	%	106	70-130	08/14/10 04:19	
4-Bromofluorobenzene (S)	%	92	70-130	08/14/10 04:19	
Dibromofluoromethane (S)	%	109	70-130	08/14/10 04:19	
Toluene-d8 (S)	%	102	70-130	08/14/10 04:19	

METHOD BLANK: 484117 Matrix: Water
Associated Lab Samples: 9275289002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	08/16/10 11:39	
1,1,1-Trichloroethane	ug/L	ND	1.0	08/16/10 11:39	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	08/16/10 11:39	
1,1,2-Trichloroethane	ug/L	ND	1.0	08/16/10 11:39	
1,1-Dichloroethane	ug/L	ND	1.0	08/16/10 11:39	
1,1-Dichloroethene	ug/L	ND	1.0	08/16/10 11:39	
1,2,3-Trichloropropane	ug/L	ND	1.0	08/16/10 11:39	
1,2-Dibromo-3-chloropropane	ug/L	ND	5.0	08/16/10 11:39	
1,2-Dibromoethane (EDB)	ug/L	ND	1.0	08/16/10 11:39	
1,2-Dichlorobenzene	ug/L	ND	1.0	08/16/10 11:39	
1,2-Dichloroethane	ug/L	ND	1.0	08/16/10 11:39	
1,2-Dichloropropane	ug/L	ND	1.0	08/16/10 11:39	
1,4-Dichlorobenzene	ug/L	ND	1.0	08/16/10 11:39	
2-Butanone (MEK)	ug/L	ND	5.0	08/16/10 11:39	
2-Hexanone	ug/L	ND	5.0	08/16/10 11:39	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	08/16/10 11:39	
Acetone	ug/L	ND	25.0	08/16/10 11:39	
Acrylonitrile	ug/L	ND	10.0	08/16/10 11:39	
Benzene	ug/L	ND	1.0	08/16/10 11:39	
Bromochloromethane	ug/L	ND	1.0	08/16/10 11:39	
Bromodichloromethane	ug/L	ND	1.0	08/16/10 11:39	
Bromoform	ug/L	ND	1.0	08/16/10 11:39	
Bromomethane	ug/L	ND	2.0	08/16/10 11:39	
Carbon disulfide	ug/L	ND	2.0	08/16/10 11:39	
Carbon tetrachloride	ug/L	ND	1.0	08/16/10 11:39	
Chlorobenzene	ug/L	ND	1.0	08/16/10 11:39	
Chloroethane	ug/L	ND	1.0	08/16/10 11:39	
Chloroform	ug/L	ND	1.0	08/16/10 11:39	
Chloromethane	ug/L	ND	1.0	08/16/10 11:39	
cis-1,2-Dichloroethene	ug/L	ND	1.0	08/16/10 11:39	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

METHOD BLANK: 484117 Matrix: Water

Associated Lab Samples: 9275289002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
cis-1,3-Dichloropropene	ug/L	ND	1.0	08/16/10 11:39	
Dibromochloromethane	ug/L	ND	1.0	08/16/10 11:39	
Dibromomethane	ug/L	ND	1.0	08/16/10 11:39	
Ethylbenzene	ug/L	ND	1.0	08/16/10 11:39	
Iodomethane	ug/L	ND	5.0	08/16/10 11:39	
m&p-Xylene	ug/L	ND	2.0	08/16/10 11:39	
Methylene Chloride	ug/L	ND	2.0	08/16/10 11:39	
o-Xylene	ug/L	ND	1.0	08/16/10 11:39	
Styrene	ug/L	ND	1.0	08/16/10 11:39	
Tetrachloroethene	ug/L	ND	1.0	08/16/10 11:39	
Toluene	ug/L	ND	1.0	08/16/10 11:39	
trans-1,2-Dichloroethene	ug/L	ND	1.0	08/16/10 11:39	
trans-1,3-Dichloropropene	ug/L	ND	1.0	08/16/10 11:39	
trans-1,4-Dichloro-2-butene	ug/L	ND	1.0	08/16/10 11:39	
Trichloroethene	ug/L	0.55J	1.0	08/16/10 11:39	
Trichlorofluoromethane	ug/L	ND	1.0	08/16/10 11:39	
Vinyl acetate	ug/L	ND	2.0	08/16/10 11:39	
Vinyl chloride	ug/L	ND	1.0	08/16/10 11:39	
Xylene (Total)	ug/L	ND	2.0	08/16/10 11:39	
1,2-Dichloroethane-d4 (S)	%	104	70-130	08/16/10 11:39	
4-Bromofluorobenzene (S)	%	98	70-130	08/16/10 11:39	
Dibromofluoromethane (S)	%	109	70-130	08/16/10 11:39	
Toluene-d8 (S)	%	100	70-130	08/16/10 11:39	

LABORATORY CONTROL SAMPLE: 482803

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	55.2	110	70-130	
1,1,1-Trichloroethane	ug/L	50	56.8	114	70-130	
1,1,2,2-Tetrachloroethane	ug/L	50	56.7	113	70-130	
1,1,2-Trichloroethane	ug/L	50	54.9	110	70-130	
1,1-Dichloroethane	ug/L	50	52.7	105	70-130	
1,1-Dichloroethene	ug/L	50	54.1	108	70-132	
1,2,3-Trichloropropane	ug/L	50	52.8	106	70-130	
1,2-Dibromo-3-chloropropane	ug/L	50	53.5	107	70-130	
1,2-Dibromoethane (EDB)	ug/L	50	53.0	106	70-130	
1,2-Dichlorobenzene	ug/L	50	53.5	107	70-130	
1,2-Dichloroethane	ug/L	50	56.3	113	70-130	
1,2-Dichloropropane	ug/L	50	49.1	98	70-130	
1,4-Dichlorobenzene	ug/L	50	50.4	101	70-130	
2-Butanone (MEK)	ug/L	100	109	109	70-145	
2-Hexanone	ug/L	100	109	109	70-144	
4-Methyl-2-pentanone (MIBK)	ug/L	100	110	110	70-140	
Acetone	ug/L	100	120	120	50-175	
Acrylonitrile	ug/L	250	280	112	70-143	

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QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

LABORATORY CONTROL SAMPLE: 482803

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	50	50.7	101	70-130	
Bromochloromethane	ug/L	50	59.3	119	70-130	
Bromodichloromethane	ug/L	50	54.7	109	70-130	
Bromoform	ug/L	50	55.2	110	70-130	
Bromomethane	ug/L	50	48.1	96	54-130	
Carbon disulfide	ug/L	50	54.4	109	70-131	
Carbon tetrachloride	ug/L	50	54.3	109	70-132	
Chlorobenzene	ug/L	50	52.7	105	70-130	
Chloroethane	ug/L	50	46.3	93	64-134	
Chloroform	ug/L	50	54.3	109	70-130	
Chloromethane	ug/L	50	47.8	96	64-130	
cis-1,2-Dichloroethene	ug/L	50	50.9	102	70-131	
cis-1,3-Dichloropropene	ug/L	50	50.6	101	70-130	
Dibromochloromethane	ug/L	50	55.0	110	70-130	
Dibromomethane	ug/L	50	58.2	116	70-131	
Ethylbenzene	ug/L	50	50.9	102	70-130	
Iodomethane	ug/L	100	109	109	49-180	
m&p-Xylene	ug/L	100	104	104	70-130	
Methylene Chloride	ug/L	50	50.9	102	63-130	
o-Xylene	ug/L	50	53.8	108	70-130	
Styrene	ug/L	50	53.9	108	70-130	
Tetrachloroethene	ug/L	50	51.2	102	70-130	
Toluene	ug/L	50	55.0	110	70-130	
trans-1,2-Dichloroethene	ug/L	50	52.9	106	70-130	
trans-1,3-Dichloropropene	ug/L	50	52.3	105	70-132	
trans-1,4-Dichloro-2-butene	ug/L	50	52.2	104	70-141	
Trichloroethene	ug/L	50	54.2	108	70-130	
Trichlorofluoromethane	ug/L	50	47.7	95	62-133	
Vinyl acetate	ug/L	100	101	101	66-157	
Vinyl chloride	ug/L	50	45.5	91	69-130	
Xylene (Total)	ug/L	150	158	105	70-130	
1,2-Dichloroethane-d4 (S)	%			109	70-130	
4-Bromofluorobenzene (S)	%			102	70-130	
Dibromofluoromethane (S)	%			105	70-130	
Toluene-d8 (S)	%			102	70-130	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 482804 482805

Parameter	Units	9275214011 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,1-Dichloroethene	ug/L	ND	50	50	43.1	46.5	86	93	70-166	7	30	
Benzene	ug/L	ND	50	50	48.4	51.1	97	102	70-148	5	30	
Chlorobenzene	ug/L	ND	50	50	51.2	53.9	102	108	70-146	5	30	
Toluene	ug/L	ND	50	50	54.3	58.3	109	117	70-155	7	30	
Trichloroethene	ug/L	ND	50	50	54.9	58.7	110	117	69-151	7	30	
1,2-Dichloroethane-d4 (S)	%						102	103	70-130			
4-Bromofluorobenzene (S)	%						96	98	70-130			

QUALITY CONTROL DATA

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 482804 482805

Parameter	Units	9275214011 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Dibromofluoromethane (S)	%						106	109	70-130			
Toluene-d8 (S)	%						101	102	70-130			

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QUALIFIERS

Project: JACKSON CO CLOSED LF 08/11
Pace Project No.: 9275289

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

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LABORATORIES

PASI-A	Pace Analytical Services - Asheville
PASI-C	Pace Analytical Services - Charlotte
PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

C9	Common Laboratory Contaminant.

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

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Email To: amacbeth@altamontenvironmental.com	
Phone: 828 281-3350	Fax:
Requested Due Date/TAT: 7 Days	

Section B Required Project Information:

Report To: Alec Macbeth	
Copy To: Amy Bondurant	
Purchase Order No.:	
Project Name: Jackson Co. Closed Landfill	
Project Number: 2040.30	

Section C Invoice Information:

Attention: Sue Brewer	
Company Name: Altamont Environmental	
Address:	
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

- [ ] NPDES
- [x] GROUND WATER
- [ ] DRINKING WATER
- [ ] UST
- [ ] RCRA
- [ ] OTHER

Site Location STATE: NC

Requested Analysis Filtered (Y/N)

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

ITEM #	SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	TIME	COMPOSITE END/GRAB DATE	TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	Appendix I Volatiles 8260	Metals 6010	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 9275289
1	MW-07					08-10-10	1247		4			X	X						X	X		9275289001
2	TRIP BLANK								2				X						X			9275289002
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	A. Macbeth / Altamont	8/11/10	1340	[signature]	8/11/10	13:40	3.2	Y	N	Y
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Amy Bondurant

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 08/10/10

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Sample Condition Upon Receipt

Pace Analytical

Client Name: Altamont Project # 9275289

Where Received: ☐ Huntersville ☑ Asheville ☐ Eden

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other______

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Optional:
Proj. Due Date:
Proj. Name:

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other______

Thermometer Used: IR Gun#2 / 14-648-44 **Type of Ice:** Wet Blue None ☑ Samples on ice, cooling process has begun

Temp Correction Factor: Add/Subtract 0.5 C

Corrected Cooler Temp.: 3.2 C **Biological Tissue is Frozen:** Yes No

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 8/11/10

				Comments:
Chain of Custody Present:	☑Yes	☐No	☐N/A	1.
Chain of Custody Filled Out:	☑Yes	☐No	☐N/A	2.
Chain of Custody Relinquished:	☑Yes	☐No	☐N/A	3.
Sampler Name & Signature on COC:	☑Yes	☐No	☐N/A	4.
Samples Arrived within Hold Time:	☑Yes	☐No	☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes	☑No	☐N/A	6.
Rush Turn Around Time Requested:	☑Yes	☐No	☐N/A	7. 7 Day TAT
Sufficient Volume:	☑Yes	☐No	☐N/A	8.
Correct Containers Used:	☑Yes	☐No	☐N/A	9.
-Pace Containers Used:	☑Yes	☐No	☐N/A	
Containers Intact:	☑Yes	☐No	☐N/A	10.
Filtered volume received for Dissolved tests	☑Yes	☐No	☐N/A	11.
Sample Labels match COC:	☑Yes	☐No	☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT				
All containers needing preservation have been checked.	☑Yes	☐No	☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes	☐No	☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☑Yes	☐No		Initial when completed
Samples checked for dechlorination:	☐Yes	☐No	☑N/A	14.
Headspace in VOA Vials (>6mm):	☑Yes	☐No	☐N/A	15.
Trip Blank Present:	☑Yes	☐No	☐N/A	16.
Trip Blank Custody Seals Present	☑Yes	☐No	☐N/A	
Pace Trip Blank Lot # (if purchased):______				

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: ______________ Date/Time: ______________

Comments/ Resolution: ______________

Project Manager Review: ______________ Date: 8/11/10

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)