ALTERNATE SOURCE DEMONSTRATION

# ANOMOLOUS DETECTIONS OF VOLATILE ORGANIC COMPOUNDS

## Henderson County Closed Construction and Demolition Landfill, Permit No. 45-01

**Submitted To:**

Henderson County Solid Waste Division
802 Stoney Mountain Road
Hendersonville, North Carolina 28791

**Submitted By:** Golder Associates NC, Inc.
5B Oak Branch Drive
Greensboro, North Carolina 27407

**September 2010** **0839-650609.900**

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NC DENR
Division of Waste Management - Solid Waste

# Environmental Monitoring Reporting Form

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## Instructions:

- **Prepare one form for each individually monitored unit.**
- **Please type or print legibly.**
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.).
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

## Solid Waste Monitoring Data Submittal Information

**Name of entity submitting data (laboratory, consultant, facility owner):**

Golder Associates NC, Inc. on behalf of Henderson County

**Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:**

Name: David Yates Reedy II, P.G. Phone: 336-852-4903

E-mail: dreedy@golder.com

| Facility name: | Facility Address: | Facility Permit # | NC Landfill Rule: (.0500 or .1600) | Actual sampling dates (e.g., October 20-24, 2006) |
|---|---|---|---|---|
| Henderson County Closed C&D Landfill | 802 Stoney Mountain Road Hendersonville, NC 28791 | 45-01 | .1600 | March 22-23, 2010 |

**Environmental Status: (Check all that apply)**

☐ Initial/Background Monitoring ☐ Detection Monitoring ☐ Assessment Monitoring ☒ Corrective Action

**Type of data submitted: (Check all that apply)**

☒ Groundwater monitoring data from monitoring wells
☐ Groundwater monitoring data from private water supply wells
☐ Leachate monitoring data
☐ Surface water monitoring data
☐ Methane gas monitoring data
☒ Corrective action data (specify) Alternate Source Demonstration
☐ Other(specify)

**Notification attached?**

☐ No. No groundwater or surface water standards or explosive methane gas limits were exceeded.
☐ Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS and preliminary analysis of the cause and significance of any concentration.
☐ Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

## Certification

**To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.**

David Yates Reedy II, P.G. — Facility Representative Name (Print)

Senior Project Hydrogeologist — Title

(336) 852-4903 — (Area Code) Telephone Number

Signature

9-28-10 — Date

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA LICENSED SEAL 1900 GEOLOGIST DAVID YATES REEDY, II 9-28-10

Revised 10/2006

September 28, 2010 0839-650609.900

Ms. Jackie Drummond, Hydrogeologist
North Carolina Department of Environment and Natural Resources
Division of Waste Management Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

**RE: ALTERNATE SOURCE DEMONSTRATION: VOLATILE ORGANIC COMPOUNDS HENDERSON COUNTY CLOSED CONSTRUCTION AND DEMOLITION LANDFILL, PERMIT NO. 45-01 HENDESONVILLE, NORTH CAROLINA**

Dear Jackie:

On behalf of Henderson County, Golder Associates NC, Inc. (Golder) is submitting the attached Alternate Source Demonstration (ASD) to address anomalous detections of volatile organic compounds (VOCs) in groundwater samples collected from monitoring wells MW-11, MW-12, and MW-13 at the Closed Construction and Demolition (C&D) landfill. This ASD has been prepared in accordance with the Groundwater Assessment Work Plan, which was approved by the North Carolina Department of Environment and Natural Resources (NC DENR) on December 18, 2009, and 15A NCAC 13B.0544(b)(1)(I), to demonstrate that the VOCs detected in the groundwater downgradient from the C&D landfill are derived from a source other than leachate from the C&D landfill.

Henderson County is requesting that the NC DENR allow the groundwater monitoring program at the C&D landfill to remain in a Detection Monitoring Program pursuant to 15A NCAC 13B.0544, since it is apparent that the anomalous VOC detections in the affected monitoring wells are not related to a release of leachate from the facility's waste disposal area. Upon approval of the ASD, the County will evaluate potential options for remediating the methane at the closed C&D facility and will submit a landfill gas remediation plan for approval prior to initiating remedial measures. If you have any questions, please contact the undersigned at (336) 852-4903.

**GOLDER ASSOCIATES NC, INC.**

David "Dusty" Y. Reedy II, P.G.
Senior Project Hydrogeologist

Rachel P. Kirkman, P.G.
Senior Geologist

Enclosure: Alternate Source Demonstration: Anomalous Detections of Volatile Organic Compounds, Henderson County Closed Construction and Demolition Landfill, Permit No. 45-01

C: Marcus Jones, Director of Engineering, Henderson County, 802 Stoney Mountain Road, Hendersonville, NC 28791. 828-697-4505. majones@hendersoncountync.org

Natalie Berry, P.E., Assistant County Engineer, Henderson County, 100 North King Street, Hendersonville, NC 28792. 828-697-4535. nberry@hendersoncountync.org (electronic copy)

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## EXECUTIVE SUMMARY

This Alternate Source Demonstration (ASD) has been prepared in accordance with the Groundwater Assessment Work Plan, which was approved by the North Carolina Department of Environment and Natural Resources (NC DENR) on December 18, 2009, and 15A NCAC 13B.0544(b)(1)(I), as an attempt to demonstrate that the volatile organic compounds (VOCs) detected in the groundwater downgradient from the C&D landfill are derived from a source other than leachate from the C&D landfill.

As discussed in the enclosed ASD, it is our opinion that sufficient evidence suggests that the source of the anomalous VOC detections reported for groundwater samples collected from downgradient wells MW-11, MW-12, and MW-13 is not leachate that has been released from the facility's waste disposal unit. Rather, the source is most likely related the partitioning of gaseous phase VOCs present in the facility's landfill gas, into the dissolved phase, resulting in concentrations of VOCs at levels that are greater than the Solid Waste Section Limits (SWSLs) and 2L groundwater standards for some constituents. The results of the groundwater analyses and historical review of the facility's analytical data indicated the following constituents of concern: acetone; benzene; chloroethane; 1,4-dichlorobenzene; 1,1-dichloroethane; cis-1,2-dichloroethene; methylene chloride; tetrachloroethene; 1,1,1-trichlorothane; trichloroethene; trichlorofluoromethane; vinyl chloride; and total xylenes.

These constituents were evaluated in this ASD through analysis and comparison of additional sampled media, namely headspace gases from the C&D landfill monitoring wells, and typical leachate composition compiled from various literature sources. This unlined facility does not have leachate collection and therefore, site-specific leachate samples were unable to be obtained.

The data generated during the March 2010 sampling activities, along with historical data, were used to evaluate leachate from the C&D landfill and closed TVA landfill, and landfill gas as possible sources for the detected VOCs. As stated above, the result of our analyses indicate that landfill gas is the most likely source for the detected constituents in the facility's groundwater.

Based on these results, Henderson County is requesting that the NC DENR allow the groundwater monitoring program at the C&D landfill to remain in a Detection Monitoring Program pursuant to 15A NCAC 13B.0544, since it is apparent that the anomalous VOC detections in the affected monitoring wells are not related to a release of leachate from the facility's waste disposal area. Upon approval of the ASD, the County will evaluate potential options for remediating the methane at the closed C&D facility and submit a landfill gas remediation plan for approval prior to initiating any remedial measures.

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# 1.0 INTRODUCTION

The Henderson Closed County Construction and Demolition (C&D) Landfill, is a closed C&D landfill that is maintained by Henderson County (the County), under Permit No. 45-01, issued by the North Carolina Department of Environment and Natural Resources (NC DENR). The location of the facility is shown on the inlay on Drawing 1. As presented, Henderson County Landfill is located approximately 3 miles northwest of the city of Hendersonville, NC, off Stoney Mountain Road. The County maintains an approximately 120-acre landfill facility that consists of a closed, unlined C&D over municipal solid waste (MSW) facility; a closed, unlined C&D facility; a closed, unlined facility formerly operated by the Tennessee Valley Authority (TVA); and an active transfer station (Drawing 1). A white goods area, a mulching area, and a beneficial reuse area are also present on the property (Drawing 1). The MSW facility is subject to Assessment Monitoring in accordance with .1634 of the Solid Waste Management Rules (SWMR) and the Transition Plan for the facility. The unlined C&D facility is subject to water quality monitoring in accordance with the January 1, 2007, revision to the C&D Rules (.0544 of the SWMR). No water quality monitoring is required or is being conducted for the TVA landfill.

The facility has been in operation since the 1940s, beginning with the TVA landfill. In January 1998, the MSW facility ceased accepting MSW waste and began placing C&D waste over the MSW waste. After closure of the C&D-over-MSW area, a new C&D landfill began operation on the southeastern portion of the facility property. The C&D-over-MSW area was capped with a modified clay cap. The County ceased accepting waste at the stand-alone C&D landfill on June 30, 2008, and completed closure activities on June 30, 2009. The stand-alone C&D landfill is the subject of this report, hereafter referred to as the C&D landfill.

The C&D landfill is bounded to the north, south, and east by undeveloped wooded properties owned by the County. The C&D Landfill is bounded to the west by the TVA landfill. Topographic relief at the landfill ranges from approximately 2170 to 2590 feet above mean sea level. Surface drainage from the facility is predominantly to the southwest toward several streams along the western and southern portions of the property. These features drain into Mill Pond Creek located southwest of the landfill.

## 1.1 Purpose of this Alternate Source Demonstration

Laboratory analytical results generated during the routine groundwater monitoring program at the facility indicate that the groundwater beneath the closed C&D landfill has been impacted by low concentrations of volatile organic compounds (VOCs). Two of the facility's downgradient monitoring wells have constituents present in concentrations that exceed the North Carolina 15A North Carolina Administrative Code (NCAC) 2L Standards (2L Standards) for groundwater. As a result of these confirmed detections, the County has undertaken this Alternative Source Demonstration (ASD) in accordance with 15A NCAC 13B.0544(b)(1)(I), to determine if the VOCs detected in the groundwater downgradient of the C&D landfill are derived from a source other than leachate from the C&D landfill.

## 1.2 Hydrogeologic Setting

Geologically, the facility is located within the Chauga Belt of the Blue Ridge Physiographic Province of North Carolina (NCGS, 1985 and 2004). The Chauga Belt is comprised of Cambrian intrusive metamorphic rocks of monzonitic to granodioritic origin. The Chauga Belt is considered a low-grade metamorphic part of the Inner Piedmont Belt and is bordered to the west by the Brevard thrust fault zone. The facility is underlain primarily by the Henderson Gneiss, which is a medium-gray, biotite granite augen composed of microcline, oligoclase, quartz, biotite, and minor amounts of muscovite, epidote, and titanite (Butler and Secor, 1991). The topography of the area is characterized by rolling, rounded hills with broad valleys and moderately steep ravines typically containing streams.

The uppermost groundwater beneath the facility is present in a shallow, unconfined aquifer comprised of partially weathered, fractured, metamorphic intrusive rock. Topographic relief at the site ranges from an elevation of approximately 2590 feet above mean sea level (AMSL) along the eastern property boundary and slopes downward to the southwest to an approximate elevation of 2170 feet AMSL along the western property boundary. As a result of the varying topographic relief at the site, groundwater occurs at depths of ranging from approximately 6 to 55 feet below grade. Depth to water measurements obtained during the March 2010 monitoring event are summarized in Table 1 and were used to prepare a groundwater surface contour map presented as Drawing 1.

As presented, the groundwater flow in the uppermost aquifer beneath the site is generally toward the southwest toward a tributary of Mill Pond Creek, which is located along the western property boundary of the site. The groundwater contour map and interpreted flow directions are generally consistent with previously submitted groundwater contour maps and flow directions.

Based on the March 2010 groundwater surface contour map, the average hydraulic gradient in the shallow aquifer underlying the MSW landfill was calculated to be approximately 0.091 foot/foot (Table 2). The hydraulic gradient underlying the C&D landfill was calculated to be approximately 0.263 foot/foot (Table 2). A hydraulic conductivity of 1.26E-04 centimeters/second is used based on an average of hydraulic conductivities measured for specific wells (Camp Dresser &McKee (CDM), October 2008). An estimated effective porosity of 0.15 was used for the shallow aquifer to represent a range from saprolite to fractured rock (CDM, October 2008).

Using the above values, the estimated rate of groundwater flow for the uppermost aquifer beneath the facility was calculated using the following modified Darcy equation:

$$V_{gw} = Ki/n_e$$

where $V_{gw}$ = average linear velocity (feet/year), K = hydraulic conductivity (feet/year), i = horizontal hydraulic gradient, and $n_e$ = effective porosity.

The average estimated linear groundwater flow velocity under the MSW landfill is approximately 80 feet/year, which is generally consistent with previous estimates (Table 2). The average estimated linear groundwater flow velocity under the C&D landfill is approximately 229 feet/year (Table 2). The range of groundwater flow is expected to vary depending on the hydrogeologic unit in which it occurs. However, the linear velocity equation above makes the simplified assumptions of a porous, homogeneous, and isotropic aquifer. Therefore, this equation represents a likely average value for the uppermost aquifer and does not account for fractured-rock flow or heterogeneous and/or anisotropic conditions that may be present in the uppermost aquifer at the facility.

## 1.3 Site Monitoring History

The County has monitored water quality at the C&D landfill by sampling one upgradient monitoring well (MW-10), and three downgradient monitoring wells (MW-11, MW-12, and MW-13) semi-annually since June 2001. Samples from the wells are analyzed for the NC Appendix I list plus mercury and required indicator parameters per the requirements listed in Title 15A NCAC 13B.0544 of the North Carolina Solid Waste Management Rules (NCSWMR).

Five VOCs (cis-1,2-dichloroethene; methylene chloride; tetrachloroethene; trichloroethene; and trichlorofluoromethane) have been detected above the Solid Waste Section Limits (SWSLs) in samples from one or more downgradient monitoring wells during recent compliance monitoring events. Ten other VOCs (acetone; benzene; chloroethane; 1,4-dichlorobenzene; 1,1-dichloroethane; toluene; 1,1,1-trichloroethene; trichloroethene; vinyl chloride; and xylenes) have been detected in samples from one or more downgradient wells below their respective SWSLs during recent sampling events. Tetrachloroethene and vinyl chloride have been detected above the 2L Standard in one or more downgradient wells during recent events. A summary of detected constituents at the C&D landfill are presented in Table 3.

A Groundwater Assessment Work Plan (Work Plan) was submitted to NC DENR on September 17, 2009, to address recent VOC detections at the C&D landfill along with VOC and inorganic detections at the MSW landfill. The Work Plan was approved by NC DENR in a letter dated December 18, 2009. A brief summary of the monitoring results for each detected constituent is presented in the following sections.

### *1.3.1 Acetone*

Historical acetone monitoring results are summarized in Table 3. As presented, acetone was detected for the first time in a sample collected from MW-12 at a concentration below the Solid Waste Section Limit (SWSL) and 2L Standard. During the most recent sampling event in March 2010, acetone was detected at concentrations below the SWSL in samples collected from MW-11 and MW-12. Because of the recent detections in samples from downgradient wells, acetone is considered to be a constituent-of-concern (COC) and is addressed in this ASD.

### 1.3.2 Benzene

Historical benzene monitoring results are summarized in Table 3. As presented, benzene was detected below the SWSL between October 2007 and October 2008 in samples collected from monitoring well MW-12. Benzene was also detected in the sample collected from MW-11 below the SWSL during the September 2009 sampling event. Because of recent detections in samples from downgradient wells, benzene is considered to be a COC at the C&D landfill and is addressed in this ASD.

### 1.3.3 Chloroethane

Historical chloroethane monitoring results are summarized in Table 3. As presented, chloroethane was detected below the SWSL in samples collected from MW-12 during the March and October 2007 sampling events and during the October 2008 event. Chloroethane is considered to be a COC at the C&D landfill and is addressed in this ASD based on recent detections in a downgradient well.

### 1.3.4 Dichlorobenzene, 1,4-

Historical 1,4-dichlorobenzene monitoring results are summarized in Table 3. As presented, 1,4-dichlorobenzene was detected below the SWSL between the March 2007 and October 2008 sampling events in samples collected from MW-12 and during the October 2007 event in the sample collected from MW-13. During the most recent sampling event in March 2010, 1,4-dichlorobenzene was detected below the SWSL in samples collected from MW-11 and MW-13. Consequently, 1,4-dichlorobenzene is considered to be a COC and is addressed in this ASD because of the recent detections in samples collected from downgradient wells.

### 1.3.5 Dichloroethane, 1,1-

Historical 1,1-dichloroethane monitoring results are summarized in Table 3. As presented, 1,1-dichloroethane has been detected below the SWSL during each sampling event from March 2007 to March 2010 in samples collected from MW-12. In samples collected from well MW-13, 1,1-dichloroethane was detected below the SWSL between the October 2007 and October 2008 sampling events. Because 1,1-dichlorethane has consistently been detected in samples collected from MW-12, the constituent is considered to be a COC at the C&D landfill and is addressed in this ASD.

### 1.3.6 Dichloroethene, cis-1,2-

Historical cis-1,2-dichloroethene monitoring results are summarized in Table 3. As presented, cis-1,2-dichloroethene was first detected above the SWSL in a sample collected from well MW-11 during the April 2003 sampling event. The constituent was detected below the SWSL in a sample from MW-11 during the October 2008 event. More recently, cis-1,2-dichloroethene has been detected above the SWSL in samples collected from MW-11 during the September 2009 and March 2010 events. The constituent has been detected below the SWSL in samples collected from MW-12 between March 2007 and October 2008. In samples collected from MW-13, cis-1,2-dichloroethene was detected below the

SWSL between October 2007 and October 2008 and during the most recent sampling event in March 2010.

Cis-1,2-dichloroethene is considered to be a COC at the C&D landfill and is addressed in this ASD based on the following observations:

- The reported concentrations in samples from MW-11 during the two most recent sampling events are above the SWSL; and
- Cis-1,2-dichloroethene has historically been detected in samples from each downgradient monitoring well and was detected in samples collected from MW-11 and MW-13 during the most recent sampling event.

### *1.3.7 Methylene Chloride*

Historical methylene chloride monitoring results are summarized in Table 3. As presented, methylene chloride has been detected in samples collected from MW-12 during each sampling event since April 2008. Methlyene chloride was detected below the SWSL in samples collected from MW-12 during the April 2008, March 2009, and March 2010 events, but above the SWSL during the October 2008 and September 2009 events. Methylene chloride was detected in a sample collected from MW-13 during the October 2008 sampling event. Methylene chloride is considered to be a COC at the C&D landfill and is addressed in this ASD because it has been detected above the SWSL in samples from MW-12 during recent sampling events.

### *1.3.8 Tetrachloroethene*

Historical tetrachloroethene monitoring results are summarized in Table 3. As presented, tetrachloroethene has been detected above the 2L Standard during each sampling event in samples collected from MW-12 since March 2007. Tetrachloroethene was detected below the SWSL in samples collected from MW-12 between March 2007 and April 2008 and has been detected above the SWSL from October 2008 to March 2010. Tetrachloroethene was detected below the SWSL and 2L Standard in samples collected from MW-13 between October 2007 and October 2008 and during the March 2010 sampling event. Tetrachloroethene has been detected during each sampling event in samples from MW-11 since April 2008. Between April 2008 and March 2009, tetrachloroethene was detected below the SWSL and the 2L Standard in samples collected from MW-11, but has been detected above the SWSL and the 2L Standard during the September 2009 and March 2010 events. Tetrachloroethene is considered to be a COC at the C&D landfill and is addressed in this ASD based on the following observations:

- Tetrachloroethene has been historically been detected in each facility downgradient monitoring well; and

- The most recent reported concentrations in samples from MW-11 and MW-12 are above the SWSL and the 2L Standard.

### 1.3.9 Toluene

Historical toluene monitoring results are summarized in Table 3. As presented, toluene was detected below the SWSL in a sample collected from MW-13 during the April 2008 sampling event. Since toluene has not been detected since April 2008 in any downgradient wells, it is not considered to be a COC at the C&D landfill and is not addressed in this ASD.

### 1.3.10 Trichloroethene

Historical trichloroethene monitoring results are summarized in Table 3. As presented, trichloroethene was detected below the SWSL in samples from MW-12 between March 2007 and March 2009 and in March 2010. Trichloroethene was detected below the SWSL in samples collected from MW-13 during the October 2007 and April 2008 sampling events and was detected above the SWSL during the October 2008 event. Tetrachloroethene has also been detected below the SWSL in the most recent samples collected from MW-10 in September 2009 and March 2010. Trichloroethene is considered to be a COC at the C&D landfill and is addressed in this ASD based on the following observations:

- Trichloroethene has consistently been detected at concentrations below the SWSL in downgradient monitoring wells since March 2007; and

- Trichloroethene was detected above the SWSL in a sample from MW-13 during the October 2008 sampling event.

### 1.3.11 Trichloroethane, 1,1,1-

Historical 1,1,1-trichloroethane monitoring results are summarized in Table 3. As presented, 1,1,1-trichloroethane was detected below the SWSL in samples collected from MW-12 between the March 2007 and October 2008 sampling events. This VOC is considered to be a COC at the C&D landfill because it has been detected during the recent sampling events.

### 1.3.12 Trichlorofluoromethane

Historical trichlorofluoromethane monitoring results are summarized in Table 3. As presented, trichlorofluoromethane was first detected above the SWSL during the October 2005 sampling event in a sample collected from MW-12. Trichlorofluoromethane has been consistently detected above the SWSL in samples collected from MW-12 since the October 2006 sampling event. Trichlorofluoromethane was detected below the SWSL in a sample collected from MW-13 during the October 2007, but has been detected above the SWSL during the April 2006 event, between April 2008 and March 2009, and during the March 2010 event. No detections in downgradient wells have exceeded the 2L Standard. Trichlorofluoromethane is considered to be a COC at the C&D landfill and is addressed in this ASD

because it has been detected above the SWSL consistently in wells MW-12 and MW-13 since October 2005.

### *1.3.13 Vinyl Chloride*

Historical vinyl chloride monitoring results are summarized in Table 3. As presented, vinyl chloride was detected below the SWSL, but above the 2L Standard in a sample collected from MW-12 in October 2008 and a sample collected from MW-11 in September 2009. Vinyl chloride is considered to be a COC at this facility and is addressed in this ASD because of the recent detections that exceeded the 2L Standard.

### *1.3.14 Xylenes*

Historical total xylene monitoring results are summarized in Table 3. As presented, xylenes were detected below the SWSL between the March 2007 and October 2008 sampling events in samples collected from MW-12. Recently, xylenes have been detected below the SWSL in samples collected from MW-11 during the September 2009 and March 2010 events. Because xylenes have been recently detected in downgradient wells, total xylenes are considered to be a COC at the C&D landfill and are addressed in this ASD.

## 1.4 Constituents-of-Concern

Based on the evaluation of the available groundwater monitoring data for the C&D landfill, the following constituents are considered to be COCs and are addressed in this ASD:

- Acetone:
- Benzene:
- Chloroethane:
- 1,4-Dichlorobenzene:
- 1,1-Dichloroethane:
- cis-1,2-Dichloroethene:
- Methylene Chloride:
- Tetrachloroethene:
- 1,1,1-Trichlorothane:
- Trichloroethene:
- Trichlorofluoromethane:
- Vinyl Chloride:
- Xylenes:

## 2.0 POTENTIAL VOC SOURCES

Pursuant to 15A NCAC 13B.0544(b)(1)(I), the purpose of this ASD is to determine if a source other than leachate from the C&D landfill's waste disposal unit is responsible for the concentrations of COCs that have been reported in monitoring wells MW-11, MW-12, and MW-13. Based on review of the available data for the C&D landfill, Golder has identified the following likely scenarios to account for the COCs concentrations that have been detected in the groundwater samples collected from the affected downgradient wells.

Scenario 1: The reported COCs concentrations in the groundwater samples are derived from leachate released from the C&D landfill waste disposal unit.

Scenario 2: The reported COC concentrations in the groundwater samples are derived from landfill gas that has been released from the C&D landfill waste disposal unit to the vadose zone beneath the landfill and the partitioning of certain COCs into the groundwater from the gaseous phase to the dissolved phase.

Scenario 3: The reported COCs concentrations in the groundwater samples are derived from leachate released from the closed TVA landfill waste disposal unit.

### 2.1 Scenario 1

The default scenario in the absence of any contrary evidence is that the trace COCs concentrations reported in the groundwater samples are accurate and represent groundwater impacts resulting from a release from the C&D landfill waste disposal unit. The disposal unit is located upgradient of monitoring wells MW-11, MW-12, and MW-13. Background monitoring well MW-10 is demonstrated to be located hydraulically upgradient from the waste disposal area.

As the C&D landfill is unlined and does not have a leachate collection system, site-specific leachate samples were not available for laboratory analysis. Various literature sources are cited in Table 4, where concentrations of typical C&D landfill leachate constituents have been compiled and are used in this ASD to represent a typical C&D leachate sample.

### 2.2 Scenario 2

Scenario 2 is that the trace COCs concentrations detected in samples from monitoring wells MW-11, MW-12, and MW-13 are derived from landfill gas that has been released from the C&D landfill waste disposal unit. Specifically, the trace COCs detected in the groundwater may have resulted from the partitioning of COCs in landfill gas to the shallow groundwater. Landfill gas typically contains COCs in the gas phase, if present, as a minor component on a percentage basis [i.e., less than 1% by volume (CWMB, 1998; Carpenter *et al.*, 1997; Baker, 1998; and Soltani-Ahmadi, 2001)].

At some sites, where landfill gas has been released from the solid waste disposal unit to the vadose zone and is in contact with soil gas moisture or the water table, the COCs in the landfill gas will partition from

the gaseous phase to the dissolved phase in accordance with the ideal gas law and the constituent-specific Henry's Law Constants (Baker, 1998; Carpenter *et al.*, 1997). Table 5 presents the Henry's Law Constants for the COCs detected during the March 2010 sampling event. Infiltrating precipitation may transport the COCs to the water table as recharge, or partitioning may directly transfer the COCs to the water table. In instances where monitoring wells are screened above the water table, landfill gas may enter the well casing and directly partition COCs to the water in the monitoring wells.

There are no methane boundary probes located around the C&D landfill. Downgradient monitoring wells MW-11, MW-12, and MW-13 are located within approximately 75 feet of the C&D landfill waste disposal unit. Well construction information for the C&D landfill monitoring wells could not be located. Based on available site data, the C&D landfill monitoring wells are believed to be screened in the weathered rock zone of the aquifer system. Assuming the wells were constructed with 10-foot screen lengths, the water table in wells MW-10 and MW-12 was above the screens during the March 2010 event, but the water table would have intersected the screen during previous events. The water table would have intersected the screen of MW-11 during the March 2010 event, but the screen would have been submerged during the September 2009 event. The well screen of MW-13 is well below the water table and has been submerged for at least the last 5 events.

If the wells were constructed with 20-foot screen lengths, the water table would have intersected the screens of MW-10, MW-11, and MW-12 during at least the last five monitoring events. The water table would still be above the well screen of MW-13.

## 2.3 Scenario 3

Scenario 3 is that trace COCs concentrations reported in the groundwater samples are accurate and represent groundwater impacts, but the source of the groundwater impacts is the closed TVA landfill waste disposal unit. Topographically, the TVA landfill appears to have been constructed between two "fingers" of a topographic drainage area, having (or formerly having) tributary streams to the east and west. Within the site-specific geologic setting, drainages often indicate preferred fracture and weathering zones within underlying bedrock, resulting in preferred flow pathways for groundwater. Because if this, groundwater flow under the TVA landfill may flow toward preferred flow pathways both to the east and west, then turning south/southwest within the fractured/weathered zones, resulting in impacts from the TVA landfill affecting monitoring wells MW-11, MW-12, and MW-13.

As the TVA landfill is unlined and does not have a leachate collection system, site-specific leachate samples were not available for laboratory analysis. Various literature sources are sited in Table 6, where typical leachate concentrations for MSW landfills have been compiled and are used in this ASD to represent a typical MSW leachate sample.

# 3.0 INVESTIGATIVE ACTIVITIES

Based on the hypotheses concerning the origin of the COCs detected in samples from downgradient wells MW-11, MW-12, and MW-13, the available site information and available published data were reviewed, and a field investigation was undertaken in September 2009 to obtain methane measurements from the headspace of each C&D landfill monitoring well during the routine semi-annual monitoring event. Based on the September 2009 results, an additional field investigation was performed in March 2010 to obtain groundwater and headspace/gas samples for selected laboratory analyses. The groundwater samples were submitted for analysis of NC Appendix I VOCs, water quality parameters, and/or leachate indicator parameters. The air samples were submitted for analysis of VOCs. The investigative activities are discussed in the following sections.

## 3.1 September 2009 Methane Monitoring Activities

On September 22, 2009, methane measurements were obtained by Golder personnel from the well casing headspaces of MW-10, MW-11, MW-12, and MW-13. To collect the methane measurements, each monitoring well was plugged to prevent potential gas from escaping from the well. Tubing, attached to a CES Landtec GEM 2000 portable gas analyzer, was inserted into the well to a depth of approximately 5 feet above the groundwater level.

Methane was not detected in upgradient well MW-10 and downgradient well MW-13. Methane was detected at 4.1% in MW-12 and at 26.5% in MW-11. Because of the detections of methane in the headspace of downgradient monitoring wells, landfill gas was determined to be a possible source of COCs in groundwater and further investigation was deemed necessary.

## 3.2 March 2010 Sampling Activities

To assist with the evaluation of the COCs detected in downgradient wells MW-11, MW-12, and MW-13, headspace samples were collected from MW-10, MW-11, MW-12, and MW-13 using Summa canisters on March 22, 2010, by personnel from Golder. To collect headspace samples, each monitoring well was plugged to prevent potential gas from escaping from the well. Tubing was inserted into the well to a depth of approximately 5 feet above the groundwater level. The tubing was attached to an empty Summa canister and the valve of the canister was opened and allowed to fill with the gases from the well headspace. Once full, the valve to the Summa canister was closed and the tubing was removed. Methane concentrations were also measured utilizing a CES Landtec GEM™ 2000 portable gas analyzer. No methane was measured from any of the wells during the event. The Summa canisters were shipped by courier to Environmental Conservation Laboratories, Inc. (ENCO) of Jacksonville, Florida, for analysis of VOCs. The laboratory certificates-of-analysis are presented in Appendix A.

On March 23, 2010, monitoring wells MW-10, MW-11, MW-12, and MW-13 were purged using disposable bailers. At least three casing volumes of groundwater were removed from each well prior to sampling.

Measurements of temperature, pH, specific conductivity, and turbidity were recorded after each purge volume with field-calibrated instruments to monitor groundwater quality.

On March 24, 2010, wells MW-10, MW-11, MW-12, and MW-13 were sampled within 24 hours of purging. Laboratory-supplied sample containers were prepared by labeling each container with the sample identification number, sampling personnel, date and time of sample collection, project name and number, and requested chemical analyses. The groundwater samples were collected directly from the bailer in the pre-preserved sample containers. After collection, the samples were placed in a cooler on ice, under chain-of-custody control. Copies of the sampling logs are presented in Appendix B. Included on each log is a description of the sampling equipment, sampling location, sampling method, field observations, and water quality measurements. Measurements of temperature, pH, specific conductivity, and turbidity were recorded at the time of sampling with field-calibrated instruments to monitor groundwater quality. The groundwater samples were shipped by courier to ENCO of Cary, NC for analysis of NC Appendix I list of constituents plus indicator parameters specified in Title 15A NCAC 13B.0566 and common cations and anions (calcium, alkalinity, magnesium, sulfate, chloride, potassium, and sodium).

For quality control, a field blank sample, prepared in the field from distilled water, was submitted for analysis of NC Appendix I constituents. Also, a laboratory-prepared trip blank sample, which accompanied the sample kit from and to the laboratory, was submitted for analysis of NC Appendix I VOCs. The laboratory certificates-of-analysis are presented in Appendix C.

## 4.0 ANALYTICAL RESULTS

The results from the laboratory analyses completed as part of this investigation are discussed in the following sections. The laboratory certificates-of-analysis and chain-of-custody forms for the headspace and groundwater samples analyzed during this investigation are presented in Appendices A and C, respectively. Analytical results for the March 2010 groundwater samples are summarized in Table 3 with available historical data.

### 4.1 Groundwater Sampling Results

As presented in Table 3, three NC Appendix I VOCs (cis-1,2-dichloroethene in MW-11, trichlorofluoromethane in MW-12 and MW-13, and tetrachloroethene in MW-11 and MW-12) were detected above their respective SWSLs during the March 2010 event. Tetrachloroethene was reported above its 2L Standard in samples from MW-11 and MW-12 during the March 2010 event. Eight NC Appendix I VOCs (acetone; 1,4-dichlorobenzene; 1,1-dichloroethane; cis-1,2-dichloroethene, methylene chloride; tetrachloroethene; trichloroethene; and total xylenes) were detected below their respective SWSLs in samples from one or more downgradient monitoring wells during the event.

## 4.2 Headspace Sampling Results

No methane was detected in headspace samples using the CES Landtec GEM™ 2000 portable gas analyzer on March 22, 2010. However, the detection levels on this meter may not allow for the measurement of the low levels of methane present in the headspace samples. The analytical results for the headspace samples collected from groundwater monitoring wells MW-10, MW-11, MW-12, and MW-13 are presented in Table 7. As presented, the results indicated the presence of methylene chloride in the headspace of all four monitoring wells and acetone, 2-butanone, tetrachloroethene, and trichlorofluoromethane in the headspace of well MW-12.

Though methylene chloride was detected in the headspace samples from each well, it was only detected in the groundwater sample from MW-12. The constituent 2-butanone was detected in the headspace sample of MW-12, but was not detected in the groundwater sample from that well. Tetrachloroethene and trichlorofluoromethane were detected in both the headspace and groundwater samples for MW-12. Other detections of VOCs (acetone and total xylenes in MW-11; 1,1-dichloroethane in MW-12; trichlorofluoromethane in MW-13; 1,4-dichlorobenzene; cis-1,2-dichloroethene; tetrachloroethene in MW-11 and MW-13; and trichloroethene in MW-11 and MW-12) in groundwater samples were not detected in headspace samples.

# 5.0 RESULTS DISCUSSION

The following sections discuss the data evaluations that were completed in consideration of the three scenarios proposed as potential sources of the VOCs that have been observed in samples collected from monitoring wells MW-11, MW-12, and MW-13.

## 5.1 Landfill Gas Source Evaluation

To evaluate landfill gas as a potential source of trace VOC concentrations in groundwater samples, Golder evaluated the potential for the VOCs in landfill gas to partition to groundwater using a numerical soil-gas to groundwater partitioning model. Golder also compared methane detections from groundwater samples to methane measurements from the headspace of monitoring wells. Although more qualitative, Golder also evaluated the potential for landfill gas to accumulate in the well casing, allowing for direct exposure of groundwater within the well casing to be potentially impacted by headspace gas. It is noted that impacted head space is not necessarily required for landfill gas to impact groundwater (i.e., such impacts can happen outside of the well casing). These evaluations are discussed in the following sections.

### *5.1.1 Henry's Law Calculations*

Since site-specific data on VOC concentrations in landfill gas are available, we evaluated the COCs concentrations observed in the groundwater near the affected monitoring wells to determine what concentrations would theoretically be required in the landfill gas to develop the concentrations observed in the groundwater. These estimated values were then compared to the observed concentrations

detected in headspace samples. The evaluations were performed using the dimensionless form of the Henry's Law Constant (H) for the COCs (Table 5), since the dimensionless form of H is the gas-water partitioning coefficient. The following is an example calculation:

Analytical Solution: H = Concentration in gas ÷ Concentration in water
or:
Concentration in gas = H * Concentration in water

Where: H (dimensionless)
Concentration in gas [parts per billion (ppb)]
Concentration in water [micrograms per liter (ug/L)]

Observed maximum COC concentration in groundwater:

Acetone = 19.0 ug/L

Estimated gas concentration necessary to obtain observed groundwater concentrations:

$COC_{gas}$ = H x $COC_{dissolved}$ ug/L

$Acetone_{gas}$ = 0.00159 x 19.0 ug/L

$Acetone_{gas}$ = 0.03 ug/L

To express in ppb divide by mole conversion factor:

$Acetone_{gas}$ = 0.03 ug/L ÷ 2.37E-03

$Acetone_{gas}$ = 12.7 ppb

Table 8 presents the above calculations for each VOC detected in the analyzed groundwater samples.

As presented on Table 9, the numerical simulation suggest that the vadose zone gas concentrations required to develop the observed groundwater concentrations are in most cases much greater than the concentrations observed in the headspace samples that were collected as part of this investigation. This finding is likely due to a number of factors. Specifically, the low COCs concentrations detected in the headspace sample collected from MW-13 are likely attributable to the fact that the water level in this area of the aquifer is likely above the top of the screened interval in this well, thus gas in the vadose zone surrounding the well does not have the opportunity to migrate into the well casing. That may also be the case for wells MW-10 and MW-12, assuming the wells were constructed with 10-foot screen lengths.

With regard to MW-11, MW-12, and MW-13, the theoretical concentrations calculated assume that steady state equilibrium conditions exist; that is that the groundwater and soil gas temperatures are steady, the pressure in the vadose zone is steady, the groundwater volume and surface area is fixed, and that there is no flux in the COCs concentrations in the soil-gas or groundwater that can be attributed to outside influences (e.g., barometric pressure fluctuations or groundwater flow velocity). Concentrations of acetone and methylene chloride in the headspace sample from MW-12 are greater than the

concentrations from the numerical simulation to develop the observed groundwater concentrations. These results are affirmative of a potential landfill gas impact scenario since four of the ten COCs that have been detected in the groundwater were detected in one or more headspace samples.

Relatively high concentrations of gas phase COCs were detected in headspace samples, particularly from samples collected from monitoring well MW-12. A similar analysis to the above-presented analysis was conducted to evaluate the dissolved phase concentrations of COCs that may be partitioned into the groundwater by gaseous phase COCs.

Analytical Solution: H = Concentration in gas ÷ Concentration in water
or:
Concentration in water = Concentration in gas / H

The results of this analysis are presented in Table 10 and are based on the calculation above. The results show that the gaseous phase COCs detected in headspace samples collected from monitoring wells MW-10, MW-11, MW-12, and MW-13 are not significant enough to partition dissolved phase COCs into the groundwater at concentrations high enough to exceed the 2L standards for groundwater (Table 10). However, these evaluations support the Scenario 2 hypothesis because it is highly likely that landfill gas to groundwater partitioning is occurring at locations closer to the waste unit and upgradient of the affected monitoring wells, and because the limited samples of landfill gas collected during this investigation have been demonstrated to contain several of the COCs that have been detected in the groundwater.

Table 11 compares the estimated groundwater concentrations based on Henry's Law calculations to the observed concentrations from the March 2010 groundwater sampling event. This comparison indicates that the headspace concentrations of acetone and methylene chloride observed in samples from monitoring well MW-12 are high enough to partition into the groundwater at the observed concentrations based on the assumptions of the numerical model. However, headspace concentrations of tetrachloroethene and trichlorofluoromethane observed in MW-12 are not high enough to partition into the groundwater at the observed concentrations based on the assumptions of the numerical model. Methylene chloride was the only VOC detected in the headspace samples from MW-10, MW-11, and MW-13, but the constituent was not detected in the groundwater samples from the wells. These results may be due to landfill gas to groundwater partitioning occurring at the locations upgradient of the affected monitoring wells as described above, or this constituent is preferentially biodegraded within groundwater.

To summarize the results of the Henry's Law calculations, observed concentrations of COCs in groundwater were used to estimate the required soil-gas concentrations needed to partition the equivalent concentration of dissolved phase COCs into the groundwater. The estimated results were compared to observed soil-gas concentrations collected from headspace samples from the facility monitoring wells. A comparison of the estimated and observed soil-gas COCs indicates that select constituent concentrations

of soilgas in monitoring well MW-12 were sufficient to partition the observed concentrations of dissolved COCs into groundwater. This finding suggests that the impacts to groundwater from landfill gas may be occurring in the vicinity of MW-12, but are not occurring in the immediate vicinity of MW-11 and MW-13; rather that the impacts are occurring upgradient from the monitoring wells. Since MW-12 is located closer to the edge of waste than other downgradient wells, this supports hypothesis 2 and the results of the evaluations presented.

### *5.1.2 Methane Concentration Analysis*

Methane was detected in groundwater samples from each monitoring well during the March 2010 sampling event. The lowest concentration of methane was in the sample from upgradient well MW-10 at 0.002 mg/L. The highest concentration of methane was detected in the sample from MW-12, which is the well with the most VOC detections. As stated previously, methane was not detected in the headspace of any of the monitoring wells during the March 2010 event, though methane was measured in the headspace of wells MW-11 and MW-12 during the September 2009 event. A summary of methane results in groundwater and headspace are provided in Table 12. The methane detection in the sample from the upgradient as well as the downgradient wells suggest that impacts to groundwater from landfill gas, which is known to contain COCs, is occurring.

### *5.1.3 Groundwater Elevation Analysis*

To evaluate the potential for landfill gas to enter the headspace of facility monitoring wells, an analysis of groundwater elevation fluctuations compared to presumed screened intervals of the C&D landfill monitoring wells was conducted. Groundwater elevation data from 2007 to 2010 were used for the evaluation. In general, groundwater elevations went through a period of decline between the period of 2007 to 2009, after which, groundwater elevations rebounded to current elevations. A summary of historical groundwater elevations are presented on Table 1 and are shown graphically on Figure 1.

Well construction information for the C&D landfill monitoring wells could not be located, but it is assumed that the wells were constructed with minimum screen lengths of 10 feet and may be up to 20 feet. Assuming the wells were constructed with 10-foot screen lengths, the water table in wells MW-10 and MW-12 was above the screens during the March 2010 event, but the water table would have intersected the screen during the previous events. The water table would have intersected the screen of MW-11 during the March 2010 event, but the screen would have been submerged during the September 2009 event. The well screen of MW-13 is well below the water table and has likely been submerged for at least the last 5 events. Based on these evaluations, it is feasible that landfill gas has impacted groundwater through the partitioning of COCs.

## 5.2 C&D Leachate Source Evaluation

To evaluate C&D leachate as a potential source of COCs concentrations that have been detected in the site groundwater, groundwater samples were collected from MW-10, MW-11, MW-12, and MW-13 during

the March 2010 field activities. The samples were analyzed for selected analytes and the results of the analyses are summarized in Table 13 and presented in the laboratory certificate-of-analysis in Appendix C. As the C&D landfill is unlined and does not have a leachate collection system, site-specific leachate samples could not be collected for laboratory analysis. Various literature sources are cited where typical leachate concentrations for C&D landfills have been compiled and are used in this ASD to represent a typical leachate sample (Table 4).

To evaluate the analytical results, Golder prepared a series of scatter plots, Piper plots, and Stiff diagrams to illustrate the variability in the geochemistry of the groundwater for the monitoring points of interest. In addition to evaluating the chemical signatures of the groundwater and typical C&D leachate, Golder simulated the potential release of leachate from the C&D landfill to the uppermost aquifer using a numerical mixing model. The results of these analyses, which suggest that C&D leachate is *not* the source of the VOCs that have been detected in the site groundwater, are presented in the following sections.

### 5.2.1 Piper Plot Analysis

Figure 2 is a Piper Plot illustrating the variations in the geochemical facies for the monitoring points sampled as part of this investigation. As presented in Figure 2, typical C&D leachate exhibits a calcium-sodium-potassium-bicarbonate geochemical facies. The groundwater sample from upgradient monitoring well MW-10 exhibits a sodium-potassium-bicarbonate geochemical facies. Monitoring well MW-11 exhibits calcium-sodium-potassium-bicarbonate geochemical facies. Well MW-12 exhibits a calcium-sodium-potassium-bicarbonate geochemical facies. Well MW-13 exhibits a sodium-potassium-bicarbonate geochemical facies. Thus these data demonstrate that the typical C&D leachate and groundwater from MW-12 are geochemically similar and typical C&D leachate and groundwater from MW-10, MW-11, and MW-13 are geochemically different.

Review of Figure 2 suggests that it is likely that a mixture of leachate, represented by the geochemical signatures of typical C&D leachate and upgradient waters (MW-10), will yield a geochemical signature similar to that observed in the samples collected from MW-11, MW-12, and MW-13; since points representing the geochemistry of these samples plot between the upgradient waters and the typical C&D leachate, assuming a conservative mixing scenario with no precipitation. The dissolved cation and anion concentrations in the groundwater are below saturation concentrations for normal temperature and pH conditions for a non-carbonate aquifer; therefore, we expect the conservative mixing condition to apply.

### 5.2.2 Stiff Diagram Analysis

Figure 3 presents Stiff Diagrams for the monitoring points sampled as part of this investigation. As presented, monitoring well samples from MW-11 and MW-12 exhibit a shape signature similar to that of the typical C&D leachate, represented by the proportionately elevated concentrations of calcium in the samples. The sample from monitoring well MW-13 exhibits a shape signature similar to the sample from

the upgradient well MW-10, which shows proportionately elevated concentrations of sodium, potassium, and calcium. If a single source (e.g., leachate) was the source of the COCs that have been detected in the affected monitoring wells, we would expect the shapes for the affected monitoring wells to bear some resemblance to, or a general morphology trending towards, the leachate shape; therefore, the possibility exists that wells MW-11 and MW-12 are being impacted by leachate.

The elevated concentrations of cations calcium, magnesium, sodium, and potassium in samples from downgradient wells MW-11, MW-12, and MW-13 may have resulted from the dissolution of these constituents from the aquifer matrix as a result of the site-wide lowering of the groundwater pH. Leachate impacts generally buffer or raise the pH of the impacted groundwater. In particular, the leachate for older landfills tends to range from 7.5 to 9.0 standard units (Kjeldsen, et al., 2002); whereas landfill gas impacts tend to lower the pH of impacted groundwater due to the dissolution of carbon dioxide (major component of landfill gas) into the groundwater (Baker, 1998). The leachate sampled in the downgradient wells had pH values that ranged from 5.64 to 6.61 during the March 2010 event, as opposed to the upgradient well MW-10, which had a pH of 7.47, offering additional support for a landfill gas influence on the groundwater system (Scenario 2). Therefore, consideration of the effects of pH on groundwater geochemistry suggests that a general increase in the concentrations of cations in downgradient groundwater is the result of lowered pH, likely attributable to the partitioning of landfill gas to groundwater.

### *5.2.3 Scatter Plots Analysis*

Figure 4 displays scatter plots of concentration data prepared for common paired anions and cations: sodium (Na) + potassium (K) vs. chloride (Cl); magnesium (Mg) vs. sulfate ($SO_4$); calcium (Ca) vs. bicarbonate ($HCO_3$).

As presented on the Cl vs. Na+K scatter plot in Figure 4, the typical C&D leachate concentrations plot away from the sampled monitoring well results due to elevated chloride and lower sodium and potassium. Samples from the downgradient wells show an increase in chloride, sodium, and potassium as compared to upgradient well MW-10, which may be due to the minor accumulation of ions along a groundwater flow path based on the decreasing pH of the groundwater, and likely explains small differences in cation and anion proportions in the monitoring well samples. If leachate were impacting the downgradient wells, we would expect to see more significant increases in the concentrations of chloride ions in the downgradient well(s), with the impacted well(s) trending along a line between MW-10 and the typical C&D leachate, assuming a conservative mixing scenario with no precipitation. Review of the ion concentrations indicates that the concentrations are well below the concentrations at which normal precipitation would be expected based on the pH and temperature of the base solution (i.e., groundwater). The assumption of no mineral precipitation is a valid assumption, although dissolution of anions and cations from the aquifer matrix is a possibility since the assumption of steady state conditions is not apparent due to the low pH values that are likely attributed to carbon dioxide gas dissolving into the groundwater from landfill gas.

As presented on the $SO_4$ vs. Mg scatter plot in Figure 4, the typical C&D leachate is enriched in sulfate, but has lower magnesium, relative to the monitoring well samples that plot in the lower right (less sulfate, more magnesium) of the diagram. Samples from the downgradient wells show an increase in sulfate and calcium as compared to upgradient well MW-10, which may be due to the introduction of additional ions within a relatively acidic portion of the aquifer. There do not appear to be biogeochemical conditions that would allow sulfate reducing bacteria to be active in the groundwater because this would likely result in an apparent increase in sulfide concentrations as the bacteria metabolize sulfate, resulting in reduction to sulfide. The lack of detectable concentrations of sulfide in groundwater suggests that this is not the case and suggests that leachate has not impacted MW-11, MW-12, or MW-13, providing further proof that leachate is not the source of the COCs detected in the samples obtained from these wells.

As presented on the $HCO_3$ vs. Ca scatter plot in Figure 4, the typical C&D leachate is enriched in bicarbonate, but has lower calcium, relative to the monitoring well samples and plot in the top of the diagram. Samples from the downgradient wells show an increase in bicarbonate and calcium as compared to the upgradient well MW-10. The positive correlation of calcium to bicarbonate in the monitoring well samples with the high bicarbonate and low calcium observed in the typical C&D leachate supports the impossibility of mixing typical leachate with the type water found in MW-10 to achieve chemistries similar to those observed in samples collected from the downgradient monitoring wells. If leachate were impacting MW-11, MW-12, or MW-13, we would expect to see minor decreases in the concentrations of calcium ions and increases in the concentrations of bicarbonate ions in the affected well(s), with the impacted well(s) trending along a line between MW-10 and the typical C&D leachate, assuming a conservative mixing scenario with no precipitation; this plot shows the impossibility of such a trend.

### *5.2.4 Simulated Leachate Impacts*

In addition to analyzing the existing variations in aquifer geochemistry at the site, Golder modeled potential leachate impacts to the groundwater in affected downgradient wells at the facility using an analytical solution; two models were run. The first model was based on simple mixing, where selected proportions of the typical C&D leachate and upgradient well MW-10 water were mixed (e.g., 10% leachate : 90% MW-10 water) to evaluate the potential evolution of groundwater that was being impacted by leachate. The simulated simple mixing model results are summarized in Table 14.

The data summarized in Table 14 are shown graphically on Figures 5, and 6. These plots illustrate the likely trend that a downgradient well would follow as the geochemistry of the affected well changes due to impacts from leachate, on the basis that the geochemistry for unimpacted downgradient wells is similar to that observed in the upgradient water. Figures 5 and 6 display the simulated mixing model results on Stiff diagrams. These figures show the resultant plot shapes of a solution represented by the geochemistry observed in the MW-10 sample progressively mixed with increasing percentages of typical C&D leachate (1% leachate to 45% leachate). Comparing the results of these figures with the shape signatures

presented in Figure 3, the mixed results do not morphologically trend toward a shape similar to typical C&D leachate, which is expected due to the relatively low concentrations of cations in the typical C&D leachate as compared to the samples from the monitoring wells. Furthermore, the shapes of the plots on Figures 5 and 6 do not resemble the shapes for MW-11, MW-12, or MW-13 on Figure 3. Thus, these results indicate that leachate is unlikely to be the source of the VOCs that have been detected in the groundwater downgradient from the landfill.

Additionally, Figure 7 displays mixing model results on scatter plots similar to those present in Figure 4. As presented, the downgradient wells do not plot along the trend defined by the mixing of MW-10 type waters and the typical C&D leachate. If leachate were impacting these wells, it is likely that points representing the geochemistry of MW-11, MW-12 and MW-13 samples would plot closer to the mixing lines between MW-10 and the leachate, rather than away from the theoretical mixing lines as is apparent on each of the scatter plots.

The second model was run using an equally weighted parameter optimization criterion based on the lowest achievable Euclidean distance between the calculated mixture and the specified sample to simulate the optimum mixing proportions of the typical C&D leachate and the upgradient groundwater from MW-10 for achieving the specified sample (i.e., each affected downgradient well). Mixing scenarios were run for each of the affected wells using the upgradient water from MW-10 based on the March 2010 sampling results. The simulated optimized model results are summarized in Table 15, and illustrated on Figure 7.

As presented in Table 15, the model results indicate that the optimum mixing proportions for typical C&D leachate and MW-10 waters to achieve the closest approximation to MW-11 waters is 1% leachate and 98% MW-10 waters. The model results indicate that the optimum mixing proportions for typical C&D leachate and MW-10 waters to achieve the closest approximation to the MW-12 and MW-13 water chemistries is 2% leachate and 98% MW-10 waters. The results of the simulated mixing are presented graphically on Stiff diagrams in Figure 8.

As presented on Figure 8, the March 2010 optimized MW-11, MW-12, and MW-13 model results do not resemble the typical C&D leachate and very closely resemble upgradient well MW-10. This is due to the relatively low cation concentrations in the typical C&D leachate as compared to MW-10. Even though there is an accumulation of ions in the downgradient direction, this can be contributed to the lowering of the groundwater pH as would be expected from a landfill gas impact versus a leachate impact to groundwater. Based on these results, it is apparent that the geochemistry of MW-11, MW-12, and MW-13 cannot be replicated by a simulated leachate release using the facility's upgradient groundwater chemistry as the base solution and typical C&D leachate chemistry as a representative leachate sample, assuming that there is no precipitation of the ions of interest.

## 5.3 MSW Leachate Source Evaluation

To evaluate leachate from the closed TVA landfill as a potential source of COCs concentrations that have been detected in samples from the C&D landfill downgradient monitoring wells, groundwater samples were collected from MW-10, MW-11, MW-12, and MW-13 during the March 2010 field activities. The samples were analyzed for selected analytes, the results of which are summarized in Table 13 and in the laboratory analytical reports in Appendix C. The TVA landfill is unlined and does not have a leachate collection system; therefore, site-specific leachate samples were not available for laboratory analysis. Various literature sources are cited where typical leachate concentrations for MSW landfills have been compiled and are used in this ASD to represent a typical MSW leachate sample (Table 6).

To evaluate the analytical results, Golder prepared a series of scatter plots, Piper plots, and Stiff diagrams to illustrate the variability in the geochemistry of the water for the various monitoring points of interest. In addition to evaluating the chemical signatures of the groundwater and leachate, Golder simulated the potential release of leachate from the TVA landfill to the uppermost aquifer using a numerical mixing model. The results of these analyses, which suggest that leachate is *not* the source of the VOCs that have been detected in the site groundwater, are presented in the following sections.

### *5.3.1 Piper Plot Analysis*

Figure 9 is a Piper plot illustrating the variations in the geochemical facies for the monitoring points sampled as part of this investigation. As presented in Figure 9, typical MSW leachate exhibits a sodium-potassium-bicarbonate-magnesium geochemical facies. The groundwater sample from upgradient monitoring well MW-10 exhibits a sodium-potassium-bicarbonate geochemical facies. Monitoring well MW-11 exhibits calcium-bicarbonate geochemical facies. Well MW-12 exhibits a calcium-sodium-potassium-bicarbonate geochemical facies. Well MW-13 exhibits a sodium-potassium-magnesium-bicarbonate geochemical facies. Thus, these data demonstrate that the typical MSW leachate and groundwater from MW-10, MW-11, MW-12, and MW-13 are geochemically different.

Review of Figure 9 suggests that it is unlikely that a mixture of leachate, represented by the geochemical signatures of typical MSW leachate and upgradient waters (MW-10), will yield a geochemical signature similar to that observed in the samples collected from MW-11, MW-12, and MW-13; since points representing the geochemistry of these samples do not plot between the upgradient waters and the typical MSW leachate, assuming a conservative mixing scenario with no precipitation. The dissolved cation and anion concentrations in the groundwater are below saturation concentrations for normal temperature and pH conditions for a non-carbonate aquifer; therefore, we expect the conservative mixing rule to apply.

### *5.3.2 Stiff Diagram Analysis*

Figure 3 presents Stiff diagrams for the monitoring points sampled as part of this investigation. As presented, groundwater samples from MW-11, MW-12, and MW-13 do not exhibit shape signatures

similar to that of the typical MSW leachate, indicated by the proportionately lower concentrations of calcium and proportionately higher concentrations of bicarbonate and chloride in the typical MSW leachate. If a single source (e.g., leachate) was the source of the COCs that have been detected in the affected monitoring wells, we would expect the shapes for the affected monitoring wells to bear some resemblance to, or a general morphology trending towards, the typical MSW leachate shape; therefore, it is unlikely that groundwater in well MW-11, MW-12, and MW-13 is being impacted by MSW leachate from the TVA facility. The elevated concentrations of cations calcium, magnesium, sodium, and potassium in samples from MW-11, MW-12, and MW-13 may have resulted from the dissolution of these constituents from the aquifer matrix as a result of the site-wide lowering of the groundwater pH.

### *5.3.3 Scatter Plot Analysis*

Figure 10 displays scatter plots of concentration data prepared for common paired anions and cations: Na + K vs. Cl; Mg vs. $SO_4$; Ca vs. $HCO_3$.

As presented on the Cl vs. Na+K scatter plot in Figure 10, the typical MSW leachate concentrations plot away from the sampled monitoring well results due to elevated chloride. As compared to the typical C&D leachate on Figure 4, the MSW leachate is higher in concentrations of chloride, sodium and potassium. Samples from the downgradient wells show an increase in chloride, sodium, and potassium as compared to the upgradient well MW-10, which may be due to the minor accumulation of ions along a groundwater flow path based on the decreasing pH of the groundwater and likely explains small differences in cation and anion proportions in the monitoring well samples. If leachate were impacting the downgradient wells, we would expect to see more significant increases in the concentrations of chloride ions in the downgradient well(s), with the impacted well(s) trending along a line between MW-10 and the typical MSW leachate, assuming a conservative mixing scenario with no precipitation (Figure 10). A review of the ion concentrations indicates that the concentrations are well below the concentrations at which normal precipitation would be expected based on the pH and temperature of the base solution (i.e., groundwater). The assumption of no mineral precipitation is a valid assumption, although dissolution of anions and cations from the aquifer matrix is a possibility since the assumption of steady state conditions is not apparent due to the declining pH trend that has been attributed to carbon dioxide gas dissolving into the groundwater from landfill gas.

As presented on the $SO_4$ vs. Mg scatter plot in Figure 10, the typical MSW leachate is enriched in sulfate relative to the monitoring well samples and plots in the top of the diagram. As compared to the typical C&D leachate on Figure 4, the MSW leachate has a higher concentration of magnesium, but a lower concentration of sulfate. Samples from the downgradient wells show an increase in sulfate and magnesium as compared to the upgradient well MW-10, which may be due to the minor accumulation of ions along a groundwater flow path based on the decreasing pH of the groundwater. As stated in section 5.2.3, there do not appear to be biogeochemical conditions that would allow sulfate reducing bacteria to

be active in the groundwater. These data suggest that leachate has not impacted MW-11, MW-12, or MW-13 and; therefore, is not the source of the COCs detected in the samples obtained from these wells.

As presented on the $HCO_3$ vs. Ca scatter plot in Figure 10, the typical MSW leachate is enriched in bicarbonate, but has lower calcium, relative to the monitoring well samples and plot in the top of the diagram. As compared to the typical C&D leachate on Figure 4, the MSW leachate has a higher concentration of bicarbonate, but a lower concentration of calcium. Samples from the downgradient wells show an increase in bicarbonate and calcium as compared to the upgradient well MW-10. The positive correlation of calcium to bicarbonate in the monitoring well samples with the high bicarbonate and low calcium observed in the typical MSW leachate supports the impossibility of mixing typical MSW leachate with the type of water found in MW-10 to achieve chemistries similar to those observed in samples collected from the downgradient monitoring wells. If leachate were impacting MW-11, MW-12, or MW-13, we would expect to see minor decreases in the concentrations of calcium ions and increases in the concentrations of bicarbonate ions in the affected well(s), with the impacted well(s) trending along a line between MW-10 and the typical C&D leachate, assuming a conservative mixing scenario with no precipitation; this plot shows the impossibility of such a trend.

### *5.3.4 Simulated Leachate Impacts*

In addition to analyzing the existing variations in aquifer geochemistry at the site, Golder modeled potential leachate impacts from the TVA Landfill to the affected C&D landfill downgradient wells at the facility using an analytical solution. As with the C&D modeling, two models were run. The first model was based on simple mixing, where selected proportions of the typical MSW leachate and upgradient well MW-10 water were mixed (e.g., 10% leachate : 90% MW-10 water) to evaluate the potential evolution of groundwater that was being impacted by leachate. The simulated simple mixing model results are summarized in Table 16.

The data summarized in Table 16 are shown graphically on Figures 11 and 12. These plots illustrate the likely trend that a downgradient well would follow as the geochemistry of the affected well changes due to impacts from leachate, on the basis that the geochemistry for unimpacted downgradient wells is similar to that observed in the upgradient water. Figures 11 and 12 display the simulated mixing model results on Stiff diagrams. These figures show the resultant shape signatures of a solution represented by the geochemistry observed in the MW-10 sample progressively mixed with increasing percentages of typical MSW leachate (1% leachate to 45% leachate). Comparing the results of these figures with the shape signatures presented in Figure 3, the mixed results do not morphologically trend toward a shape similar to the leachate, which is expected due to the relatively low concentrations of cations in the leachate as compared to the samples from the monitoring wells. Furthermore, none of the shapes on Figures 11 and 12 resemble the shapes for MW-11, MW-12, or MW-13 on Figure 3. Thus, these results indicate that leachate from the TVA landfill is unlikely to be the source of the VOCs that have been detected in the groundwater downgradient from the landfill.

Likewise, Figure 13 displays mixing model results on scatter plots similar to those present in Figure 10. As presented, the downgradient wells do not plot along the trend defined by the mixing line between MW-10 type waters and the typical MSW leachate. If leachate from the TVA landfill were impacting these wells, it is likely that points representing the geochemistry of MW-11, MW-12 and MW-13 samples would plot closer to the mixing lines between MW-10 and the typical MSW leachate, rather than away from the theoretical mixing lines as is apparent on each scatter plot on Figure 13.

The second model was run using an equally weighted parameter optimization criterion based on the lowest achievable Euclidean distance between the calculated mixture and the specified sample to simulate the optimum mixing proportions of typical MSW leachate and the selected upgradient groundwater for achieving the specified sample (i.e., each affected downgradient well). Mixing scenarios were run for each of the affected wells using the upgradient water from MW-10 based on the March 2010 sampling results. The simulated optimized model results are summarized in Table 17, and illustrated on Figure 13.

As presented in Table 17, the model results indicate that the optimum mixing proportions for typical MSW leachate and MW-10 waters to achieve the closest approximation to MW-11, MW-12 and MW-13 water chemistries is 2% leachate and 98% MW-10 waters. The results of the simulated mixing are presented graphically on Stiff diagrams in Figure 14.

As presented on Figure 14, the March 2010 optimized MW-11, MW-12, and MW-13 model results do not resemble the typical MSW leachate and very closely resemble upgradient well MW-10. This is due to the relatively low cation concentrations in the typical MSW leachate as compared to MW-10. Even though there is an accumulation of ions in the downgradient direction, this can be contributed to the lowering of the groundwater pH as would be expected from a landfill gas impact versus a leachate impact to groundwater. Based on these results, it is apparent that the geochemistry of MW-11, MW-12, and MW-13 cannot be replicated by a simulated leachate release using the facility's upgradient groundwater chemistry as the base solution and the typical MSW leachate chemistry as a representative leachate sample, assuming that there is no precipitation of the ions of interest.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the data and evaluations presented herein, it is apparent that leachate from the facility's waste disposal units is not the source of the VOC concentrations that have been detected in the C&D landfill downgradient monitoring wells MW-10, MW-11, and MW-13. Additionally, the data suggest that the source of the COC and their related breakdown products detected in these monitoring wells is most likely landfill gas.

Supporting conclusions summarized from discussions herein are as follows:

The geochemistry of the water in the affected downgradient monitoring wells is significantly different from typical leachate from both C&D and MSW landfills. The chemical signatures of the groundwater samples are such that it is not possible to mix typical C&D and MSW leachates with waters represented by upgradient well MW-10 in any proportions assuming a conservative mixing scenario to replicate the water chemistry observed in wells MW-11, MW-12, and MW-13.

Numerous studies, as referenced in this report, have documented the general decline in the pH of shallow groundwater as a result of landfill gas impacts due to the partitioning of carbon dioxide from the landfill gas to the groundwater. Samples from downgradient monitoring wells MW-11, MW-12, and MW-13 had much lower pH values than the sample from upgradient well MW-10 during the March 2010 event.

The areal extent of the groundwater impacts is not consistent with a leachate release, which tends to be narrow in distribution as opposed to landfill gas impacts which tend to have a large footprint, due to the fact that landfill gas has a viscosity of approximately 10,000 time less than water and thus it can disperse through the vadose zone quickly. This is particularly true for fractured rock aquifers, such as the one present around the C&D landfill.

An evaluation of the partitioning potential from landfill gas to shallow groundwater and/or infiltrating precipitation in accordance with Henry's Law indicates that it is possible to develop groundwater concentrations that are equal to or greater than observed concentrations for some COCs.

Based on these conclusions and supporting statements, Golder recommends, and the County is respectfully requesting, that NC DENR approve this ASD for past and future statistically significant detections of the following COCs:

- Acetone
- Benzene
- Chloroethane
- 1,4-Dichlorobenzene
- 1,1-Dichloroethane
- cis-1,2-Dichloroethene
- Methylene Chloride
- Tetrachloroethene
- 1,1,1-Trichlorothane
- Trichloroethene
- Trichlorofluoromethane

- Vinyl Chloride
- Xylenes (Total)

In addition to this list of COCs, the County is requesting that biochemical breakdown products of these organic constituents in the facility monitoring wells be included in this ASD. With NC DENR's approval of this ASD, the monitoring program at the C&D landfill will remain in a Detection Monitoring Program. The County will also evaluate potential landfill gas remediation strategies to address groundwater impacts, pending approval of the ASD.

## 7.0 REFERENCES

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# TABLES

**TABLE 1**

**Summary of Historical Static Water Level Data**
**Alternate Source Demonstration**
**Henderson County Closed MSW and C&D Landfills, Permit No. 45-01**

| | Monitoring Well | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **MW-5** | **MW-6** | **MW-7** | **MW-8** | **MW-9** | **MW-10** | **MW-11** | **MW-12** | **MW-13** | **AMW-1S** | **AMW-1D** | **AMW-2S** | **AMW-2D** | **MW-1 (Old)** | **MW-1** | **MW-2 (Old)** | **MW-2** |
| **TOC Elevation (ft AMSL)** | 2389.82 | 2204.24 | 2210.66 | 2235.87 | 2260.01 | 2404.55 | 2297.01 | 2300.09 | 2300.24 | 2193.09 | 2190.77 | 2177.66 | 2177.58 | 2206.42 | 2205.76 | 2182.77 | 2182.07 |
| **Date** | **Static Water Elevation (ft AMSL)** | | | | | | | | | | | | | | | | |
| 10/04/06 | 2334.31 | 2191.02 | 2191.61 | 2209.54 | 2244.64 | -- | -- | -- | -- | 2179.83 | 2176.67 | -- | -- | -- | -- | -- | -- |
| 03/21/07 | -- | -- | -- | -- | -- | 2371.42 | 2266.46 | 2250.25 | 2252.90 | -- | -- | -- | -- | -- | -- | -- | -- |
| 10/02/07 | 2331.55 | 2188.19 | 2189.95 | 2207.85 | 2244.08 | -- | -- | -- | -- | 2176.63 | 2174.07 | -- | -- | -- | -- | -- | -- |
| 04/03/08 | 2326.17 | 2190.65 | 2190.63 | 2209.61 | 2244.03 | -- | -- | -- | -- | 2180.41 | 2177.04 | -- | -- | -- | -- | -- | -- |
| 10/29/08 | 2322.17 | 2186.73 | 2188.87 | 2206.91 | 2242.52 | 2364.42 | 2258.56 | 2246.56 | 2245.91 | 2175.87 | 2173.56 | 2168.25 | 2170.93 | -- | -- | -- | -- |
| 03/24/09 | 2319.25 | 2188.30 | 2189.28 | 2208.43 | 2242.21 | 2363.04 | 2256.50 | 2244.43 | 2244.51 | 2178.99 | 2176.04 | 2169.29 | 2172.05 | -- | -- | -- | -- |
| 09/21-24/09 | 2326.37 | 2194.99 | 2190.56 | 2209.46 | 2243.29 | 2367.33 | 2258.97 | 2245.20 | 2245.56 | 2180.79 | 2177.56 | 2170.17 | 2174.88 | 2200.47 | 2200.58 | 2174.92 | 2174.14 |
| 03/22-23/10 | 2342.62 | <2185.22 | 2193.88 | 2208.53 | 2236.04 | 2376.31 | 2258.18 | 2250.60 | 2253.17 | 2182.71 | 2178.32 | 2170.28 | 2173.33 | 2200.91 | 2201.11 | 2175.02 | 2164.27 |
| **MEAN** | *2328.92* | *2189.98* | *2190.68* | *2208.62* | *2242.40* | *2368.50* | *2259.73* | *2247.41* | *2248.41* | *2179.32* | *2176.18* | *2169.50* | *2172.80* | *2200.69* | *2200.85* | *2174.97* | *2169.21* |
| **MAXIMUM** | *2342.62* | *2194.99* | *2193.88* | *2209.61* | *2244.64* | *2376.31* | *2266.46* | *2250.60* | *2253.17* | *2182.71* | *2178.32* | *2170.28* | *2174.88* | *2200.91* | *2201.11* | *2175.02* | *2174.14* |
| **MINIMUM** | *2319.25* | *2185.22* | *2188.87* | *2206.91* | *2236.04* | *2363.04* | *2256.50* | *2244.43* | *2244.51* | *2175.87* | *2173.56* | *2168.25* | *2170.93* | *2200.47* | *2200.58* | *2174.92* | *2164.27* |

Notes: ft AMSL = feet above mean sea level.
TOC = top of casing
-- = no data available
1) Historical data prior to March 2009 provided by Henderson County and CDM.

**TABLE 2**

**Summary of Estimated Horizontal Flow Velocities**
**Alternate Source Demonstration**
**Henderson County Closed MSW and C&D Landfills, Permit No. 45-01**

| March 2010 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Gradient Calculation Segment** | **Flow Direction** | **Gradient Segment Length (feet)** | **Gradient Segment Elevations (feet)** | **Horizontal Gradient (i, feet)** | **Effective Porosity ($n_e$)** | **Hydraulic Conductivity (K, cm/sec)** | **Velocity ($V_{gw}$, feet/year)** |
| $i_1$ | SW | 1818 | 2340 / 2180 | 0.0880 | 0.15 | 1.26E-04 | 76.65 |
| $i_2$ | SSW | 1478 | 2340 / 2200 | 0.0947 | 0.15 | 1.26E-04 | 82.50 |
| $i_3$ | WSW | 381 | 2360 / 2260 | 0.2626 | 0.15 | 1.26E-04 | 228.75 |

Notes: Horizontal velocities based on the modified Darcy equation $V_{gw} = Ki/n_e$.
Value for K is collected from the average of measured hydraulic conductivities from the December 2008 CDM Report.
Value for $n_e$ is an estimated effective porosity used in previous CDM reports.

TABLE 3

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | | Downgradient Wells MW-11 | | MW-12 | | MW-13 | | Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | ug/L | 03/24/09 | 6 | ND | | ND | | ND | | ND | | ND | |
| SWS GPS = 1.4 ug/L | ug/L | 09/22/09 | 6 | ND | | ND | | 0.0980 | J | ND | | ND | |
| | ug/L | 03/24/10 | 6 | ND | | ND | | ND | | ND | | ND | |
| Arsenic | µg/L | 06/21/01 | 10 | ND | | ND | | ND | | ND | | -- | |
| NC 2L = 10 ug/L | µg/L | 04/24/02 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/01/02 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/10/03 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/20/03 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 03/24/04 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/27/04 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 05/25/05 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/05 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/25/06 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/06 | 10 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 03/21/07 | 10 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 10/02/07 | 10 | 2.79 | J | ND | | ND | | 4.85 | J | ND | |
| | µg/L | 04/01/08 | 10 | 10.1 | | 3.01 | J | 6.29 | J | 9.48 | J | ND | |
| | µg/L | 10/29/08 | 10 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 03/24/09 | 10 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 09/22/09 | 10 | ND | | 3.81 | J | 3.64 | J | ND | | ND | |
| | ug/L | 03/24/10 | 10 | ND | | ND | | ND | | ND | | ND | |
| Barium | µg/L | 06/21/01 | 100 | ND | | ND | | ND | | ND | | -- | |
| NC 2L = 700 ug/L | µg/L | 04/24/02 | 100 | 278 | | ND | | 306 | | ND | | -- | |
| | µg/L | 10/01/02 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/10/03 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/20/03 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 03/24/04 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/27/04 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 05/25/05 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/05 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/25/06 | 100 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/06 | 100 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 03/21/07 | 100 | 19.5 | J | 25.0 | J | 19.7 | J | 20.0 | J | ND | |
| | µg/L | 10/02/07 | 100 | 12.0 | J | 24.7 | J | 15.6 | J | 28.2 | J | ND | |
| | µg/L | 04/01/08 | 100 | 49.5 | J | 63.1 | J | 27.6 | J | 153 | | ND | |
| | µg/L | 10/29/08 | 100 | 5.81 | J | 150 | | 26.1 | J | 68.7 | J | ND | |
| | ug/L | 03/24/09 | 100 | 15.8 | J | 61.2 | J | 25.9 | J | 19.8 | J | ND | |
| | ug/L | 09/22/09 | 100 | 5.04 | J | 75.9 | J | 26.0 | J | 14.9 | J | ND | |
| | ug/L | 03/24/10 | 100 | 2.75 | B | 33.7 | J | 14.3 | J | 12.1 | J | 1.54 | J |
| Beryllium | ug/L | 03/24/09 | 1 | 0.32 | J | 1.19 | | 0.46 | J | 0.09 | J | ND | |
| SWS GPS = 4 ug/L | ug/L | 09/22/09 | 1 | 0.190 | B | 1.02 | | 0.682 | J | 0.117 | B | 0.113 | J |
| | ug/L | 03/24/10 | 1 | 0.178 | J | 1.46 | | 0.130 | J | ND | | ND | |
| Cadmium | µg/L | 06/21/01 | 1 | ND | | ND | | ND | | ND | | -- | |
| NC 2L = 2 ug/L | µg/L | 04/24/02 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/01/02 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/10/03 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/20/03 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 03/24/04 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/27/04 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 05/25/05 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/05 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/25/06 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/06 | 1 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 03/21/07 | 1 | 0.750 | J | 1.31 | J | 2.31 | J | 2.15 | J | ND | |
| | µg/L | 10/02/07 | 1 | ND | | ND | | 2.90 | J | ND | | ND | |
| | µg/L | 04/01/08 | 1 | ND | | ND | | ND | | 0.53 | J | ND | |
| | µg/L | 10/29/08 | 1 | ND | | 0.35 | J | ND | | ND | | ND | |
| | ug/L | 03/24/09 | 1 | ND | | 0.27 | J | 0.14 | J | ND | | ND | |
| | ug/L | 09/22/09 | 1 | ND | | 1.15 | | 0.461 | J | 1.00 | | ND | |
| | ug/L | 03/24/10 | 1 | ND | | ND | | ND | | ND | | ND | |

TABLE 3

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | | Downgradient Wells MW-11 | | MW-12 | | MW-13 | | Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | µg/L | 06/21/01 | 10 | ND | | ND | | ND | | 23.8 | | -- |
| NC 2L = 10 ug/L | µg/L | 04/24/02 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/01/02 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 04/10/03 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/20/03 | 10 | ND | | ND | | ND | | 13.5 | | -- |
| | µg/L | 03/24/04 | 10 | ND | | ND | | ND | | 12.8 | | -- |
| | µg/L | 10/27/04 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 05/25/05 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/05/05 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 04/25/06 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/05/06 | 10 | ND | | ND | | ND | | ND | | ND |
| | µg/L | 03/21/07 | 10 | 3.41 | J | 3.26 | J | 3.55 | J | 2.97 | J | ND |
| | µg/L | 10/02/07 | 10 | 2.28 | J | 1.17 | J | 2.08 | J | 3.80 | J | ND |
| | µg/L | 04/01/08 | 10 | 5.80 | J | 3.56 | J | 3.07 | J | 103 | | ND |
| | µg/L | 10/29/08 | 10 | ND | | ND | | 1.77 | J | 19.0 | | ND |
| | ug/L | 03/24/09 | 10 | 1.0 | J | ND | | 1.2 | J | 3.0 | J | ND |
| | ug/L | 09/22/09 | 10 | ND | | ND | | ND | | ND | | ND |
| | ug/L | 03/24/10 | 10 | ND | | ND | | ND | | ND | | ND |
| Cobalt | ug/L | 03/24/09 | 10 | 0.8 | J | ND | | 1.1 | J | ND | | ND |
| GWPS = 70 ug/L | ug/L | 09/22/09 | 10 | ND | | ND | | 1.28 | J | ND | | ND |
| | ug/L | 03/24/10 | 10 | ND | | 4.30 | J | ND | | ND | | ND |
| Copper | ug/L | 03/24/09 | 10 | 3.42 | J | ND | | ND | | ND | | ND |
| NC 2L =1000 ug/L | ug/L | 09/22/09 | 10 | ND | | ND | | ND | | 1.82 | J | ND |
| | ug/L | 03/24/10 | 10 | ND | | 2.76 | J | ND | | ND | | ND |
| Lead | µg/L | 06/21/01 | 10 | 14.2 | | ND | | ND | | 10.4 | | -- |
| NC 2L = 15 ug/L | µg/L | 04/24/02 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/01/02 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 04/10/03 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/20/03 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 03/24/04 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/27/04 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 05/25/05 | 10 | 10.3 | | ND | | ND | | ND | | -- |
| | µg/L | 10/05/05 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 04/25/06 | 10 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/05/06 | 10 | ND | | ND | | ND | | ND | | ND |
| | µg/L | 03/21/07 | 10 | 3.32 | J | 3.57 | J | 2.12 | J | ND | | ND |
| | µg/L | 10/02/07 | 10 | ND | | ND | | ND | | ND | | ND |
| | µg/L | 04/01/08 | 10 | 13.1 | | 9.16 | J | ND | | 25.1 | | ND |
| | µg/L | 10/29/08 | 10 | 6.51 | J | ND | | 8.35 | J | 9.00 | J | ND |
| | ug/L | 03/24/09 | 10 | 4.4 | J | 3.7 | J | 3.1 | J | 3.9 | J | ND |
| | ug/L | 09/22/09 | 10 | 2.40 | J | ND | | 3.84 | J | ND | | ND |
| | ug/L | 03/24/10 | 10 | ND | | ND | | 2.18 | J | ND | | ND |
| Mercury | µg/L | 06/21/01 | 0.2 | ND | | ND | | ND | | ND | | -- |
| NC 2L = 1 ug/L | µg/L | 04/24/02 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/01/02 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 04/10/03 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/20/03 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 03/24/04 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/27/04 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 05/25/05 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/05/05 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 04/25/06 | 0.2 | ND | | ND | | ND | | ND | | -- |
| | µg/L | 10/05/06 | 0.2 | ND | | ND | | ND | | ND | | ND |
| | µg/L | 03/21/07 | 0.2 | ND | | ND | | 0.093 | J | ND | | ND |
| | µg/L | 10/02/07 | 0.2 | ND | | ND | | 0.136 | J | ND | | ND |
| | µg/L | 04/01/08 | 0.2 | ND | | ND | | 0.096 | J | ND | | ND |
| | µg/L | 10/29/08 | 0.2 | ND | | ND | | 0.198 | J | ND | | ND |
| | ug/L | 03/24/09 | 0.2 | ND | | ND | | 0.54 | | ND | | ND |
| | ug/L | 09/22/09 | 0.2 | ND | | ND | | 0.172 | J | ND | | ND |
| | ug/L | 03/24/10 | 0.2 | ND | | 0.0586 | J | 0.144 | J | ND | | ND |
| Nickel | ug/L | 03/24/09 | 50 | 0.7 | J | ND | | 1.1 | J | 1.0 | J | ND |
| NC 2L = 100 ug/L | ug/L | 09/22/09 | 50 | ND | | ND | | ND | | 1.88 | J | ND |
| | ug/L | 03/24/10 | 50 | ND | | ND | | ND | | ND | | ND |

TABLE 3

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | | Downgradient Wells MW-11 | | MW-12 | | MW-13 | | Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Selenium | µg/L | 06/21/01 | 10 | ND | | ND | | ND | | ND | | -- | |
| NC 2L = 20 ug/L | µg/L | 04/24/02 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/01/02 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/10/03 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/20/03 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 03/24/04 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/27/04 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 05/25/05 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/05 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/25/06 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/06 | 10 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 03/21/07 | 10 | ND | | ND | | ND | | 10.2 | J | ND | |
| | µg/L | 10/02/07 | 10 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 04/01/08 | 10 | ND | | ND | | ND | | 19.2 | | ND | |
| | µg/L | 10/29/08 | 10 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 03/24/09 | 10 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 09/22/09 | 10 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 03/24/10 | 10 | ND | | ND | | ND | | ND | | ND | |
| Silver | µg/L | 06/21/01 | 10 | ND | | ND | | ND | | ND | | -- | |
| NC 2L = 20 ug/L | µg/L | 04/24/02 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/01/02 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/10/03 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/20/03 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 03/24/04 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/27/04 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 05/25/05 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/05 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/25/06 | 10 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/06 | 10 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 03/21/07 | 10 | 3.49 | J | 3.41 | J | 3.04 | J | 2.96 | J | ND | |
| | µg/L | 10/02/07 | 10 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 04/01/08 | 10 | 4.12 | J | 4.48 | J | 4.07 | J | 3.65 | J | ND | |
| | µg/L | 10/29/08 | 10 | 1.57 | B | 1.80 | B | 1.40 | B | 1.52 | B | -- | |
| | ug/L | 03/24/09 | 10 | ND | | 1.2 | J | ND | | ND | | ND | |
| | ug/L | 09/22/09 | 10 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 03/24/10 | 10 | ND | | ND | | ND | | ND | | ND | |
| Vanadium | ug/L | 03/24/09 | 25 | 4.9 | J | 1.0 | J | 6.5 | J | 3.3 | J | ND | |
| GWPS = 3.5 ug/L | ug/L | 09/22/09 | 25 | 2.01 | J | ND | | 6.20 | J | 2.01 | J | ND | |
| | ug/L | 03/24/10 | 25 | ND | | 2.62 | J | 1.57 | J | ND | | ND | |
| Zinc | ug/L | 03/24/09 | 10 | 8.0 | B | 9.0 | B | 17.9 | | 7.2 | B | 3.4 | J |
| NC 2L = 1000 ug/L | ug/L | 09/22/09 | 10 | ND | | 32.4 | | 17.3 | | 12.0 | | ND | |
| | ug/L | 03/24/10 | 10 | 13.2 | | 20.0 | | 21.5 | | 12.2 | | ND | |
| Iron | ug/L | 03/24/09 | 300 | 2750 | | 1400 | | 4810 | | 1670 | | ND | |
| NC 2L = 300 ug/L | ug/L | 09/22/09 | 300 | 684 | | 1390 | | 4450 | | 735 | | ND | |
| | ug/L | 03/24/10 | 300 | 151 | J | 2050 | | 830 | | 564 | | 27.6 | J |
| Manganese | ug/L | 03/24/09 | 50 | 60.9 | | 165 | | 155 | | 59.1 | | ND | |
| NC 2L = 50 ug/L | ug/L | 09/22/09 | 50 | 18.1 | J | 186 | | 163 | | 34.9 | J | 1.99 | J |
| | ug/L | 03/24/10 | 50 | 4.51 | B | 1780 | | 142 | | 111 | | 2.13 | J |
| Acetone | ug/L | 03/24/09 | 100 | ND | | ND | | 3.8 | J | ND | | ND | |
| NC 2L = 6000 ug/L | ug/L | 09/22/09 | 100 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 03/24/10 | 100 | ND | | 19 | J | 13 | J | ND | | ND | |
| Benzene | µg/L | 06/21/01 | 1 | ND | | ND | | ND | | ND | | -- | |
| NC 2L = 1 ug/L | µg/L | 04/24/02 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/01/02 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/10/03 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/20/03 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 03/24/04 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/27/04 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 05/25/05 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/05 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 04/25/06 | 1 | ND | | ND | | ND | | ND | | -- | |
| | µg/L | 10/05/06 | 1 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 03/21/07 | 1 | ND | | ND | | ND | | ND | | ND | |
| | µg/L | 10/02/07 | 1 | ND | | ND | | 0.15 | J | ND | | ND | |
| | µg/L | 04/01/08 | 1 | ND | | ND | | 0.28 | J | ND | | ND | |
| | µg/L | 10/29/08 | 1 | ND | | ND | | 0.28 | J | ND | | ND | |
| | ug/L | 03/24/09 | 1 | ND | | ND | | ND | | ND | | ND | |
| | ug/L | 09/22/09 | 1 | ND | | 0.50 | J | ND | | ND | | ND | |
| | ug/L | 03/24/10 | 1 | ND | | ND | | ND | | ND | | ND | |



Golder Associates

TABLE 3

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | Downgradient Wells MW-11 | MW-12 | MW-13 | Blanks |
|---|---|---|---|---|---|---|---|---|
| Chloroethane | µg/L | 06/21/01 | 10 | ND | ND | ND | ND | -- |
| SWS GPS = 2800 ug/L | µg/L | 04/24/02 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 10 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 10 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 10 | ND | ND | 0.84 J | ND | ND |
| | µg/L | 10/02/07 | 10 | ND | ND | 1.08 J | ND | ND |
| | µg/L | 04/01/08 | 10 | ND | ND | ND | ND | ND |
| | µg/L | 10/29/08 | 10 | ND | ND | 1.60 J | ND | ND |
| | ug/L | 03/24/09 | 10 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 10 | ND | ND | ND | ND | ND |
| | ug/L | 03/24/10 | 10 | ND | ND | ND | ND | ND |
| 1,4-Dichlorobenzene | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 6 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | 0.21 J | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | 0.23 J | 0.23 J | ND |
| | µg/L | 04/01/08 | 1 | ND | ND | 0.26 J | ND | ND |
| | µg/L | 10/29/08 | 1 | ND | ND | 0.23 J | ND | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | 0.46 J | ND | 0.45 J | ND |
| 1,1-Dichloroethane | µg/L | 06/21/01 | 5 | ND | ND | ND | ND | -- |
| NC 2L = 6 ug/L | µg/L | 04/24/02 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 5 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 5 | ND | ND | 0.71 J | ND | ND |
| | µg/L | 10/02/07 | 5 | ND | ND | 0.79 J | 0.09 J | ND |
| | µg/L | 04/01/08 | 5 | ND | ND | 0.99 J | 0.12 J | ND |
| | µg/L | 10/29/08 | 5 | ND | ND | 1.01 J | 0.15 J | ND |
| | ug/L | 03/24/09 | 5 | ND | ND | 0.82 J | ND | ND |
| | ug/L | 09/22/09 | 5 | ND | ND | 0.70 J | ND | ND |
| | ug/L | 03/24/10 | 5 | ND | ND | 0.47 J | ND | ND |
| cis-1,2-Dichloroethene | µg/L | 06/21/01 | 5 | ND | ND | ND | ND | -- |
| NC 2L = 70 ug/L | µg/L | 04/24/02 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 5 | ND | 6 | ND | ND | -- |
| | µg/L | 10/20/03 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 5 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 5 | ND | ND | 0.20 J | ND | ND |
| | µg/L | 10/02/07 | 5 | ND | ND | 0.27 J | 0.21 J | ND |
| | µg/L | 04/01/08 | 5 | ND | ND | 0.39 J | 0.30 J | ND |
| | µg/L | 10/29/08 | 5 | ND | 0.11 J | 0.44 J | 0.35 J | ND |
| | ug/L | 03/24/09 | 5 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 5 | ND | 5.7 | ND | ND | ND |
| | ug/L | 03/24/10 | 5 | ND | 5.3 | ND | 0.84 J | ND |

TABLE 3

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | Downgradient Wells MW-11 | MW-12 | MW-13 | Blanks |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 5 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | 0.20 B | ND | 2.08 B | 0.38 B | 0.39 J |
| | µg/L | 10/02/07 | 1 | ND | ND | 1.42 B | ND | 0.61 J |
| | µg/L | 04/01/08 | 1 | ND | 0.52 B | 2.83 J | 0.48 B | 0.54 J |
| | µg/L | 10/29/08 | 1 | ND | ND | 2.58 | 0.52 J | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | 0.53 J | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | ND | 1.2 | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | ND | 0.92 J | ND | ND |
| Tetrachloroethene (PCE) | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 0.7 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | 0.76 J | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | 1.05 J | 0.27 J | ND |
| | µg/L | 04/01/08 | 1 | ND | 0.12 J | 1.22 J | 0.32 J | ND |
| | µg/L | 10/29/08 | 1 | ND | 0.36 J | 1.21 | 0.33 J | ND |
| | ug/L | 03/24/09 | 1 | ND | 0.49 J | 1.3 | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | 2.9 | 1.1 | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | 3.4 | 1.6 | 0.56 J | ND |
| Toluene | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 600 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 04/01/08 | 1 | ND | ND | ND | 0.19 J | ND |
| | µg/L | 10/29/08 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| SWS GPS = 200 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | 0.24 J | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | 0.21 J | ND | ND |
| | µg/L | 04/01/08 | 1 | ND | ND | 0.17 J | ND | ND |
| | µg/L | 10/29/08 | 1 | ND | ND | 0.15 J | ND | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | ND | ND | ND | ND |

TABLE 3

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | Downgradient Wells MW-11 | MW-12 | MW-13 | Blanks |
|---|---|---|---|---|---|---|---|---|
| Trichloroethene | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 3 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | 0.24 J | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | 0.27 J | 0.18 J | ND |
| | µg/L | 04/01/08 | 1 | ND | ND | 0.51 J | 0.19 J | ND |
| | µg/L | 10/29/08 | 1 | ND | ND | 0.52 J | 1.13 | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | 0.44 J | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | 0.64 J | ND | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | 0.90 J | 0.52 J | ND | ND |
| Trichlorofluoromethane | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 2000 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | 8.07 | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | 23.1 | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | 13.8 | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | 11.3 | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | 9.90 | 0.26 J | ND |
| | µg/L | 04/01/08 | 1 | ND | ND | 8.03 | 3.88 | ND |
| | µg/L | 10/29/08 | 1 | ND | ND | 6.83 | 2.71 | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | 4.3 | 1.5 | ND |
| | ug/L | 09/22/09 | 1 | ND | ND | 2.0 | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | ND | 2.6 | 1.0 | ND |
| Vinyl chloride | µg/L | 06/21/01 | 1 | ND | ND | ND | ND | -- |
| NC 2L = 0.03 ug/L | µg/L | 04/24/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 1 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 10/02/07 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 04/01/08 | 1 | ND | ND | ND | ND | ND |
| | µg/L | 10/29/08 | 1 | ND | ND | 0.56 J | ND | ND |
| | ug/L | 03/24/09 | 1 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 1 | ND | 0.55 J | ND | ND | ND |
| | ug/L | 03/24/10 | 1 | ND | ND | ND | ND | ND |
| Xylenes (Total) | µg/L | 06/21/01 | 5 | ND | ND | ND | ND | -- |
| NC 2L = 500 ug/L | µg/L | 04/24/02 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/01/02 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 04/10/03 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/20/03 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 03/24/04 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/27/04 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 05/25/05 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/05 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 04/25/06 | 5 | ND | ND | ND | ND | -- |
| | µg/L | 10/05/06 | 5 | ND | ND | ND | ND | ND |
| | µg/L | 03/21/07 | 5 | ND | ND | 0.17 J | ND | ND |
| | µg/L | 10/02/07 | 5 | ND | ND | 0.17 J | ND | ND |
| | µg/L | 04/01/08 | 5 | ND | ND | 0.28 J | ND | ND |
| | µg/L | 10/29/08 | 5 | ND | ND | 0.25 J | ND | ND |
| | ug/L | 03/24/09 | 5 | ND | ND | ND | ND | ND |
| | ug/L | 09/22/09 | 5 | ND | 0.72 J | ND | ND | ND |
| | ug/L | 03/24/10 | 5 | ND | 0.62 J | ND | ND | ND |
| Chloride | mg/L | 03/24/09 | -- | ND | 8.8 | 4.1 J | ND | ND |
| NC 2L = 250 mg/L | mg/L | 09/22/09 | -- | 3.1 J | 8.1 | 8.7 | 3.6 J | ND |
| | mg/L | 03/24/10 | -- | ND | 1.7 J | 7.3 | 2.5 J | ND |

**TABLE 3**

**Summary of Detected Constituents in C&D Monitoring Wells**
**Alternate Source Demonstration**
**Henderson County Closed C&D Landfill, Permit No. 45-01**

| Detected Monitoring Constituent/Parameter | Units | Date | SWS Reporting | Upgradient Well MW-10 | Downgradient Wells MW-11 | MW-12 | MW-13 | Blanks |
|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | mg/L | 03/24/09 | -- | 86 | 310 | 190 | 140 | ND |
| NC 2L = 500 mg/L | mg/L | 09/22/09 | -- | 66 | 280 | 160 | 130 | ND |
| | mg/L | 03/24/10 | -- | 22 | 110 | 170 | 140 | ND |
| Sulfate as SO4 | mg/L | 03/24/09 | 250 | 1.5 J | 150 J | 18 J | 3.0 J | ND |
| NC 2L = 250 mg/L | mg/L | 09/22/09 | 250 | 1.7 J | 100 J | 17 J | 3.9 J | ND |
| | mg/L | 03/24/10 | 250 | ND | 5.3 J | 16 J | 2.1 J | ND |
| Total Alkalinity | mg/L | 03/24/09 | -- | 17 | 18 | 80 | 65 | ND |
| No Standard | mg/L | 09/22/09 | -- | 12 J | 41 | 76 | 68 | ND |
| | mg/L | 03/24/10 | -- | 9.6 J | 57 | 76 | 75 | ND |
| pH (field) | S.U. | 03/21/07 | -- | 5.23 | 5.29 | 5.52 | 5.78 | -- |
| | S.U. | 10/02/07 | -- | -- | -- | -- | -- | -- |
| | S.U. | 04/01/08 | -- | -- | -- | -- | -- | -- |
| | S.U. | 10/29/08 | -- | -- | -- | -- | -- | -- |
| | S.U. | 03/24/09 | -- | 6.78 | 6.22 | 6.46 | 6.84 | -- |
| | S.U. | 09/22/09 | -- | 7.37 | 5.41 | 5.59 | 5.90 | -- |
| | S.U. | 03/24/10 | -- | 7.47 | 5.64 | 5.90 | 6.61 | -- |
| Conductivity (field) | µS/cm | 03/21/07 | -- | 35 | 73 | 135 | 87 | -- |
| | µS/cm | 10/02/07 | -- | -- | -- | -- | -- | -- |
| | µS/cm | 04/01/08 | -- | -- | -- | -- | -- | -- |
| | µS/cm | 10/29/08 | -- | -- | -- | -- | -- | -- |
| | µS/cm | 03/24/09 | -- | 50 | 450 | 150 | 230 | -- |
| | µS/cm | 09/22/09 | -- | 58 | 404 | 240 | 156 | -- |
| | µS/cm | 03/24/10 | -- | 42 | 170 | 249 | 191 | -- |
| Temperature (field) | Celsius | 03/21/07 | -- | 14.1 | 15.5 | 13.5 | 13.1 | -- |
| | Celsius | 10/02/07 | -- | -- | -- | -- | -- | -- |
| | Celsius | 04/01/08 | -- | -- | -- | -- | -- | -- |
| | Celsius | 10/29/08 | -- | -- | -- | -- | -- | -- |
| | Celsius | 03/24/09 | -- | 16.0 | 14.7 | 14.1 | 15.8 | -- |
| | Celsius | 09/22/09 | -- | 15.68 | 15.92 | 14.99 | 14.90 | -- |
| | Celsius | 03/24/10 | -- | 13.36 | 14.12 | 13.13 | 12.31 | -- |
| Turbidity (field) | NTU | 03/24/09 | -- | 76.2 | 13.8 | 149 | 108 | -- |
| | NTU | 09/22/09 | -- | 20.1 | 20.4 | 61.3 | 37.3 | -- |
| | NTU | 03/24/10 | -- | 6.36 | 16.6 | 51.1 | 19.7 | -- |

Notes:
ug/L = micrograms per liter
mg/L = milligrams per liter
NTU = Nephelometric Turbidity Units
mV = millivolts
S.U. = Standard Units
ND = Not detected at the stated reporting limit
NM = Not measured
J = estimated concentration
B = Blank-qualified result
-- = no data available
Blanks = field, trip and method blanks
Shaded = concentrations above the NC 2L Groundwater Standards or Solid Waste Section Groundwater Protection Standards (SWS GPS) have been shaded.
SWSL = NCPQL or lab-specific reporting limit prior to October 2007 and NCSWSL starting in October 2007
1) Historical data prior to March 2009 provided by Henderson County and CDM.
2) The sulfate value fro MW-11 from 09/22/09 was diluted 2:1.

**TABLE 4**

**Typical C&D Landfill Leachate Concentrations**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

| Source | A | B | C | D | E (test cell) | E (simulated average) | F | Geometric Mean |
|---|---|---|---|---|---|---|---|---|
| Sodium (mg/L) | -- | -- | ND to 1510 | -- | -- | 114 | 360 | 191 |
| Potassium (mg/L) | -- | -- | ND to 618 | -- | -- | 23.6 | 82 | 46 |
| Magnesium (mg/L) | -- | -- | ND to 460 | -- | -- | 24.6 | 150 | 65 |
| Calcium (mg/L) | 299 to 691 | 280 to 600 | ND to 600 | 274 | 140 to 740 | 536 | 430 | 420 |
| Chloride (mg/L) | 12.5 to 62.7 | 100 to 460 | ND to 2400 | 158 | 10 to 5720 | 16.2 | 230 | 135 |
| Sulfate (mg/L) | 313 to 1138 | 690 to 1700 | ND to 2700 | 254 | 1 to 1300 | 794 | 170 | 609 |
| Alkalinity (mg/L) | -- | -- | ND to 6520 | -- | -- | 852 | 2100 | 1492 |
| Manganese (mg/L) | 0.2 to 2.3 | 80 to 9800 | ND to 258 | 8.7 | -- | 1 | -- | 13 |
| Iron (mg/L) | 0.3 to 4.6 | 20 to 14000 | ND to 172 | 36.8 | -- | 1 | -- | 35 |
| TDS (mg/L) | 1360 to 3310 | 1700 to 5740 | ND to 8400 | 2263 | 752 to 6000 | 2300 | 8600 | 3181 |
| pH (SU) | 6.1 to 7.9 | 6.8 to 7.1 | 6.2 to 8.0 | 7 | 5.9 to 7.8 | -- | -- | 7.0 |

**Notes:**
1. -- = indicates no data reported from that source
2. ND = non detect
3. mg/L = milligram per liter
4. SU = standard units
5. Geometric Mean = a geometric mean, inlike an arithmetic mean, tends to dampen the effect of very high or very low values, which might bias the mean if a straight average (arithmetic mean) were calculated.
6. Sources:
   a. Walsh, P. and P. O'Leary, 2002. Landfilling Demolition and High Volume Industrial Wastes, Waste Age. pp. 68-74. October.
   b. National Association of Demolition Contractors. C&D Waste Landfills, Leachate Quality Data, Volume 1, Specific State by State Response. Prepared by Gersham, Brickner & Bratton, Inc., Falls Church, Virginia.
   c. Melendez, B.A., 1996, A Study of Leachate Generated from Construction and Demolition Debris Landfills, 144 pp.
   d. EPA, 1995,. Construction and Demolition Waste Landfills. Office of Solid Waste. Prepared by ICF Inc., Contract No. 68-W3-0008.
   e. Townsend, T.G. et al., 2000. Continued Research into the Characteristics of Leachate from Construction and Demolition Waste Landfills. Florida Center of Solid and Hazardous Waste Management, Report No. 00-04.
   f. Golder Associates Inc., 2007. Private CDD Landfill, Virginia. Annual Leachate Sampling Results.

**TABLE 5**

**Fate and Transport Parameters for VOCs Detected in Groundwater**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

| Parameters | Henry's Law Constant (dimensionless) | $K_{oc}$ (L/Kg) | $F_{oc}$ | $K_d$ | r (g/cc) | n | R | $V_{gw}$ (ft/yr) | $V_{COC}$ (ft/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Acetone | 1.59E-03 | 0.575 | 0.50% | 0.57 | 2.68 | 0.150 | 11.18 | 228.75 | 20.45 |
| 1,4-Dichlorobenzene | 1.12E-01 | 616.00 | 0.50% | 3.08 | 2.68 | 0.150 | 56.03 | 228.75 | 4.08 |
| 1,1-Dichloroethane | 2.23E-01 | 53.40 | 0.50% | 0.27 | 2.68 | 0.150 | 5.77 | 228.75 | 39.64 |
| cis-1,2-Dichloroethene | 1.67E-01 | 35.50 | 0.50% | 0.18 | 2.68 | 0.150 | 4.17 | 228.75 | 54.84 |
| Methylene Chloride | 1.31E-01 | 10.00 | 0.50% | 0.05 | 2.68 | 0.150 | 1.89 | 228.75 | 120.82 |
| Tetrachloroethene | 7.54E-01 | 265.00 | 0.50% | 1.33 | 2.68 | 0.150 | 24.67 | 228.75 | 9.27 |
| Trichloroethene | 3.74E-01 | 94.30 | 0.50% | 0.47 | 2.68 | 0.150 | 9.42 | 228.75 | 24.27 |
| Trichlorofluoromethane | 4.51E+00 | 158.00 | 0.50% | 0.79 | 2.68 | 0.150 | 15.11 | 228.75 | 15.13 |
| Xylenes | 2.16E-01 | 249.00 | 0.50% | 1.25 | 2.68 | 0.150 | 23.24 | 228.75 | 9.84 |

**Notes:**
1. $K_{oc}$ = Soil organic carbon-water partition coefficient
2. $F_{oc}$ = Fraction of organic carbon
3. $K_d$ = soil to water partion coefficient ($K_d$=$K_{oc}$*$F_{oc}$)
4. r = soil density
5. n = effective porosity
6. R = retardation factor [R = 1+(r*$K_d$)/n = $V_{gw}$/$V_{coc}$]
7. $V_{gw}$ = groundwater velocity
8. $V_{coc}$ = velocity of constituent-of-concern
9. % = percent
10. g/cc = grams per cubic centimeter
11. ft/yr = feet per year
12. Fate and transport parameters compiled from the following sources:
    NC DENR, Division of Waste Management, Hazardous Waste Section, Revised May 2005, Guidelines for Establishing Remediation Goals at RCRA Hazardous Waste Sites. Appendix 2.

**TABLE 6**

**Typical MSW Landfill Leachate Concentrations**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

| Source | A | B | C | D (Acid Phase) | D (Methan-ogenic Phase) | Geometric Mean |
|---|---|---|---|---|---|---|
| Sodium (mg/L) | 17.0 to 2000 | 200 to 1500 | 70 to 7700 | -- | -- | 1179 |
| Potassium (mg/L) | 6.0 to 726 | -- | 50 to 3700 | -- | -- | 220 |
| Magnesium (mg/L) | 241 | 30 to 500 | 30 to 15000 | 50 to 1150 | 40 to 350 | 640 |
| Calcium (mg/L) | 54.0 to 2700 | 100 to 3000 | 10 to 7200 | 10 to 2500 | 20 to 600 | 684 |
| Chloride (mg/L) | 23.0 to 2700 | 100 to 2000 | 150 to 4500 | -- | -- | 1202 |
| Sulfate (mg/L) | 15.0 to 980 | 10 to 1000 | 8 to 7750 | 70 to 1750 | 10 to 420 | 476 |
| Alkalinity (mg/L) | -- | 500 to 10000 | -- | -- | -- | 3600 |
| Manganese (mg/L) | -- | -- | 0.03 to 1400 | 0.3 to 65 | 0.03 to 45 | 23.0 |
| Iron (mg/L) | 284 | 10 to 1000 | 3 to 5500 | 20 to 2100 | 3 to 280 | 330 |
| TDS (mg/L) | 180.0 to 28000 | 1000 to 20000 | -- | -- | -- | 8273 |
| pH (SU) | 5.50 to 8.20 | 5 to 7.5 | 4.5 to 9 | 4.5 to 7.5 | 7.5 to 9 | 7.0 |

**Notes:**

1. -- = indicates no data reported from that source
2. ND = non detect
3. mg/L = milligram per liter
4. SU = standard units
5. Geometric Mean = a geometric mean, inlike an arithmetic mean, tends to dampen the effect of very high or verylow values, which might bias the mean if a straight average (arithmetic mean) were calculated.
6. Sources:
   a. Harris, J. and J. Gaspar, 1989. Management of Leachate from Sanitary Landfills, Environmental Engineering: Proceedings of the 1989 Specialy Conference. pp. 320-333. July 10-12.
   b. Jones-Lee, A. et al, 1993. Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance. Sardinia '93IV International Landfill Symposiums. October 11-15.
   c. Kjeldsen, P. et al, 2002, Present and Long-Term Composition of MSW Landfill Leachate: A Review: Critical Reviews in Environmental Science and Technology, 32(4): pp. 297-336.
   d. Zanetti, M., 2008, Aerobic Biostabilization of Old MSW Landfills: American Journal of Engineering and

**TABLE 7**

**Multimedia Comparison of Detected Constituents**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit 45-01**

| Parameter | NC 2L Standard (ug/L) | SWSL (ug/L) | Groundwater Samples (ug/L) | | | | Headspace Samples (ppb v/v) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MW-10 | MW-11 | MW-12 | MW-13 | MW-10 | MW-11 | MW-12 | MW-13 |
| Acetone | 6000 | 100 | ND | 19 J | 13 J | ND | ND | ND | 40 | ND |
| 2-Butanone | 4000 | 100 | ND | ND | ND | ND | ND | ND | 21 | ND |
| 1,4-Dichlorobenzene | 6 | 1 | ND | 0.46 J | ND | 0.45 J | ND | ND | ND | ND |
| 1,1-Dichloroethane | 6 | 5 | ND | ND | 0.47 J | ND | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | 70 | 5 | ND | 5.3 | ND | 0.84 J | ND | ND | ND | ND |
| Methylene chloride | 5 | 1 | ND | ND | 0.92 J | ND | 42 | 32 J | 38 J | 34 J |
| Tetrachloroethene | 0.7 | 1 | ND | **3.4** | **1.6** | 0.56 J | ND | ND | 22 J | ND |
| Trichloroethene | 3 | 1 | ND | 0.90 J | 0.52 J | ND | ND | ND | ND | ND |
| Trichlorofluoromethane | 2000 | 1 | ND | ND | 2.6 | 1.0 | ND | ND | 54 | ND |
| Xylenes (Total) | 500 | 5 | ND | 0.62 J | ND | ND | ND | ND | ND | ND |

**Notes:**
1. ug/L = micrograms per liter
2. ND = not detected
3. J = estimated concentration
4. Shaded cells = identified constituents of concern for the facility, as discussed in the text
5. Bold = constituent results that are greater than the NC 2L Standards for groundwater
6. ppb = parts per billion
7. ppb (v/v) = parts per billion on a volume by volume basis
8. NC 2L Standard = current North Carolina groundwater standards
9. SWSL = Solid Waste Section Limit
10. The analytical results provided above are from the March 2010 routine semi-annual monitoring event.

**TABLE 8**

**Calculated Gas Concentrations Based on Concentrations of VOCs in Groundwater and Henry's Law Alternate Source Demonstration Henderson County C&D Landfill, Permit 45-01**

| Parameter | NC 2L Standard (ug/L) | SWSL (ug/L) | Observed Groundwater Concentrations (ug/L) | | | | Henry's Law Constant (Dimensionless) | Gas Concentrations (ug/L-gas) | | | | ug/L to ppb Conversion | Calculated Gas Concentrations (ppb v/v) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MW-10 | MW-11 | MW-12 | MW-13 | | MW-10 | MW-11 | MW-12 | MW-13 | | MW-10 | MW-11 | MW-12 | MW-13 |
| Acetone | 6000 | 100 | ND | 19 | 13 | ND | 0.00159 | -- | 0.03 | 0.02 | -- | 2.37E-03 | -- | 12.7 | 8.71 | -- |
| 1,4-Dichlorobenzene | 6 | 1 | ND | 0.46 | ND | 0.45 | 0.112 | -- | 0.05 | -- | 0.05 | 6.01E-03 | -- | 8.58 | -- | 8.39 |
| 1,1-Dichloroethane | 6 | 5 | ND | ND | 0.47 | ND | 0.223 | -- | -- | 0.10 | -- | 4.05E-03 | -- | -- | 25.9 | -- |
| cis-1,2-Dichloroethene | 70 | 5 | ND | 5.3 | ND | 0.84 | 0.167 | -- | 0.89 | -- | 0.14 | 3.96E-03 | -- | 223 | -- | 35.4 |
| Methylene chloride | 5 | 1 | ND | ND | 0.92 | ND | 0.131 | -- | -- | 0.12 | -- | 3.47E-03 | -- | -- | 34.7 | -- |
| Tetrachloroethene | 0.7 | 1 | ND | 3.4 | 1.6 | 0.56 | 0.754 | -- | 2.56 | 1.21 | 0.42 | 6.78E-03 | -- | 378 | 178 | 62.3 |
| Trichloroethene | 3 | 1 | ND | 0.90 | 0.52 | ND | 0.374 | -- | 0.34 | 0.19 | -- | 5.37E-03 | -- | 62.7 | 36.2 | -- |
| Trichlorofluoromethane | 2000 | 1 | ND | ND | 2.6 | 1.0 | 4.51 | -- | -- | 11.73 | 4.51 | 5.61E-03 | -- | -- | 2,089 | 803 |
| Xylenes (Total) | 500 | 5 | ND | 0.62 | ND | ND | 0.216 | -- | 0.13 | -- | -- | 4.34E-03 | -- | 0.0006 | -- | -- |

**Notes:**

1. ug/L = micrograms per liter
2. Calculated gas concentrations based on groundwater concentrations from the March 2010 sampling event
3. Values obtained from Table 2 - Summary of Non-Methane organic Compounds in Various Landfills in "A Review of the Literature Regarding Non-Methane and Volatile Organic Compounds In Municipal Solid Waste Landfill Gas" by Hamideh Soltani-Ahmadi and the 1996 EPA, Soil Screening Users Guidance; EPA/540/R-96/018
4. Henry's Law Constant = dimensionless value
5. -- = not calculated
6. ND = Not Detected
7. ppb = parts per billion
8. ppb v/v = parts per billion on a volume by volume basis
9. Observed Groundwater Concentrations are from Table 5, which also shows several detections that have been flagged by the laboratory as estimated values
10. NC 2L Standard = the North Carolina groundwater standards
11. SWSL = Solid Waste Section Limit

**TABLE 9**

**Comparison of Calculated $VOC_{gas}$ Concentrations Derived**

**by Henry's Law Calculations to Observed $VOC_{gas}$ Concentrations from Headspace Sampling**

**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit 45-01**

| Parameters Detected in Groundwater | Calculated Gas Concentrations from Table 8 (ppb v/v) | | | | Observed Headspace Concentrations (ppb v/v) | | | |
|---|---|---|---|---|---|---|---|---|
| | MW-10 | MW-11 | MW-12 | MW-13 | MW-10 | MW-11 | MW-12 | MW-13 |
| Acetone | -- | 12.7 | 8.71 | -- | ND | ND | 40 | ND |
| 1,4-Dichlorobenzene | -- | 8.58 | -- | 8.39 | ND | ND | ND | ND |
| 1,1-Dichloroethane | -- | -- | 25.9 | -- | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | -- | 223 | -- | 35.4 | ND | ND | ND | ND |
| Methylene chloride | -- | -- | 34.7 | -- | 42 | 32 | 38 | 34 |
| Tetrachloroethene | -- | 378 | 178 | 62.3 | ND | ND | 22 | ND |
| Trichloroethene | -- | 62.7 | 36.2 | -- | ND | ND | ND | ND |
| Trichlorofluoromethane | -- | -- | 2089 | 803 | ND | ND | 54 | ND |
| Xylenes (Total) | -- | 0.0006 | -- | -- | ND | ND | ND | ND |

**Notes:**
1) ppb (v/v) = parts per billion on a volume by volume basis
2) Calculated Gas Concentrations from Table 8 were calculated using the detected groundwater concentration and multiplying the consituents by Henry's Law constant and converting to ppb
3) Observed headspace concentrations represent analytical results from headspace sampling of individual monitoring and landfill gas wells.
4) -- = not calculated
5) Several detections have been flagged by the laboratory as estimated values see Table 5
6) ND = not detected

**TABLE 10**

**Calculated Groundwater Concentrations**
**Based on Analytical Results of Headspace Samples**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit 45-01**

| PARAMETER | Observed Headspace Samples (ppbv) | | | | ug/L to ppb conversion | Gas Concentrations (ug/L-gas) | | | | Henry's Law Constant | Calculated Water Concentrations (ug/L) | | | | NC 2L Standard (ug/L) | SWSL (ug/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MW-10 | MW-11 | MW-12 | MW-13 | ppb (v/v) | MW-10 | MW-11 | MW-12 | MW-13 | | MW-10 | MW-11 | MW-12 | MW-13 | | |
| Acetone | ND | ND | 40 | ND | 2.37E-03 | -- | -- | 0.095 | -- | 0.00159 | -- | -- | 59.7 | -- | 6000 | 100 |
| 1,4-Dichlorobenzene | ND | ND | ND | ND | 6.01E-03 | -- | -- | -- | -- | 0.112 | -- | -- | -- | -- | 6 | 1 |
| 1,1-Dichloroethane | ND | ND | ND | ND | 4.05E-03 | -- | -- | -- | -- | 0.223 | -- | -- | -- | -- | 6 | 5 |
| cis-1,2-Dichloroethene | ND | ND | ND | ND | 3.96E-03 | -- | -- | -- | -- | 0.167 | -- | -- | -- | -- | 70 | 5 |
| Methylene chloride | 42 | 32 | 38 | 34 | 3.47E-03 | 0.146 | 0.111 | 0.132 | 0.118 | 0.131 | 1.11 | 0.848 | 1.01 | 0.901 | 5 | 1 |
| Tetrachloroethene | ND | ND | 22 | ND | 6.78E-03 | -- | -- | 0.149 | -- | 0.754 | -- | -- | 0.198 | -- | 0.7 | 1 |
| Trichloroethene | ND | ND | ND | ND | 5.37E-03 | -- | -- | -- | -- | 0.374 | -- | -- | -- | -- | 3 | 1 |
| Trichlorofluoromethane | ND | ND | 54 | ND | 5.61E-03 | -- | -- | 0.303 | -- | 4.51 | -- | -- | 0.067 | -- | 2000 | 1 |
| Xylenes (Total) | ND | ND | ND | ND | 4.34E-03 | -- | -- | -- | -- | 0.216 | -- | -- | -- | -- | 500 | 5 |

**Notes:**
1) ug/L = micrograms per liter
2) Calculated groundwater concentrations based on headspace gas sample analyses from the March 2010 sampling event.
3) Values obtained from Table 2 - Summary of Non-Methane organic Compounds in Various Landfills in "A Review of the Literature Regarding Non-Methane and Volatile Organic Compounds In Municipal Solid Waste Landfill Gas" by Hamideh Soltani-Ahmadi and from the 1996, EPA, Soil Screening User Guidance, EPA/540/r-96/018.
4) Henry's Law Constant = dimensionless value
5) ppbv = parts per billion by volume
6) -- = not calculated
7) Bold = calculated concentrations greater than 2L Groundwater Standard
8) ND = not detected
9) Shaded cells = identified as constituents of concern for the facility as discussed in text
10) ppb (v/v) = parts per billion on a volume by volume basis
11) NC 2L Standard = the North Carolina groundwater standards
12) SWSL = Solid Waste Section Limit

**TABLE 11**

**Comparison of Estimated Groundwater Concentrations Derived by Henry's Law Calculations to Observed Groundwater Concentrations Alternate Source Demonstration Henderson County C&D Landfill, Permit 45-01**

| PARAMETER | Calculated Groundwater Concentrations (ug/L) | | | | NC 2L Standard (ug/L) | SWSL (ug/L) | Observed Groundwater Samples (ug/L) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MW-10 | MW-11 | MW-12 | MW-13 | | | MW-10 | MW-11 | MW-12 | MW-13 |
| Acetone | -- | -- | 59.723 | -- | 6000 | 100 | ND | 19 | 13 | ND |
| 1,4-Dichlorobenzene | -- | -- | -- | -- | 6 | 1 | ND | 0.46 | ND | 0.45 |
| 1,1-Dichloroethane | -- | -- | -- | -- | 6 | 5 | ND | ND | 0.47 | ND |
| cis-1,2-Dichloroethene | -- | -- | -- | -- | 70 | 5 | ND | 5.3 | ND | 0.84 |
| Methylene chloride | 1.113 | 0.848 | 1.007 | 0.901 | 5 | 1 | ND | ND | 0.92 | ND |
| Tetrachloroethene | -- | -- | 0.198 | -- | 0.7 | 1 | ND | 3.4 | 1.6 | 0.56 |
| Trichloroethene | -- | -- | -- | -- | 3 | 1 | ND | 0.90 | 0.52 | ND |
| Trichlorofluoromethane | -- | -- | 0.067 | -- | 2000 | 1 | ND | ND | 2.6 | 1.0 |
| Xylenes (Total) | -- | -- | -- | -- | 500 | 5 | ND | 0.62 | ND | ND |

**Notes:**
1) ug/L = micrograms per liter
2) ND = not detected
3) Calculated groundwater concentrations based on headspace gas sample analysis from the March 2010 sampling event (see Table 10).
4) -- = not calculated
5) Bold = concentrations greater than 2L Groundwater Standard
6) Shaded cells = identified as constituents of concern for the facility as discussed in text
7) Max Calc. - The maximum calculated groundwater concentration evaluated against each of the observed groundwater concentrations
8) Several detections in the Observed Groundwater Samples columns have been flagged by the laboratory as estimated values (see Table 5).
9) NC 2L Standard = the North Carolina groundwater standards
10) SWSL = Solid Waste Section Limit

**TABLE 12**

**Summary of Methane Results from Groundwater and Headspace**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

| Monitoring Well Identification | Groundwater Sampling Results | | | Methane Monitoring Results | | |
|---|---|---|---|---|---|---|
| | Reporting Units | Reporting Limit | 3/24/10 Concentrations | Reporting Units | 9/22/09 Readings | 3/23/10 Readings |
| MW-10 | mg/L | 0.001 | 0.002 | % Methane | 0 | 0 |
| MW-11 | mg/L | 0.001 | 0.789 | % Methane | 26.5 | 0 |
| MW-12 | mg/L | 0.001 | 1.48 | % Methane | 4.1 | 0 |
| MW-13 | mg/L | 0.001 | 0.010 | % Methane | 0 | 0 |

**Notes:**
mg/L = milligrams per liter
% Methane = percent methane per volume

**TABLE 13**

**Summary of Cation and Anion Sampling Results**
**Alternate Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

| Constituent | Reporting Units | Sampling Date | Reporting Limit | Results | | | |
|---|---|---|---|---|---|---|---|
| | | | | MW-10 | MW-11 | MW-12 | MW-13 |
| Total Alkalinity | mg/L | 3/24/10 | 10 | 9.6 J | 57 | 76 | 75 |
| Chloride | mg/L | 3/24/10 | 5.0 | ND | 1.7 J | 7.3 | 2.5 J |
| Sulfate | mg/L | 3/24/10 | 5.0 | ND | 5.3 J | 16 J | 2.1 J |
| Sulfide | mg/L | 3/24/10 | 0.10 | ND | ND | ND | ND |
| Nitrate as N | mg/L | 3/24/10 | 0.10 | 0.74 J | ND | 0.92 J | 0.15 J |
| Nitrite as N | mg/L | 3/24/10 | 0.10 | ND | ND | 0.067 J | 0.014 J |
| Ammonia as N | mg/L | 3/24/10 | 0.10 | ND | 0.077 J | ND | ND |
| TDS | mg/L | 3/24/10 | 10 | 22 | 110 | 170 | 140 |
| Calcium | mg/L | 3/24/10 | 100 | 1630 | 19900 | 26200 | 16500 |
| Iron | mg/L | 3/24/10 | 50 | 151 J | 2050 | 830 | 564 |
| Magnesium | mg/L | 3/24/10 | 100 | 311 | 2720 | 5150 | 3510 |
| Potassium | mg/L | 3/24/10 | 500 | 1370 | 1940 | 2980 | 3060 |
| Sodium | mg/L | 3/24/10 | 500 | 3630 | 9910 | 18700 | 20200 |

**Notes:**
1. ND = not detected above reporting limit
2. mg/L = milligrams per liter
3. J = estimated concentration

**TABLE 14**

**Summary of Simple Mixing Results with Typical C&D Leachate**
**Alternative Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

**Solution 1:** **Typical C&D Leachate**
**Solution 2:** **MW-10 (March 2010)**
**Percentage of solution 1 in target solution 1%-70%**

| | **Mixture Proportions** | | | | | | | | | | | **Downgradient Wells** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solution 1 | 100% | 70% | 45% | 20% | 10% | 5% | 4% | 3% | 2% | 1% | 0% | | | |
| Solution 2 | 0% | 30% | 55% | 80% | 90% | 95% | 96% | 97% | 98% | 99% | 100% | **MW-11** | **MW-12** | **MW-13** |
| Na (mg/L) | 191 | 1222.980 | 2082.630 | 2942.280 | 3286.140 | 3458.070 | 3492.456 | 3526.842 | 3561.228 | 3595.614 | 3630 | 9910 | 18700 | 20200 |
| K (mg/L) | 46.0 | 443.200 | 774.200 | 1105.200 | 1237.600 | 1303.800 | 1317.040 | 1330.280 | 1343.520 | 1356.760 | 1370 | 1940 | 2980 | 3060 |
| Ca (mg/L) | 420 | 782.790 | 1085.365 | 1387.940 | 1508.970 | 1569.485 | 1581.588 | 1593.691 | 1605.794 | 1617.897 | 1630 | 19900 | 26200 | 16500 |
| Mg (mg/L) | 64.9 | 138.730 | 200.255 | 261.780 | 286.390 | 298.695 | 301.156 | 303.617 | 306.078 | 308.539 | 311 | 2720 | 5150 | 3510 |
| Cl (mg/L) | 135 | 94.290 | 60.615 | 26.940 | 13.470 | 6.735 | 5.388 | 4.041 | 2.694 | 1.347 | ND | 1.7 | 7.3 | 2.5 |
| HCO3 (mg/L) | 1492 | 1047.420 | 676.770 | 306.120 | 157.860 | 83.730 | 68.904 | 54.078 | 39.252 | 24.426 | 9.6 | 57 | 76 | 75 |
| SO4 (mg/L) | 609 | 425.950 | 273.825 | 121.700 | 60.850 | 30.425 | 24.340 | 18.255 | 12.170 | 6.085 | ND | 5.3 | 16 | 2.1 |

**Notes:**
1) mg/L = milligrams per Liter
2) % = percent

**TABLE 15**

**Optimized Simulated Mixing Results with Typical C&D Leachate**
**Alternative Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

| | | | | |
|---|---|---|---|---|
| **Solution 1: Typical C&D Leachate** | | | | |
| **Solution 2: MW-10** | | | | |
| **Optimized sample: MW-11** | | | | |
| **Contribution of sample 1** | 1% | | | |
| mg/L | **Solution 1** | **Solution 2** | **MW-11** | **Optimized (MW-11)** |
| Na | 191 | 3630 | 9910 | 3596 |
| K | 46.0 | 1370 | 1940 | 1357 |
| Ca | 420 | 1630 | 19900 | 1618 |
| Mg | 64.9 | 311 | 2720 | 309 |
| Cl | 135 | ND | 1.7 | 1.3 |
| HCO3 | 1492 | 9.6 | 57 | 24 |
| SO4 | 609 | ND | 5.3 | 6.1 |

| | | | | |
|---|---|---|---|---|
| **Solution 1: Typical C&D Leachate** | | | | |
| **Solution 2: MW-10** | | | | |
| **Optimized sample: MW-12** | | | | |
| **Contribution of sample 1** | 2% | | | |
| mg/L | **Solution 1** | **Solution 2** | **MW-12** | **Optimized (MW-12)** |
| Na | 191 | 3630 | 18700 | 3561 |
| K | 46.0 | 1370 | 2980 | 1344 |
| Ca | 420 | 1630 | 26200 | 1606 |
| Mg | 64.9 | 311 | 5150 | 306 |
| Cl | 135 | ND | 7.3 | 2.7 |
| HCO3 | 1492 | 9.6 | 76 | 39 |
| SO4 | 609 | ND | 16 | 12 |

| | | | | |
|---|---|---|---|---|
| **Solution 1: Typical C&D Leachate** | | | | |
| **Solution 2: MW-10** | | | | |
| **Optimized sample: MW-13** | | | | |
| **Contribution of sample 1** | 2% | | | |
| mg/L | **Solution 1** | **Solution 2** | **MW-13** | **Optimized (MW-13)** |
| Na | 191 | 3630 | 20200 | 3561 |
| K | 46.0 | 1370 | 3060 | 1344 |
| Ca | 420 | 1630 | 16500 | 1606 |
| Mg | 64.9 | 311 | 3510 | 306 |
| Cl | 135 | ND | 2.5 | 2.7 |
| HCO3 | 1492 | 9.6 | 75 | 39 |
| SO4 | 609 | ND | 2.1 | 12 |

**Notes:**
1. mg/L = milligrams per Liter

**TABLE 16**

**Summary of Simple Mixing Results with Typical MSW Leachate**
**Alternative Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

**Solution 1:** **Typical MSW Leachate**
**Solution 2:** **MW-10 (March 2010)**
**Percentage of solution 1 in target solution 1%-70%**

| | **Mixture Proportions** | | | | | | | | | | | **Downgradient Wells** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solution 1 | 100% | 70% | 45% | 20% | 10% | 5% | 4% | 3% | 2% | 1% | 0% | | | |
| Solution 2 | 0% | 30% | 55% | 80% | 90% | 95% | 96% | 97% | 98% | 99% | 100% | **MW-11** | **MW-12** | **MW-13** |
| Na (mg/L) | 1179 | 1914.300 | 2527.050 | 3139.800 | 3384.900 | 3507.450 | 3531.960 | 3556.470 | 3580.980 | 3605.490 | 3630 | 9910 | 18700 | 20200 |
| K (mg/L) | 220 | 565.000 | 852.500 | 1140.000 | 1255.000 | 1312.500 | 1324.000 | 1335.500 | 1347.000 | 1358.500 | 1370 | 1940 | 2980 | 3060 |
| Ca (mg/L) | 684 | 967.800 | 1204.300 | 1440.800 | 1535.400 | 1582.700 | 1592.160 | 1601.620 | 1611.080 | 1620.540 | 1630 | 19900 | 26200 | 16500 |
| Mg (mg/L) | 640 | 541.300 | 459.050 | 376.800 | 343.900 | 327.450 | 324.160 | 320.870 | 317.580 | 314.290 | 311 | 2720 | 5150 | 3510 |
| Cl (mg/L) | 1202 | 841.400 | 540.900 | 240.400 | 120.200 | 60.100 | 48.080 | 36.060 | 24.040 | 12.020 | ND | 1.7 | 7.3 | 2.5 |
| HCO3 (mg/L) | 3600 | 2522.880 | 1625.280 | 727.680 | 368.640 | 189.120 | 153.216 | 117.312 | 81.408 | 45.504 | 9.6 | 57 | 76 | 75 |
| SO4 (mg/L) | 476 | 333.200 | 214.200 | 95.200 | 47.600 | 23.800 | 19.040 | 14.280 | 9.520 | 4.760 | ND | 5.3 | 16 | 2.1 |

**Notes:**
1) mg/L = milligrams per Liter
2) % = percent

**TABLE 17**

**Optimized Simulated Mixing Results with Typical MSW Leachate**
**Alternative Source Demonstration**
**Henderson County C&D Landfill, Permit No. 45-01**

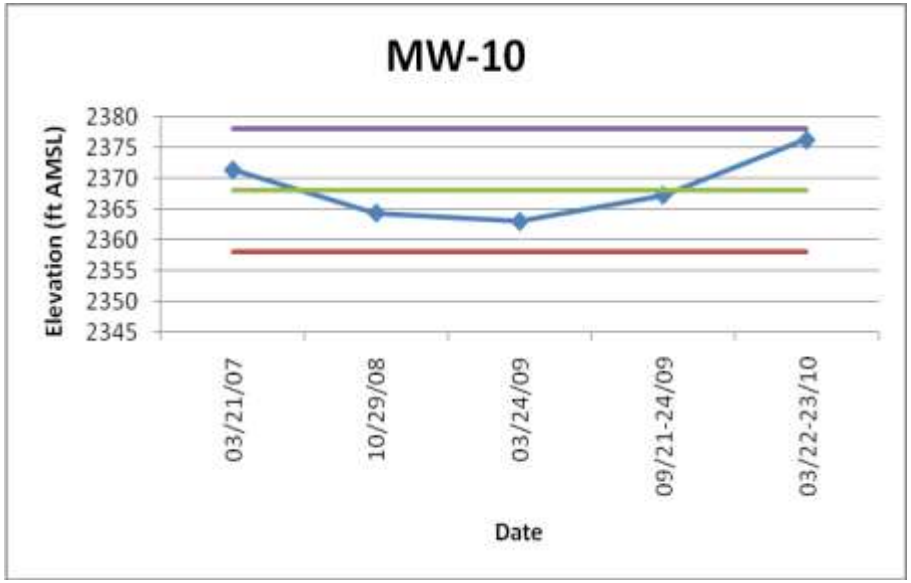
| | | | | |
|---|---|---|---|---|
| **Solution 1: Typical MSW Leachate** | | | | |
| **Solution 2: MW-10** | | | | |
| **Optimized sample: MW-11** | | | | |
| **Contribution of sample 1** | 2% | | | |
| mg/L | **Solution 1** | **Solution 2** | **MW-11** | **Optimized (MW-11)** |
| Na | 1179 | 3630 | 9910 | 3581 |
| K | 220.0 | 1370 | 1940 | 1347 |
| Ca | 684 | 1630 | 19900 | 1611 |
| Mg | 640.0 | 311 | 2720 | 318 |
| Cl | 1202 | ND | 1.7 | 24 |
| HCO3 | 3600 | 9.6 | 57 | 81 |
| SO4 | 476 | ND | 5.3 | 9.5 |

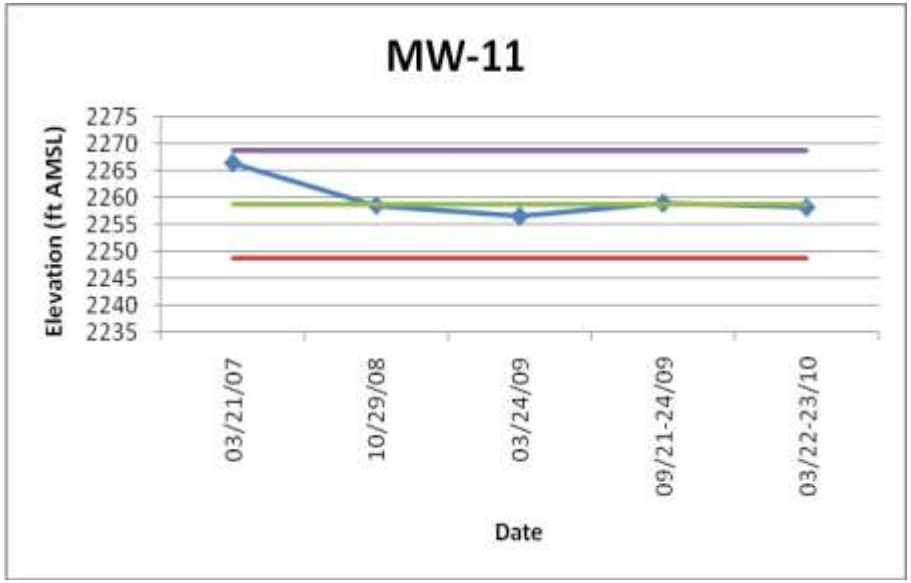
| | | | | |
|---|---|---|---|---|
| **Solution 1: Typical C&D Leachate** | | | | |
| **Solution 2: MW-10** | | | | |
| **Optimized sample: MW-12** | | | | |
| **Contribution of sample 1** | 2% | | | |
| mg/L | **Solution 1** | **Solution 2** | **MW-12** | **Optimized (MW-12)** |
| Na | 1179 | 3630 | 18700 | 3581 |
| K | 220.0 | 1370 | 2980 | 1347 |
| Ca | 684 | 1630 | 26200 | 1611 |
| Mg | 640.0 | 311 | 5150 | 318 |
| Cl | 1202 | ND | 7.3 | 24 |
| HCO3 | 3600 | 9.6 | 76 | 81 |
| SO4 | 476 | ND | 16 | 9.5 |

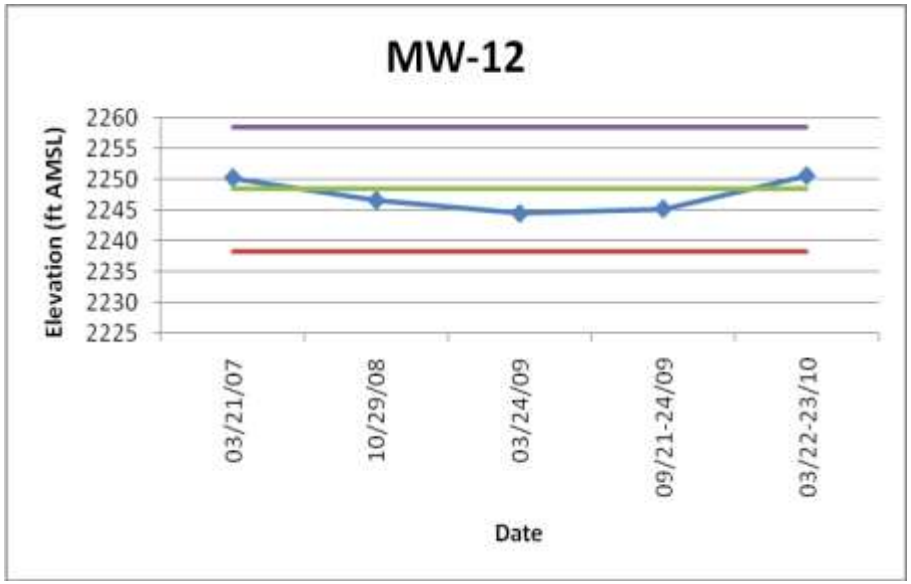
| | | | | |
|---|---|---|---|---|
| **Solution 1: Typical C&D Leachate** | | | | |
| **Solution 2: MW-10** | | | | |
| **Optimized sample: MW-13** | | | | |
| **Contribution of sample 1** | 2% | | | |
| mg/L | **Solution 1** | **Solution 2** | **MW-13** | **Optimized (MW-13)** |
| Na | 1179 | 3630 | 20200 | 3581 |
| K | 220.0 | 1370 | 3060 | 1347 |
| Ca | 684 | 1630 | 16500 | 1611 |
| Mg | 640.0 | 311 | 3510 | 318 |
| Cl | 1202 | ND | 2.5 | 24 |
| HCO3 | 3600 | 9.6 | 75 | 81 |
| SO4 | 476 | ND | 2.1 | 9.5 |

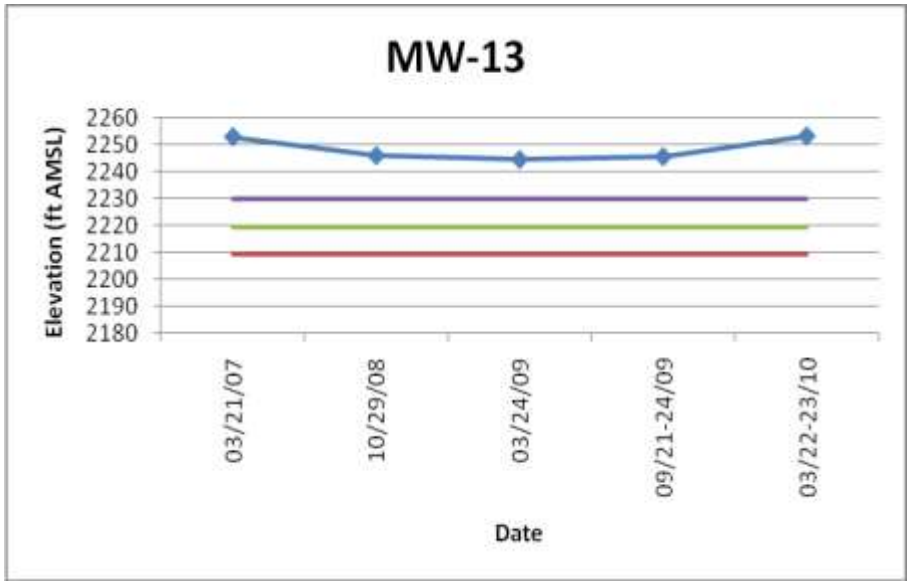
**Notes:**
1. mg/L = milligrams per Liter

# FIGURES




**LEGEND**

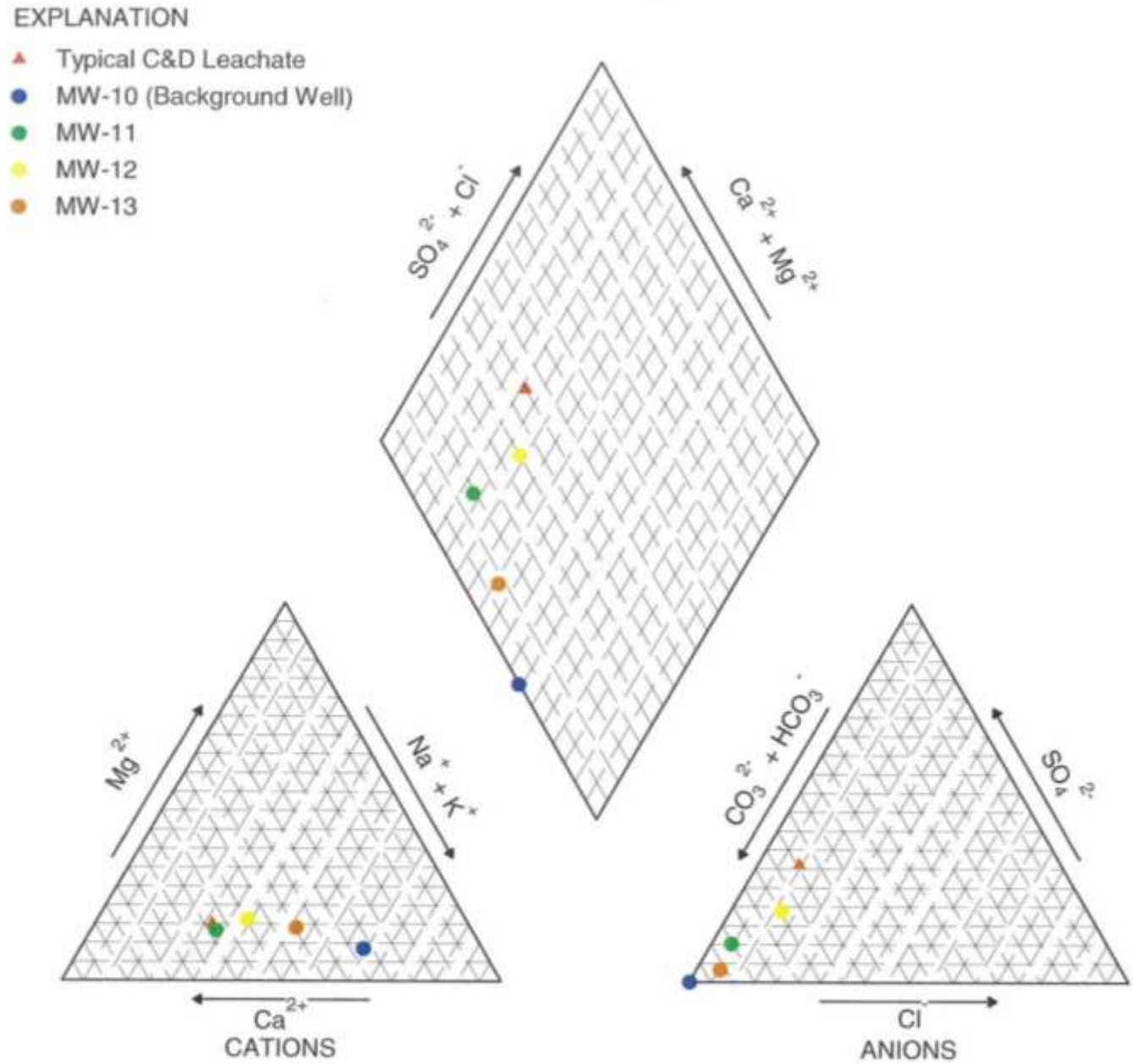
- Groundwater Elevations
- Bottom of Well
- 10 ft Above Bottom of Well
- 20 ft Above Bottom of Well

Golder Associates

| | |
|---|---|
| DATE: 07/26/10 | |
| Project #: 08396506 | |
| Prepared By: | |
| Reviewed By: | |

**Title:**
**ANALYSIS OF GROUNDWATER ELEVATIONS**
**CLOSED HENDERSON COUNTY C&D LANDFILL**
**PERMIT NO. 45-01**

**Figure No.**
**1**

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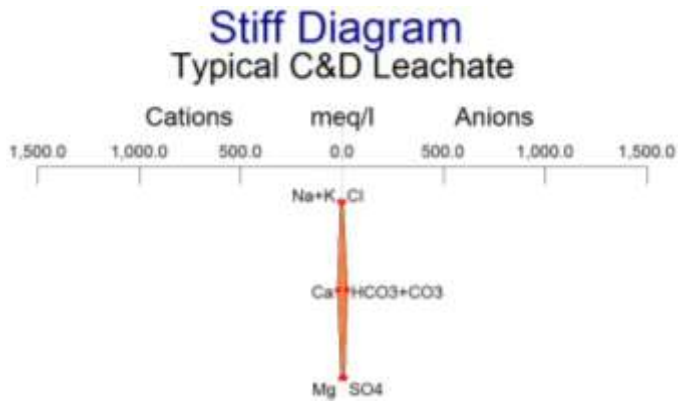
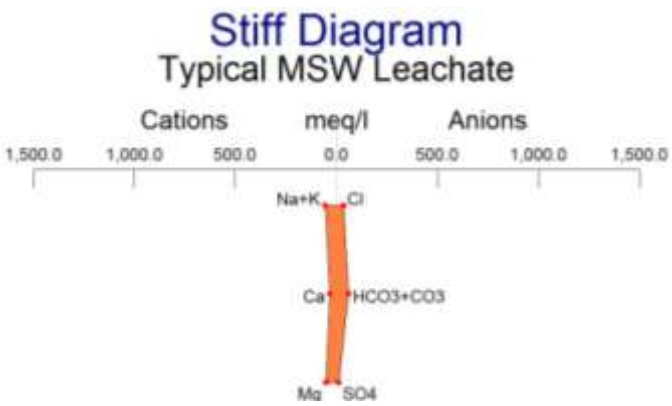
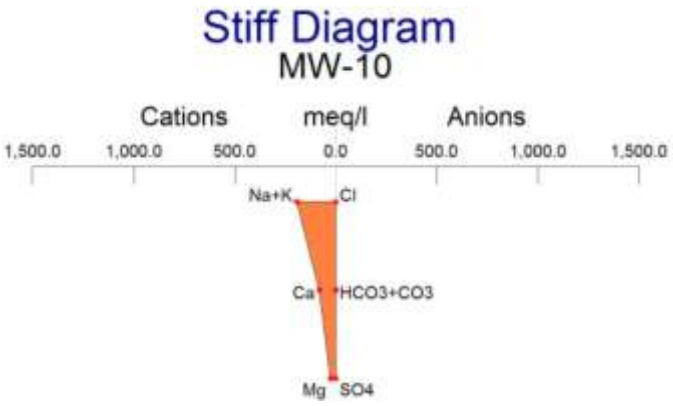
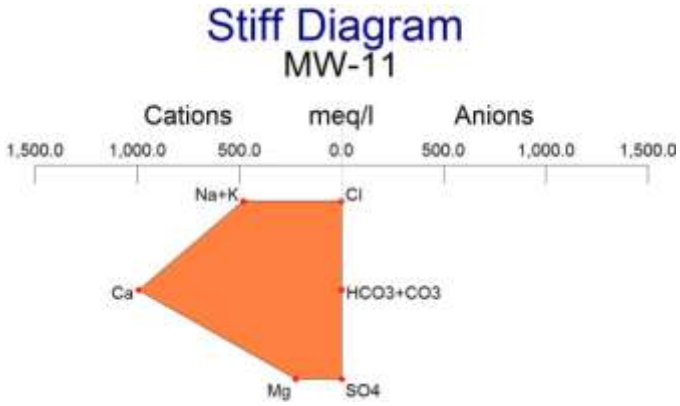
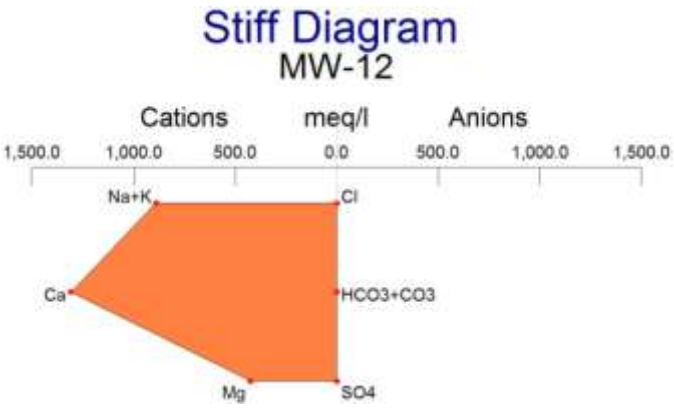
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **Title:**<br>**PIPER PLOT WITH TYPICAL C&D LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**2** |

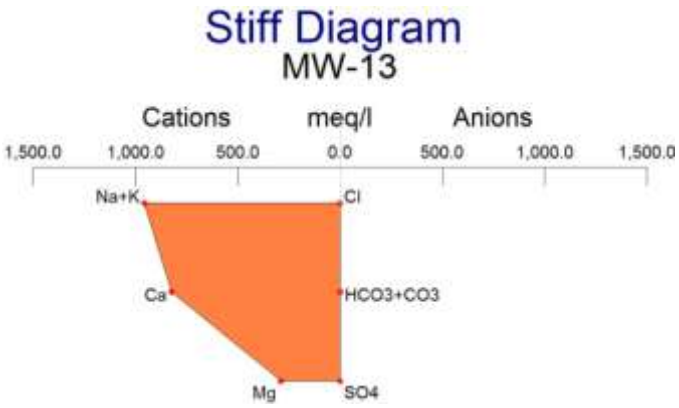
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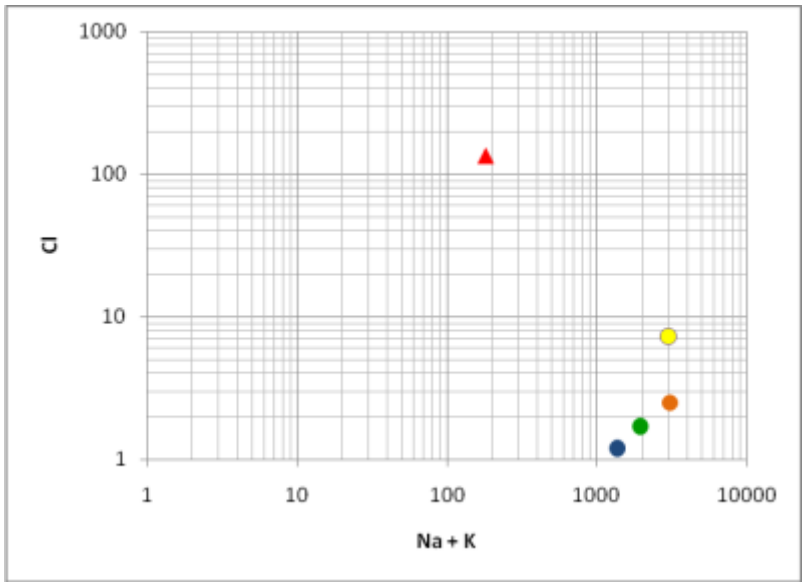
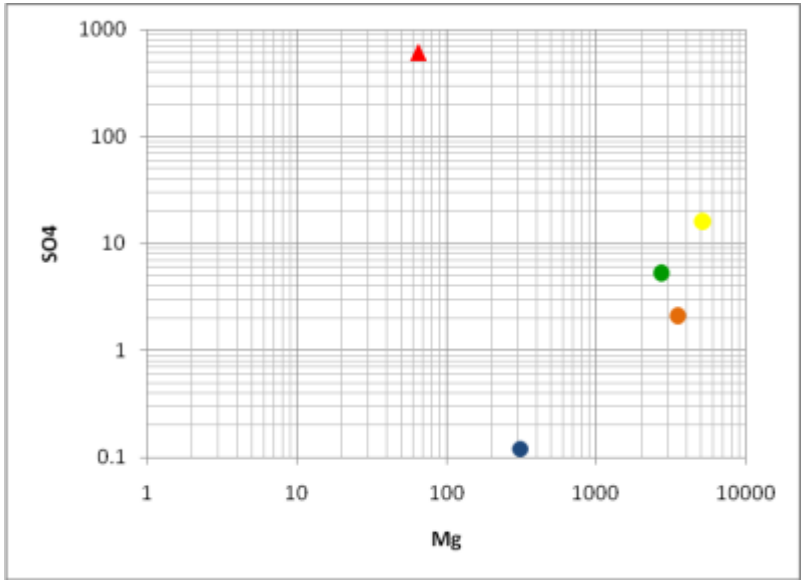
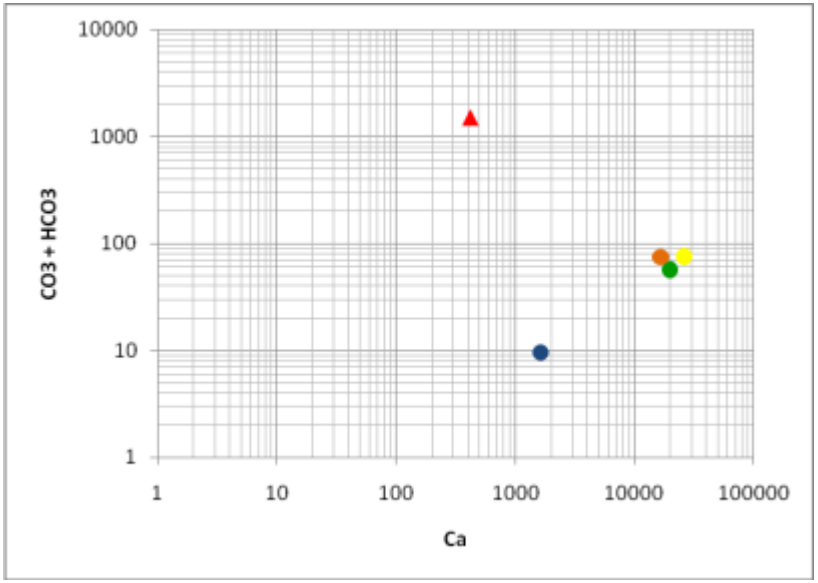
|---|---|---|---|
| Golder Associates | DATE: 07/07/10 | **Title:** | **Figure No.** |
| | Project #: 0839-650609 | **STIFF DIAGRAMS**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **3** |
| | Prepared By: | | |
| | Reviewed By: | | |



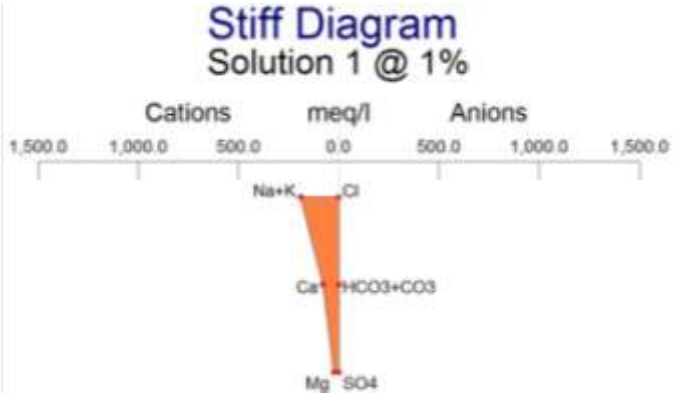



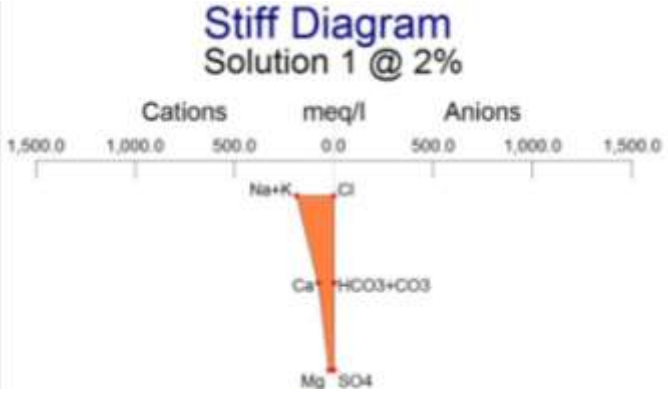



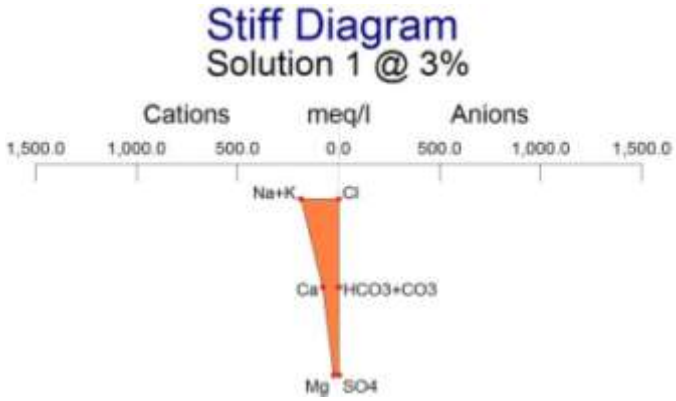

**LEGEND**

- Typical C&D Leachate
- MW-10 (Background Well)
- MW-11
- MW-12
- MW-13

| | | | |
|---|---|---|---|
| Golder Associates | DATE: 07/26/10<br>Project #: 08396506<br>Prepared By:<br>Reviewed By: | **MAJOR IONS SCATTER PLOTS WITH TYPICAL C&D LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**4** |



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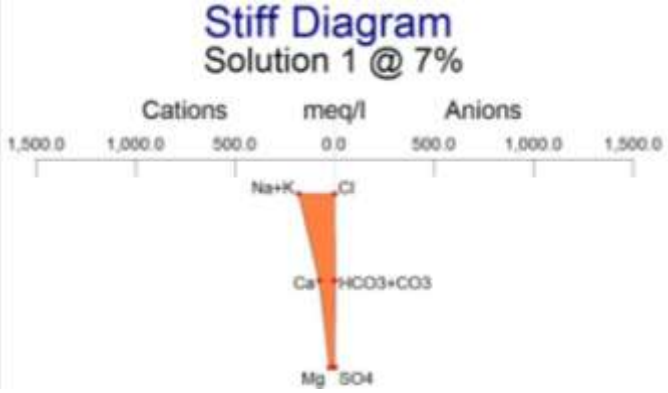
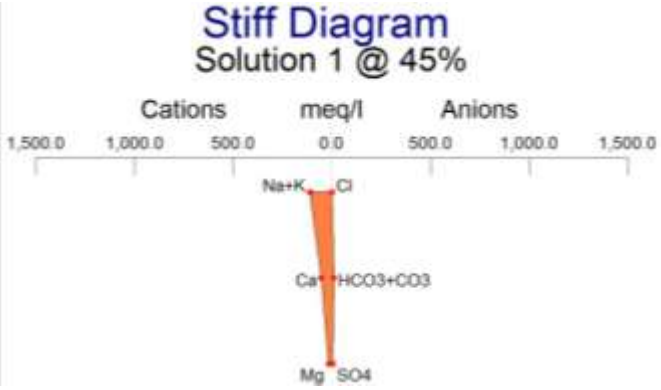
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **SIMPLE MIXING STIFF DIAGRAMS WITH TYPICAL C&D LEACHATE (1% through 6%)**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**5** |



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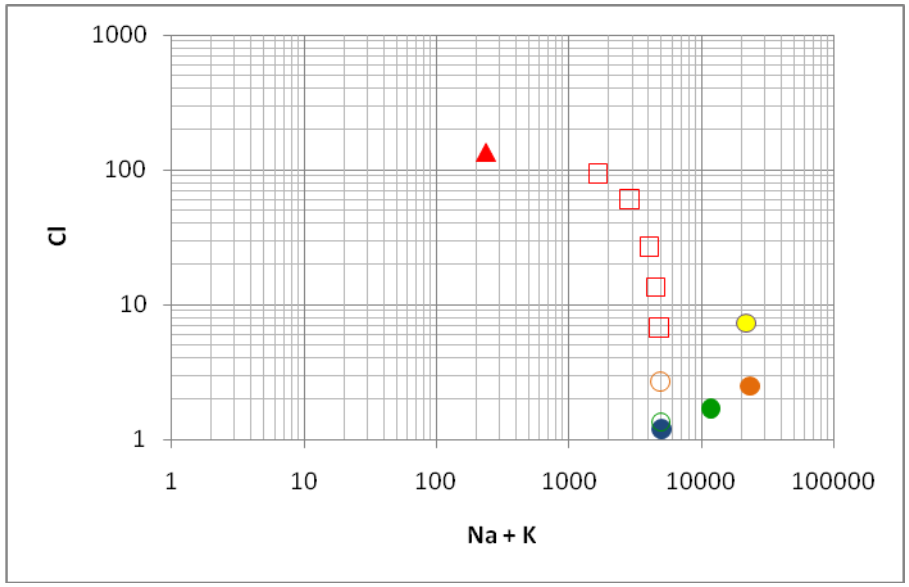
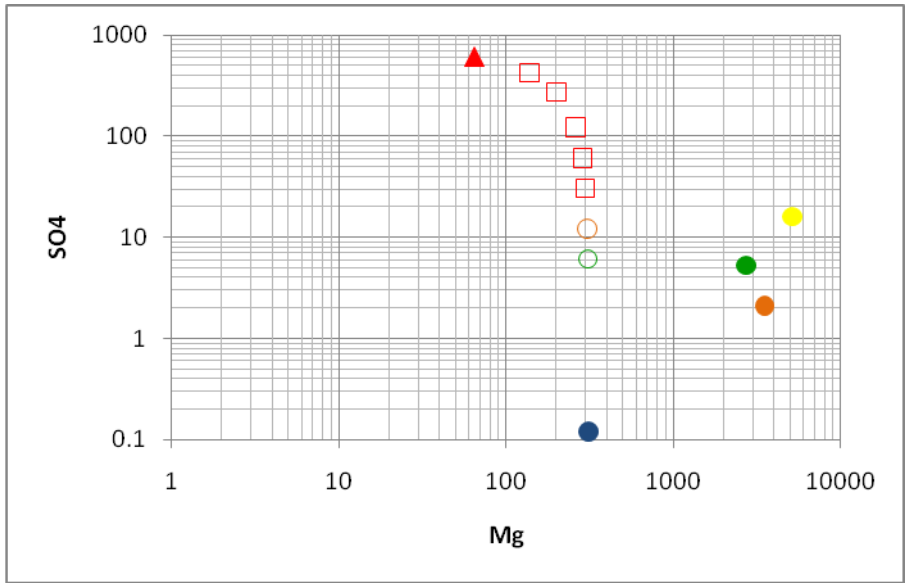
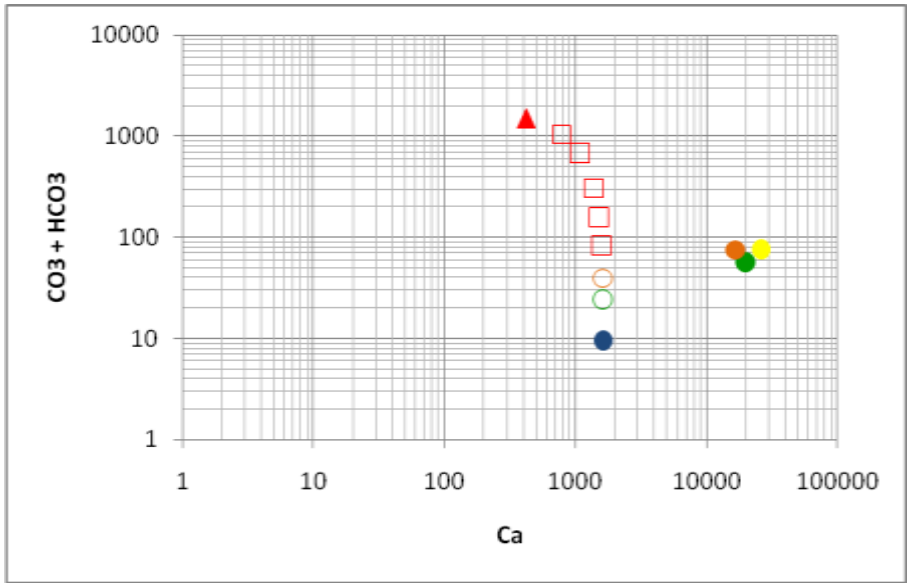
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **SIMPLE MIXING STIFF DIAGRAMS WITH TYPICAL C&D LEACHATE (6% through 10%, 20%, and 45%)**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**6** |



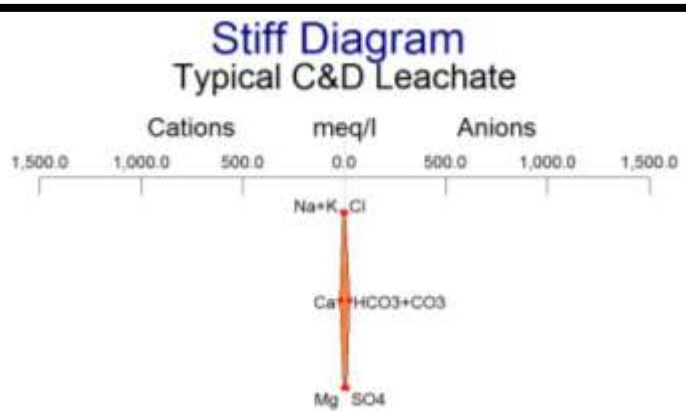



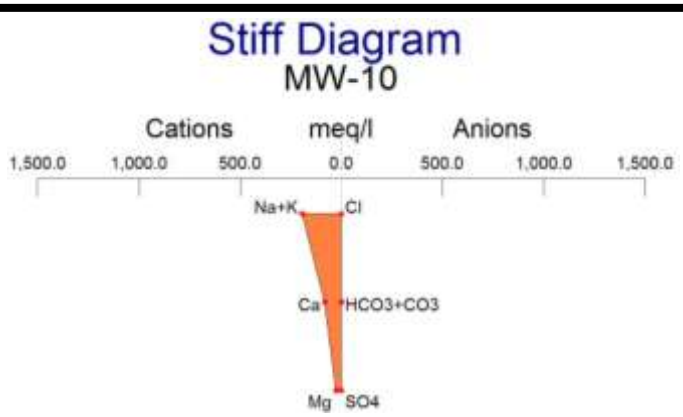



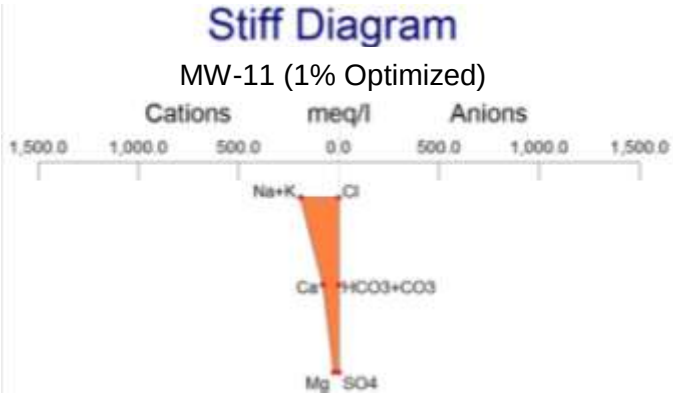

**LEGEND**

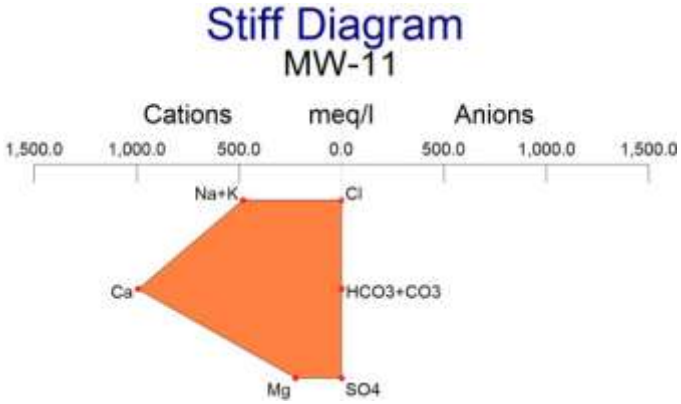
- Typical C&D Leachate
- MW-10 (Background Well)
- MW-11
- MW-12
- MW-13
- Mixing %
- Optimized MW-11
- Optimized MW-12 and MW-13

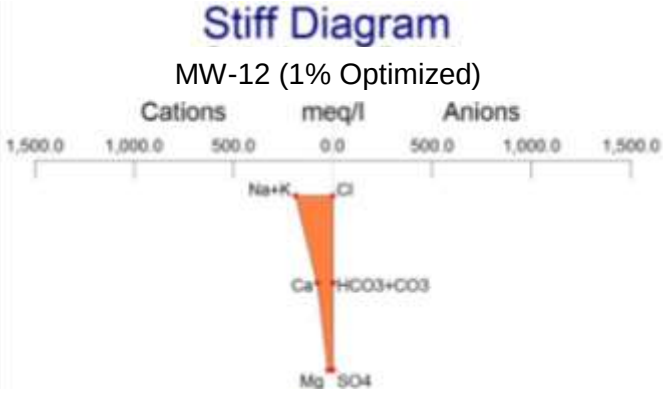
| | | | |
|---|---|---|---|
| Golder Associates | DATE: 07/26/10<br>Project #: 08396506<br>Prepared By:<br>Reviewed By: | **MIXING MODELS OF MAJOR IONS SCATTER PLOTS WITH TYPICAL C&D LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No. 7** |

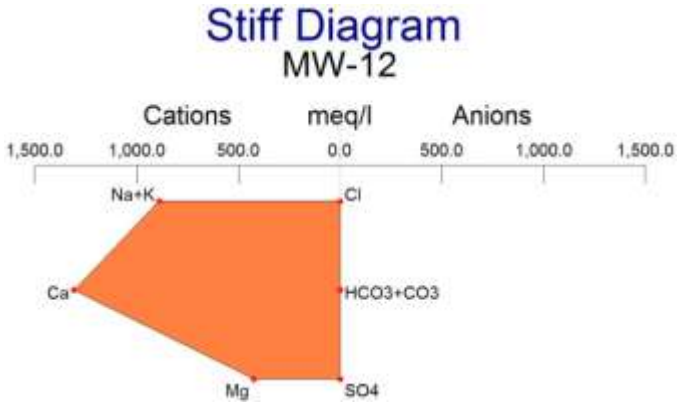


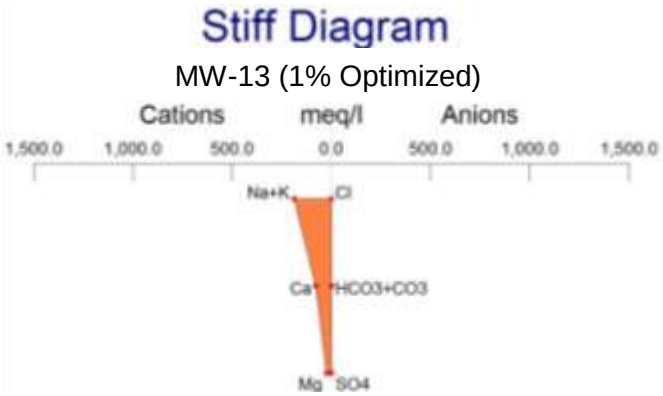



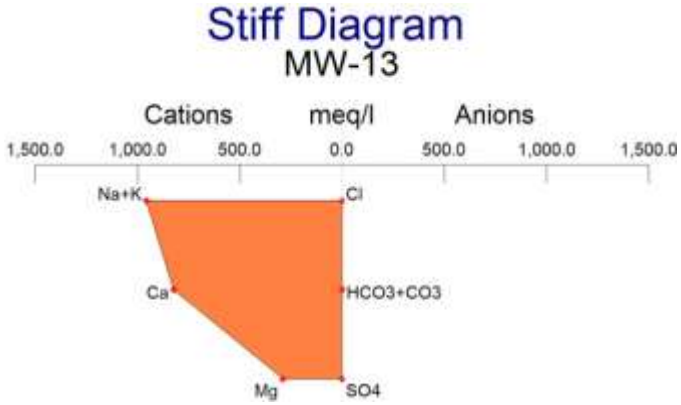

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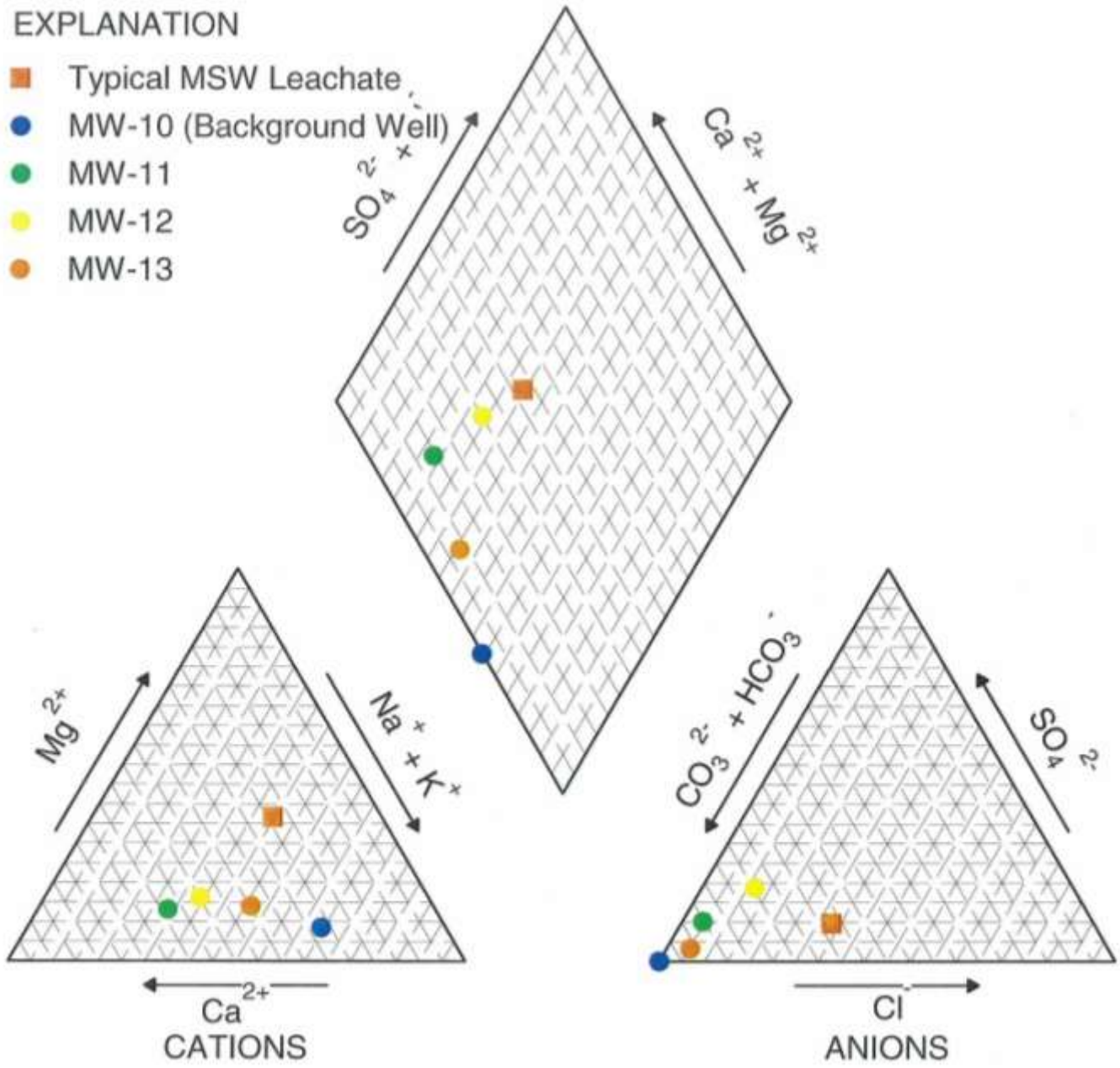
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **Title:**<br>**OPTIMIZED SIMULTATED MIXING STIFF DIAGRAMS WITH TYPICAL C&D LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**8** |

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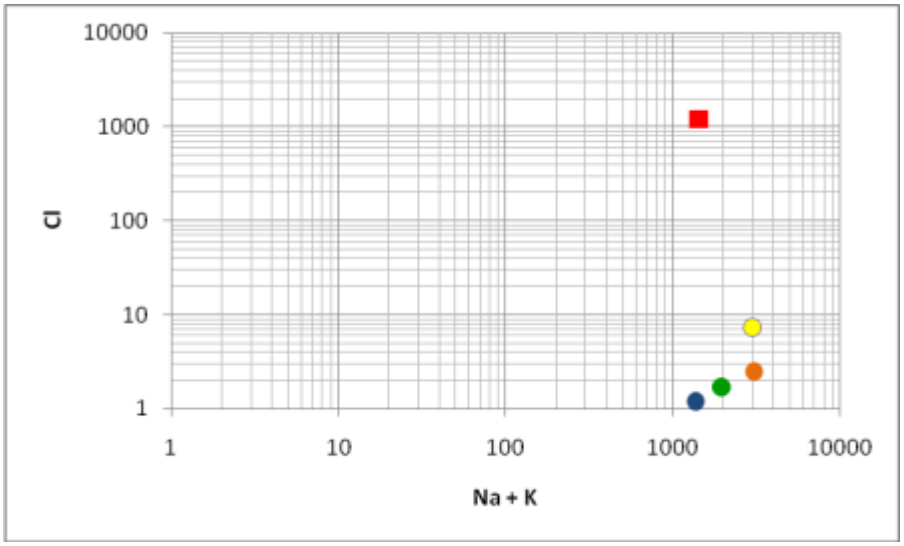
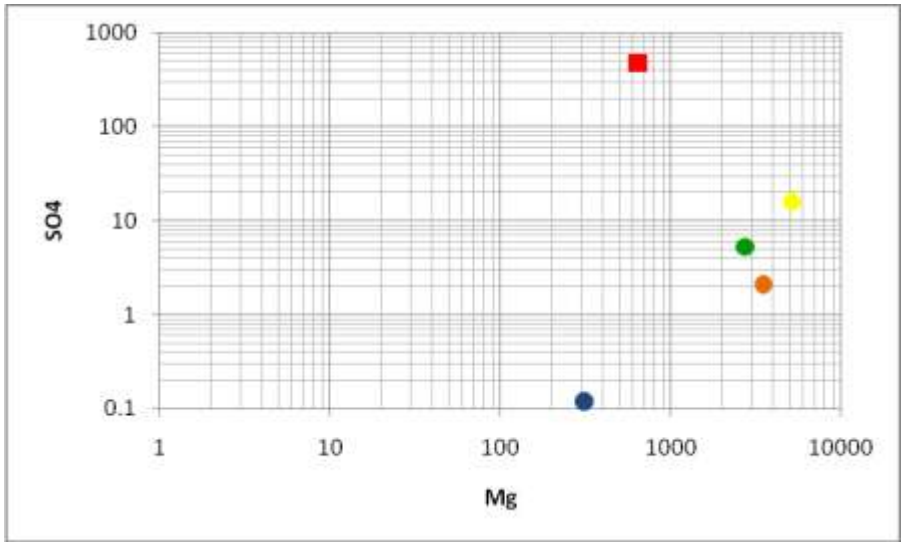
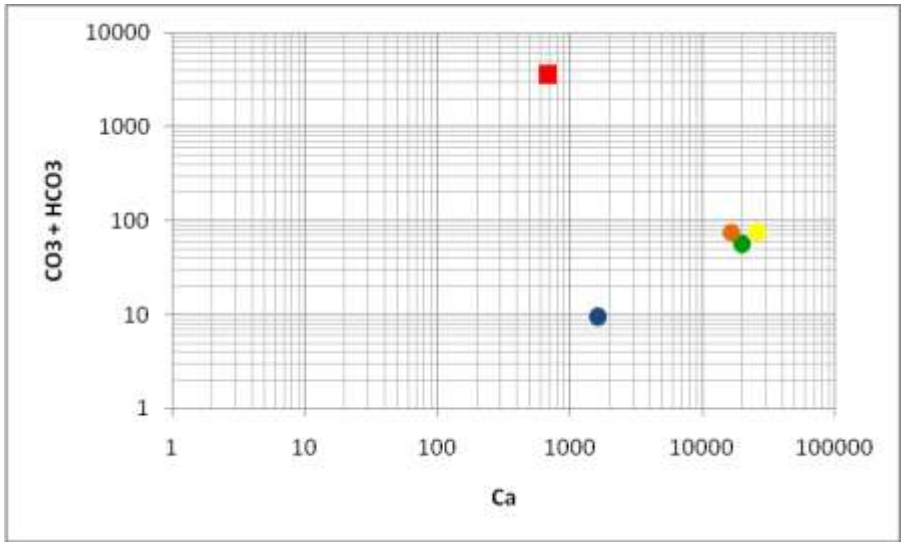
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **Title:**<br>**PIPER PLOT WITH TYPICAL MSW LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**9** |



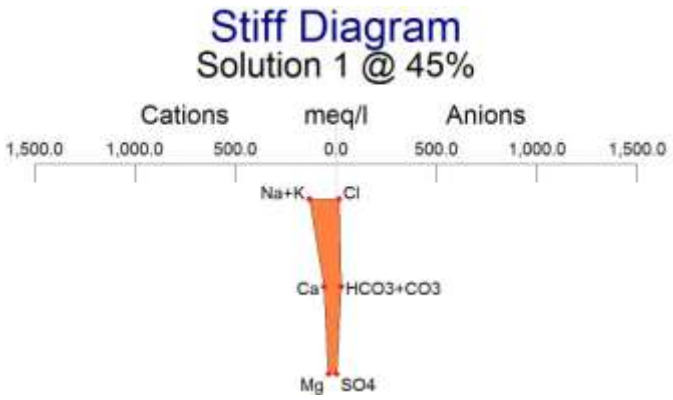




**LEGEND**

- Typical MSW Leachate
- MW-10 (Background Well)
- MW-11
- MW-12
- MW-13

| | | | |
|---|---|---|---|
| Golder Associates | DATE: 07/26/10<br>Project #: 08396506<br>Prepared By:<br>Reviewed By: | **Title:**<br>**MAJOR IONS SCATTER PLOTS WITH TYPICAL MSW LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No. 10** |

| | | | |
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **SIMPLE MIXING STIFF DIAGRAMS WITH TYPICAL MSW LEACHATE (1% through 6%)**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No. 11** |

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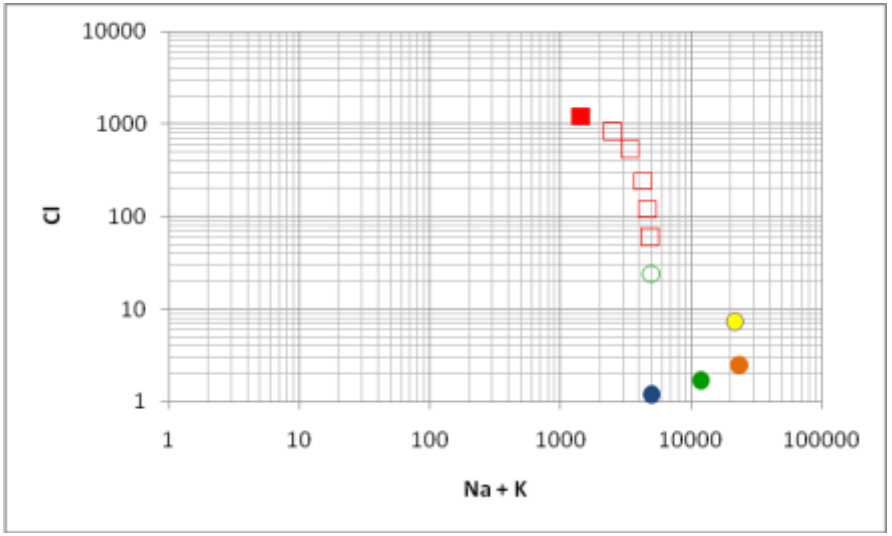
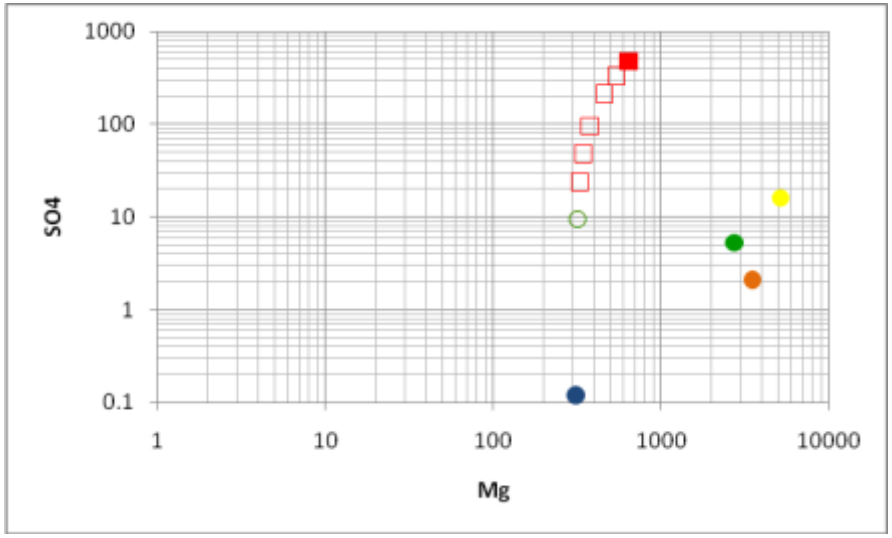
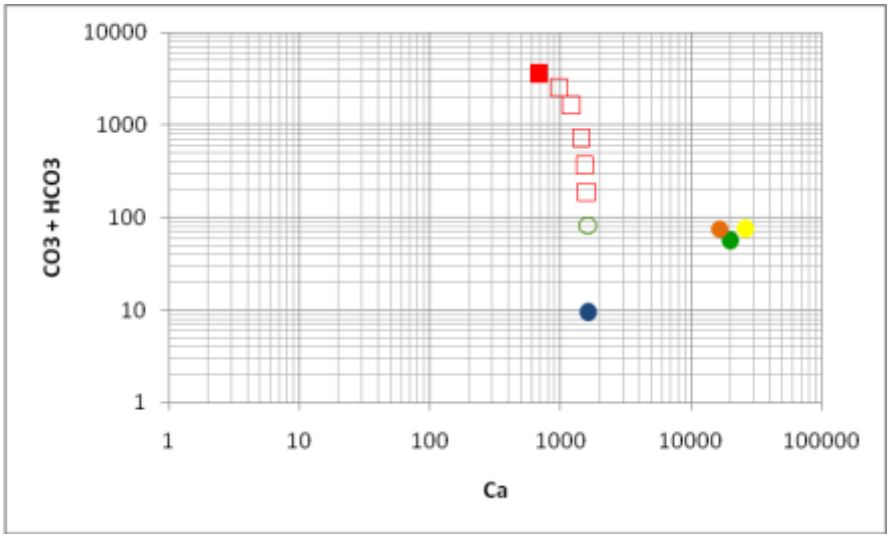
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **SIMPLE MIXING STIFF DIAGRAMS WITH TYPICAL MSW LEACHATE (6% through 10%, 20%, and 45%)**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No. 12** |



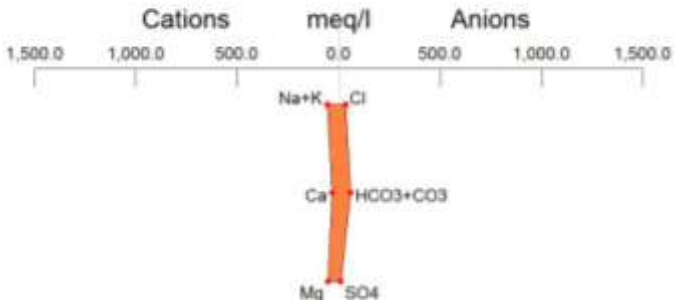



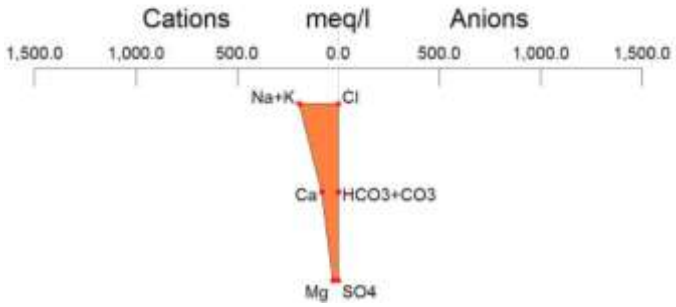



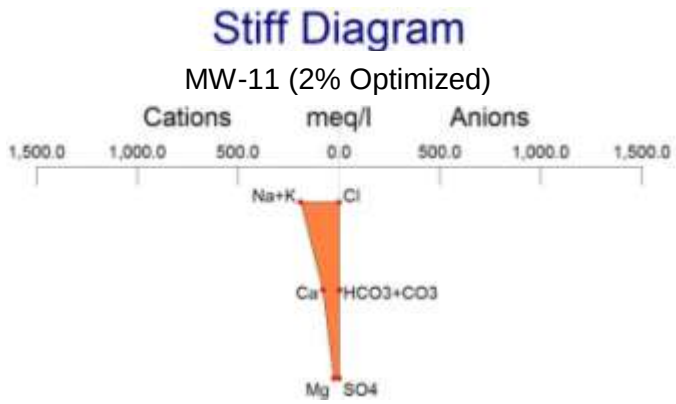

**LEGEND**

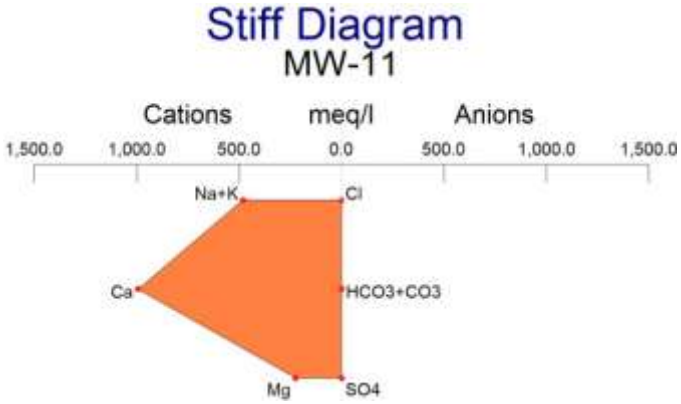
- Typical C&D Leachate
- MW-10 (Background Well)
- MW-11
- MW-12
- MW-13
- Mixing %
- Optimized MW-11, MW-12, and MW-13

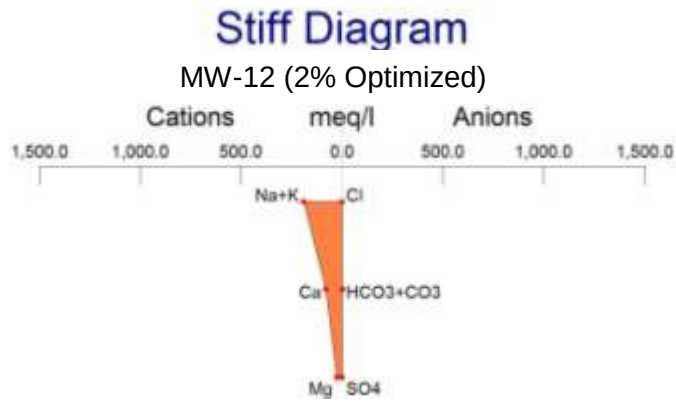
| | | | |
|---|---|---|---|
| Golder Associates | DATE: 07/26/10<br>Project #: 08396506<br>Prepared By:<br>Reviewed By: | **MIXING MODELS OF MAJOR IONS SCATTER PLOTS WITH TYPICAL MSW LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No. 13** |

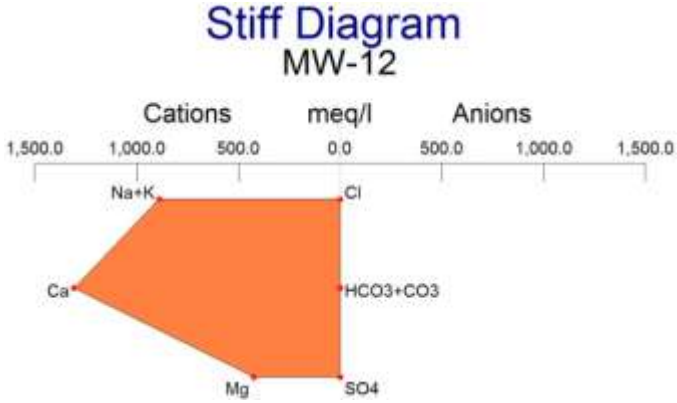


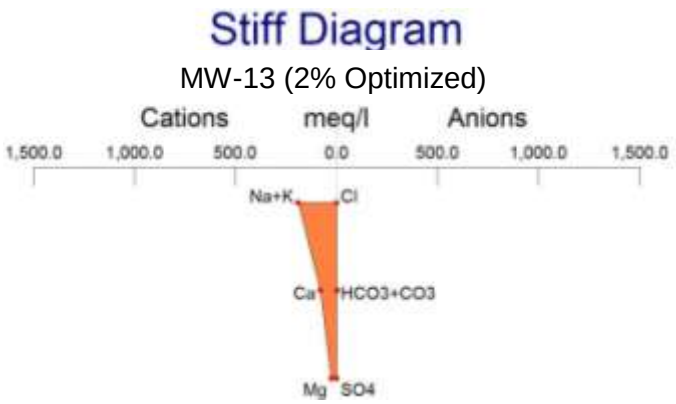



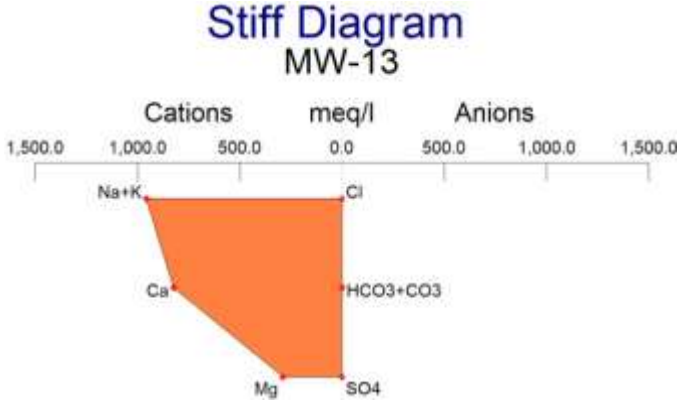



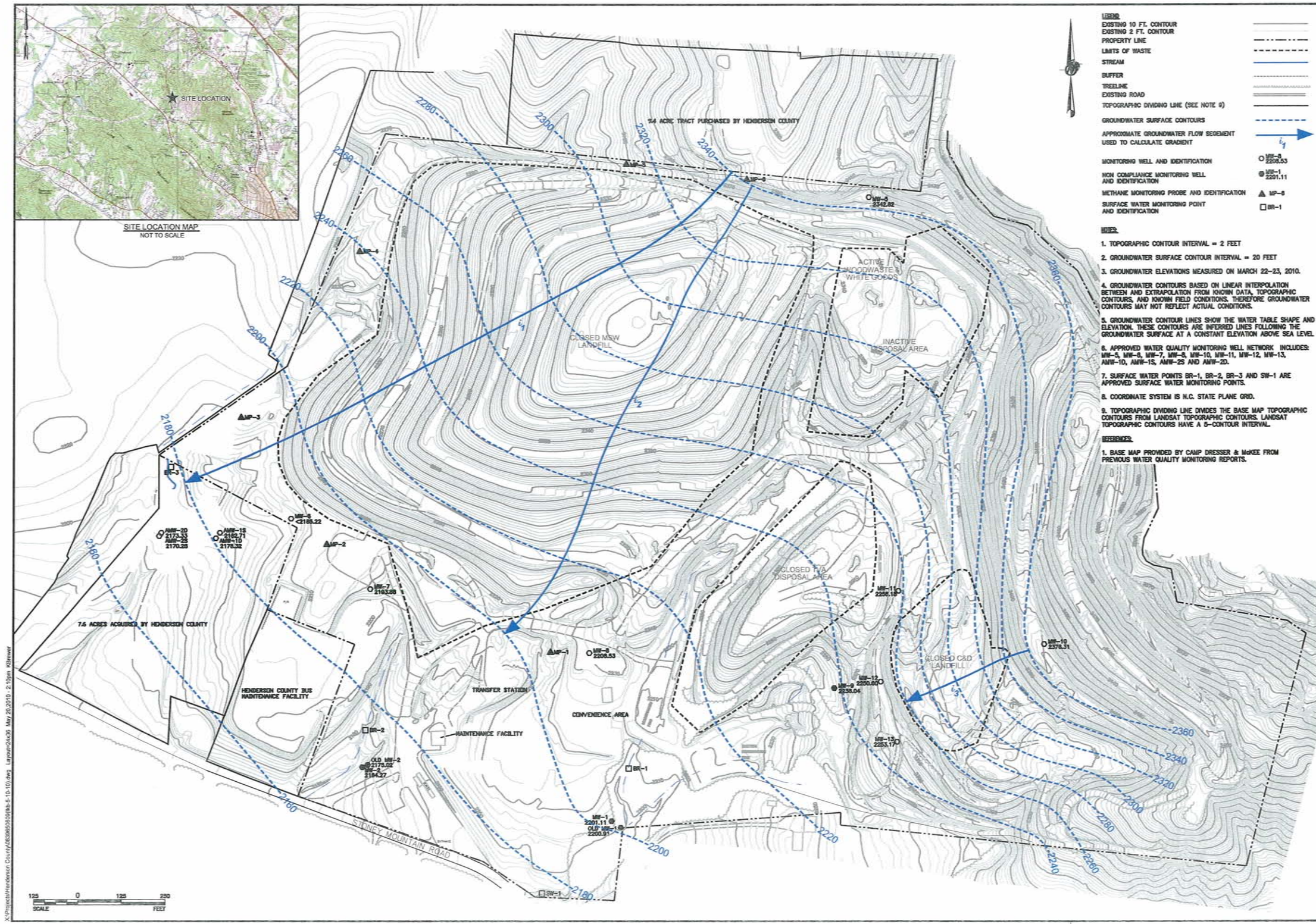




| | | | |
|---|---|---|---|
| Golder Associates | DATE: 07/07/10<br>Project #: 0839-650609<br>Prepared By:<br>Reviewed By: | **Title:**<br>**OPTIMIZED SIMULTATED MIXING STIFF DIAGRAMS WITH TYPICAL MSW LEACHATE**<br>**CLOSED HENDERSON COUNTY C&D LANDFILL**<br>**PERMIT NO. 45-01** | **Figure No.**<br>**14** |

**DRAWING**




LEGEND

- EXISTING 10 FT. CONTOUR
- EXISTING 2 FT. CONTOUR
- PROPERTY LINE
- LIMITS OF WASTE
- STREAM
- BUFFER
- TREELINE
- EXISTING ROAD
- TOPOGRAPHIC DIVIDING LINE (SEE NOTE 9)
- GROUNDWATER SURFACE CONTOURS
- APPROXIMATE GROUNDWATER FLOW SEGEMENT USED TO CALCULATE GRADIENT
- MONITORING WELL AND IDENTIFICATION — MW-8 2208.53
- NON COMPLIANCE MONITORING WELL AND IDENTIFICATION — MW-1 2201.11
- METHANE MONITORING PROBE AND IDENTIFICATION — MP-8
- SURFACE WATER MONITORING POINT AND IDENTIFICATION — BR-1

NOTES:

1. TOPOGRAPHIC CONTOUR INTERVAL = 2 FEET
2. GROUNDWATER SURFACE CONTOUR INTERVAL = 20 FEET
3. GROUNDWATER ELEVATIONS MEASURED ON MARCH 22-23, 2010.
4. GROUNDWATER CONTOURS BASED ON LINEAR INTERPOLATION BETWEEN AND EXTRAPOLATION FROM KNOWN DATA, TOPOGRAPHIC CONTOURS, AND KNOWN FIELD CONDITIONS. THEREFORE GROUNDWATER CONTOURS MAY NOT REFLECT ACTUAL CONDITIONS.
5. GROUNDWATER CONTOUR LINES SHOW THE WATER TABLE SHAPE AND ELEVATION. THESE CONTOURS ARE INFERRED LINES FOLLOWING THE GROUNDWATER SURFACE AT A CONSTANT ELEVATION ABOVE SEA LEVEL.
6. APPROVED WATER QUALITY MONITORING WELL NETWORK INCLUDES: MW-5, MW-6, MW-7, MW-8, MW-10, MW-11, MW-12, MW-13, AMW-10, AMW-15, AMW-25 AND AMW-20.
7. SURFACE WATER POINTS BR-1, BR-2, BR-3 AND SW-1 ARE APPROVED SURFACE WATER MONITORING POINTS.
8. COORDINATE SYSTEM IS N.C. STATE PLANE GRID.
9. TOPOGRAPHIC DIVIDING LINE DIVIDES THE BASE MAP TOPOGRAPHIC CONTOURS FROM LANDSAT TOPOGRAPHIC CONTOURS. LANDSAT TOPOGRAPHIC CONTOURS HAVE A 5-CONTOUR INTERVAL.

REFERENCES:

1. BASE MAP PROVIDED BY CAMP DRESSER & McKEE FROM PREVIOUS WATER QUALITY MONITORING REPORTS.

Golder Associates
GOLDER ASSOCIATES INC, INC.

| REV | DATE | DES | REVISION DESCRIPTION | CADD | CHK | RVW |
|---|---|---|---|---|---|---|
| 2 | 5/20/10 | DYR | REVISED GW CONTOURS | LKB | DYR | RPK |
| 1 | 10/27/09 | DYR | REVISED GW CONTOURS | LKB | DYR | RPK |

PROJECT
HENDERSON COUNTY
CLOSED MSW AND C&D
LANDFILL PERMIT # 45-01

TITLE
GROUNDWATER
SURFACE CONTOUR MAP
MARCH 22-23, 2010

| | | |
|---|---|---|
| PROJECT No. 083-9600609 | | |
| FILE No. | | |
| REV. 0 | SCALE | 1"=125' |
| DESIGN | DYR | 05/10/10 |
| CADD | LKB | 05/10/10 |
| CHECK | DYR | 05/10/10 |
| REVIEW | RPK | 05/10/10 |

DWG. 1

X:\Projects\Henderson County\083-9600609\Mb-5-10-10.dwg Layout=24x36 May 20,2010 - 2:10pm KBrewer

# APPENDIX A

## ANALYTICAL RESULTS FOR HEADSPACE GAS SAMPLES COLLECTED DURING THE MARCH 2010 SAMPLING EVENT

**Environmental Conservation Laboratories, Inc.**
**4810 Executive Park Court, Suite 211**
**Jacksonville FL, 32216-6069**
**Phone: 904.296.3007 FAX: 904.296.6210**
**www.encolabs.com**

Tuesday, August 10, 2010

Golder Associates, Inc. (GO007)

Attn: David Reedy II

The Wingate Building 4900 Koger Blvd., Suite 140

Greensboro, NC 27407

**RE: Laboratory Results for**
**Project Number: 08396506009.900, Project Name/Desc: Henderson County Landfills**
**ENCO Workorder: B001371**

Dear David Reedy II,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Tuesday, March 23, 2010.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Jacksonville. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Chris Tompkins

Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 17.

**PROJECT NARRATIVE**

Client: Golder Associates, Inc. (GO007)
Project: Henderson County Landfills
ENCO Project ID: B001371

Overview

All samples submitted were analyzed by Environmental Conservation Laboratories, Inc. in accordance with the methods referenced in the laboratory report. Any particular difficulties encountered during sample handling and processing will be discussed in the Remarks section below.

Remarks

Analysis: TO-15
Affected Samples: 45-01 - MW-10[B001371-01], 45-01 - MW-11[B001371-02], 45-01 - MW-12[B001371-03], 45-01 - MW-13[B001371-04]
Nonconformance: The continuing calibration verification standard was outside control limits bias high for 1,4-Dichlorobenzene. The associated sample results were not detected and thus the impact of this nonconformance is minimal and allowed under NELAC guidelines.

Analysis: TO-15
Affected Samples: 45-01 - MW-10[B001371-01], 45-01 - MW-11[B001371-02], 45-01 - MW-12[B001371-03], 45-01 - MW-13[B001371-04]
Nonconformance: The method blank and associated samples had positive results for Methylene Chloride which is a common laboratory contaminate.

Chris Tompkins
Project Manager

www.encolabs.com

## SAMPLE SUMMARY/LABORATORY CHRONICLE

| Client ID: 45-01 - MW-10 | Lab ID: B001371-01 | Sampled: 03/22/10 15:40 | Received: 03/23/10 09:30 |
|---|---|---|---|

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| TO-15 | 04/05/10 | 04/01/10 18:15 | 4/1/2010 20:38 |

| Client ID: 45-01 - MW-11 | Lab ID: B001371-02 | Sampled: 03/22/10 16:32 | Received: 03/23/10 09:30 |
|---|---|---|---|

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| TO-15 | 04/05/10 | 04/01/10 18:15 | 4/1/2010 21:12 |

| Client ID: 45-01 - MW-12 | Lab ID: B001371-03 | Sampled: 03/22/10 16:17 | Received: 03/23/10 09:30 |
|---|---|---|---|

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| TO-15 | 04/05/10 | 04/01/10 18:15 | 4/1/2010 21:45 |

| Client ID: 45-01 - MW-13 | Lab ID: B001371-04 | Sampled: 03/22/10 16:00 | Received: 03/23/10 09:30 |
|---|---|---|---|

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| TO-15 | 04/05/10 | 04/01/10 18:15 | 4/1/2010 22:19 |

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## SAMPLE DETECTION SUMMARY

**Client ID: 45-01 - MW-10** **Lab ID: B001371-01**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Methylene chloride | 42 | B | 16 | 40 | ppbv | TO-15 | O-01, QB-01 |

**Client ID: 45-01 - MW-11** **Lab ID: B001371-02**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Methylene chloride | 32 | JB | 16 | 40 | ppbv | TO-15 | J-01, O-01 |

**Client ID: 45-01 - MW-12** **Lab ID: B001371-03**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| 2-Butanone | 21 | J | 21 | 40 | ppbv | TO-15 | |
| Acetone | 40 | | 19 | 40 | ppbv | TO-15 | |
| Cyclohexane | 110 | | 18 | 40 | ppbv | TO-15 | |
| Methylene chloride | 38 | JB | 16 | 40 | ppbv | TO-15 | J-01, QB-01 |
| n-Hexane | 21 | J | 16 | 40 | ppbv | TO-15 | |
| Propene | 41 | | 21 | 40 | ppbv | TO-15 | |
| Tetrachloroethene | 22 | J | 22 | 40 | ppbv | TO-15 | |
| Trichlorofluoromethane | 54 | | 21 | 40 | ppbv | TO-15 | |

**Client ID: 45-01 - MW-13** **Lab ID: B001371-04**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Methylene chloride | 34 | JB | 16 | 40 | ppbv | TO-15 | O-01, QB-01 |

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## ANALYTICAL RESULTS

**Description:** 45-01 - MW-10 | **Lab Sample ID:** B001371-01 | **Received:** 03/23/10 09:30

**Matrix:** Air | **Sampled:** 03/22/10 15:40 | **Work Order:** B001371

**Project:** Henderson County Landfills | **Sampled By:** David Reedy II | **% Solids:**

### Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane [71-55-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,1,2,2-Tetrachloroethane [79-34-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,1,2-Trichloroethane [79-00-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,1-Dichloroethane [75-34-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,1-Dichloroethene [75-35-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,2,4-Trichlorobenzene [120-82-1] | 12 | U | ppbv | 1 | 12 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,2,4-Trimethylbenzene [95-63-6] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,2-Dibromoethane [106-93-4] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,2-Dichlorobenzene [95-50-1] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,2-Dichloroethane [107-06-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,2-Dichloropropane [78-87-5] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,3,5-Trimethylbenzene [108-67-8] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,3-Butadiene [106-99-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,3-Dichlorobenzene [541-73-1] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 1,4-Dichlorobenzene [106-46-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | QV-01 |
| 1,4-Dioxane [123-91-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 2,2,4-Trimethylpentane [540-84-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 2-Butanone [78-93-3] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 2-Hexanone [591-78-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 2-Propanol [67-63-0] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 3-Chloropropene [107-05-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 4-Ethyltoluene [622-96-8] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| 4-Methyl-2-pentanone [108-10-1] | 26 | U | ppbv | 1 | 26 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Acetone [67-64-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Benzene [71-43-2] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Benzyl chloride [100-44-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Bromodichloromethane [75-27-4] | 24 | U | ppbv | 1 | 24 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Bromoethene [593-60-2] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Bromoform [75-25-2] | 13 | U | ppbv | 1 | 13 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Bromomethane [74-83-9] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Carbon disulfide [75-15-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Carbon tetrachloride [56-23-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Chlorobenzene [108-90-7] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Chloroethane [75-00-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Chloroform [67-66-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Chloromethane [74-87-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| cis-1,2-Dichloroethene [156-59-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| cis-1,3-Dichloropropene [10061-01-5] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Cyclohexane [110-82-7] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Dibromochloromethane [124-48-1] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Dichlorodifluoromethane [75-71-8] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Ethyl Acetate [141-78-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Ethylbenzene [100-41-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Freon 113 [76-13-2] | 30 | U | ppbv | 1 | 30 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Freon 114 [76-14-2] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Heptane [142-82-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Hexachlorobutadiene [87-68-3] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| **Methylene chloride [75-09-2]** | **42** | B | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | O-01, QB-01 |

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| | | | | | |
|---|---|---|---|---|---|
| **Description:** | 45-01 - MW-10 | **Lab Sample ID:** | B001371-01 | **Received:** | 03/23/10 09:30 |
| **Matrix:** | Air | **Sampled:** | 03/22/10 15:40 | **Work Order:** | B001371 |
| **Project:** | Henderson County Landfills | **Sampled By:** | David Reedy II | **% Solids:** | |

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl-tert-butyl ether [1634-04-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| n-Hexane [110-54-3] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Propene [115-07-1] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Styrene [100-42-5] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Tetrachloroethene [127-18-4] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Tetrahydrofuran [109-99-9] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Toluene [108-88-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Total Light Petroleum Hydrocarbons [ECL-0163] | 3900 | U | ppbv | 1 | 3900 | 3900 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| trans-1,2-Dichloroethene [156-60-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| trans-1,3-Dichloropropene [10061-02-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Trichloroethene [79-01-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Trichlorofluoromethane [75-69-4] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Vinyl acetate [108-05-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Vinyl chloride [75-01-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |
| Xylenes (Total) [1330-20-7] | 34 | U | ppbv | 1 | 34 | 40 | 0D01021 | TO-15 | 04/01/10 20:38 | LTS | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *30* | *1* | *31.2* | *97.7 %* | *70-130* | *0D01021* | *TO-15* | *04/01/10 20:38* | *LTS* | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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**Description:** 45-01 - MW-11 | **Lab Sample ID:** B001371-02 | **Received:** 03/23/10 09:30

**Matrix:** Air | **Sampled:** 03/22/10 16:32 | **Work Order:** B001371

**Project:** Henderson County Landfills | **Sampled By:** David Reedy II | **% Solids:**

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane [71-55-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,1,2,2-Tetrachloroethane [79-34-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,1,2-Trichloroethane [79-00-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,1-Dichloroethane [75-34-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,1-Dichloroethene [75-35-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,2,4-Trichlorobenzene [120-82-1] | 12 | U | ppbv | 1 | 12 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,2,4-Trimethylbenzene [95-63-6] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,2-Dibromoethane [106-93-4] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,2-Dichlorobenzene [95-50-1] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,2-Dichloroethane [107-06-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,2-Dichloropropane [78-87-5] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,3,5-Trimethylbenzene [108-67-8] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,3-Butadiene [106-99-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,3-Dichlorobenzene [541-73-1] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 1,4-Dichlorobenzene [106-46-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | QV-01 |
| 1,4-Dioxane [123-91-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 2,2,4-Trimethylpentane [540-84-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 2-Butanone [78-93-3] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 2-Hexanone [591-78-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 2-Propanol [67-63-0] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 3-Chloropropene [107-05-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 4-Ethyltoluene [622-96-8] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| 4-Methyl-2-pentanone [108-10-1] | 26 | U | ppbv | 1 | 26 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Acetone [67-64-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Benzene [71-43-2] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Benzyl chloride [100-44-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Bromodichloromethane [75-27-4] | 24 | U | ppbv | 1 | 24 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Bromoethene [593-60-2] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Bromoform [75-25-2] | 13 | U | ppbv | 1 | 13 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Bromomethane [74-83-9] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Carbon disulfide [75-15-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Carbon tetrachloride [56-23-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Chlorobenzene [108-90-7] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Chloroethane [75-00-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Chloroform [67-66-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Chloromethane [74-87-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| cis-1,2-Dichloroethene [156-59-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| cis-1,3-Dichloropropene [10061-01-5] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Cyclohexane [110-82-7] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Dibromochloromethane [124-48-1] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Dichlorodifluoromethane [75-71-8] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Ethyl Acetate [141-78-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Ethylbenzene [100-41-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Freon 113 [76-13-2] | 30 | U | ppbv | 1 | 30 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Freon 114 [76-14-2] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Heptane [142-82-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Hexachlorobutadiene [87-68-3] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| **Methylene chloride [75-09-2]** | **32** | JB | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | J-01, O-01 |
| Methyl-tert-butyl ether [1634-04-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| n-Hexane [110-54-3] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Propene [115-07-1] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |

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| | | | | | |
|---|---|---|---|---|---|
| **Description:** | 45-01 - MW-11 | **Lab Sample ID:** | B001371-02 | **Received:** | 03/23/10 09:30 |
| **Matrix:** | Air | **Sampled:** | 03/22/10 16:32 | **Work Order:** | B001371 |
| **Project:** | Henderson County Landfills | **Sampled By:** | David Reedy II | **% Solids:** | |

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Styrene [100-42-5] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Tetrachloroethene [127-18-4] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Tetrahydrofuran [109-99-9] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Toluene [108-88-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Total Light Petroleum Hydrocarbons [ECL-0163] | 3900 | U | ppbv | 1 | 3900 | 3900 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| trans-1,2-Dichloroethene [156-60-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| trans-1,3-Dichloropropene [10061-02-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Trichloroethene [79-01-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Trichlorofluoromethane [75-69-4] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Vinyl acetate [108-05-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Vinyl chloride [75-01-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |
| Xylenes (Total) [1330-20-7] | 34 | U | ppbv | 1 | 34 | 40 | 0D01021 | TO-15 | 04/01/10 21:12 | LTS | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *32* | *1* | *31.2* | *103 %* | *70-130* | *0D01021* | *TO-15* | *04/01/10 21:12* | *LTS* | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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**Description:** 45-01 - MW-12 | **Lab Sample ID:** B001371-03 | **Received:** 03/23/10 09:30

**Matrix:** Air | **Sampled:** 03/22/10 16:17 | **Work Order:** B001371

**Project:** Henderson County Landfills | **Sampled By:** David Reedy II | **% Solids:**

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane [71-55-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,1,2,2-Tetrachloroethane [79-34-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,1,2-Trichloroethane [79-00-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,1-Dichloroethane [75-34-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,1-Dichloroethene [75-35-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,2,4-Trichlorobenzene [120-82-1] | 12 | U | ppbv | 1 | 12 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,2,4-Trimethylbenzene [95-63-6] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,2-Dibromoethane [106-93-4] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,2-Dichlorobenzene [95-50-1] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,2-Dichloroethane [107-06-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,2-Dichloropropane [78-87-5] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,3,5-Trimethylbenzene [108-67-8] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,3-Butadiene [106-99-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,3-Dichlorobenzene [541-73-1] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 1,4-Dichlorobenzene [106-46-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | QV-01 |
| 1,4-Dioxane [123-91-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 2,2,4-Trimethylpentane [540-84-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **2-Butanone [78-93-3]** | **21** | J | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 2-Hexanone [591-78-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 2-Propanol [67-63-0] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 3-Chloropropene [107-05-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 4-Ethyltoluene [622-96-8] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| 4-Methyl-2-pentanone [108-10-1] | 26 | U | ppbv | 1 | 26 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **Acetone [67-64-1]** | **40** | | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Benzene [71-43-2] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Benzyl chloride [100-44-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Bromodichloromethane [75-27-4] | 24 | U | ppbv | 1 | 24 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Bromoethene [593-60-2] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Bromoform [75-25-2] | 13 | U | ppbv | 1 | 13 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Bromomethane [74-83-9] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Carbon disulfide [75-15-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Carbon tetrachloride [56-23-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Chlorobenzene [108-90-7] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Chloroethane [75-00-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Chloroform [67-66-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Chloromethane [74-87-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| cis-1,2-Dichloroethene [156-59-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| cis-1,3-Dichloropropene [10061-01-5] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **Cyclohexane [110-82-7]** | **110** | | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Dibromochloromethane [124-48-1] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Dichlorodifluoromethane [75-71-8] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Ethyl Acetate [141-78-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Ethylbenzene [100-41-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Freon 113 [76-13-2] | 30 | U | ppbv | 1 | 30 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Freon 114 [76-14-2] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Heptane [142-82-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Hexachlorobutadiene [87-68-3] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **Methylene chloride [75-09-2]** | **38** | JB | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | J-01, QB-01 |
| Methyl-tert-butyl ether [1634-04-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **n-Hexane [110-54-3]** | **21** | J | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **Propene [115-07-1]** | **41** | | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |

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|---|---|---|---|---|---|
| **Description:** | 45-01 - MW-12 | **Lab Sample ID:** | B001371-03 | **Received:** | 03/23/10 09:30 |
| **Matrix:** | Air | **Sampled:** | 03/22/10 16:17 | **Work Order:** | B001371 |
| **Project:** | Henderson County Landfills | **Sampled By:** | David Reedy II | **% Solids:** | |

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Styrene [100-42-5] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **Tetrachloroethene [127-18-4]** | **22** | J | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Tetrahydrofuran [109-99-9] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Toluene [108-88-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Total Light Petroleum Hydrocarbons [ECL-0163] | 3900 | U | ppbv | 1 | 3900 | 3900 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| trans-1,2-Dichloroethene [156-60-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| trans-1,3-Dichloropropene [10061-02-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Trichloroethene [79-01-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| **Trichlorofluoromethane [75-69-4]** | **54** | | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Vinyl acetate [108-05-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Vinyl chloride [75-01-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |
| Xylenes (Total) [1330-20-7] | 34 | U | ppbv | 1 | 34 | 40 | 0D01021 | TO-15 | 04/01/10 21:45 | LTS | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *32* | *1* | *31.2* | *101 %* | *70-130* | *0D01021* | *TO-15* | *04/01/10 21:45* | *LTS* | |

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**Description:** 45-01 - MW-13 | **Lab Sample ID:** B001371-04 | **Received:** 03/23/10 09:30

**Matrix:** Air | **Sampled:** 03/22/10 16:00 | **Work Order:** B001371

**Project:** Henderson County Landfills | **Sampled By:** David Reedy II | **% Solids:**

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane [71-55-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,1,2,2-Tetrachloroethane [79-34-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,1,2-Trichloroethane [79-00-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,1-Dichloroethane [75-34-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,1-Dichloroethene [75-35-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,2,4-Trichlorobenzene [120-82-1] | 12 | U | ppbv | 1 | 12 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,2,4-Trimethylbenzene [95-63-6] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,2-Dibromoethane [106-93-4] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,2-Dichlorobenzene [95-50-1] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,2-Dichloroethane [107-06-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,2-Dichloropropane [78-87-5] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,3,5-Trimethylbenzene [108-67-8] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,3-Butadiene [106-99-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,3-Dichlorobenzene [541-73-1] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 1,4-Dichlorobenzene [106-46-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | QV-01 |
| 1,4-Dioxane [123-91-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 2,2,4-Trimethylpentane [540-84-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 2-Butanone [78-93-3] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 2-Hexanone [591-78-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 2-Propanol [67-63-0] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 3-Chloropropene [107-05-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 4-Ethyltoluene [622-96-8] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| 4-Methyl-2-pentanone [108-10-1] | 26 | U | ppbv | 1 | 26 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Acetone [67-64-1] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Benzene [71-43-2] | 15 | U | ppbv | 1 | 15 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Benzyl chloride [100-44-7] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Bromodichloromethane [75-27-4] | 24 | U | ppbv | 1 | 24 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Bromoethene [593-60-2] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Bromoform [75-25-2] | 13 | U | ppbv | 1 | 13 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Bromomethane [74-83-9] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Carbon disulfide [75-15-0] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Carbon tetrachloride [56-23-5] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Chlorobenzene [108-90-7] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Chloroethane [75-00-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Chloroform [67-66-3] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Chloromethane [74-87-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| cis-1,2-Dichloroethene [156-59-2] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| cis-1,3-Dichloropropene [10061-01-5] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Cyclohexane [110-82-7] | 18 | U | ppbv | 1 | 18 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Dibromochloromethane [124-48-1] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Dichlorodifluoromethane [75-71-8] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Ethyl Acetate [141-78-6] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Ethylbenzene [100-41-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Freon 113 [76-13-2] | 30 | U | ppbv | 1 | 30 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Freon 114 [76-14-2] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Heptane [142-82-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Hexachlorobutadiene [87-68-3] | 14 | U | ppbv | 1 | 14 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| **Methylene chloride [75-09-2]** | **34** | JB | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | O-01, QB-01 |
| Methyl-tert-butyl ether [1634-04-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| n-Hexane [110-54-3] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Propene [115-07-1] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |

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| | | | | | |
|---|---|---|---|---|---|
| **Description:** | 45-01 - MW-13 | **Lab Sample ID:** | B001371-04 | **Received:** | 03/23/10 09:30 |
| **Matrix:** | Air | **Sampled:** | 03/22/10 16:00 | **Work Order:** | B001371 |
| **Project:** | Henderson County Landfills | **Sampled By:** | David Reedy II | **% Solids:** | |

## Volatile Organic Compounds by GCMS

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Styrene [100-42-5] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Tetrachloroethene [127-18-4] | 22 | U | ppbv | 1 | 22 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Tetrahydrofuran [109-99-9] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Toluene [108-88-3] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Total Light Petroleum Hydrocarbons [ECL-0163] | 3900 | U | ppbv | 1 | 3900 | 3900 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| trans-1,2-Dichloroethene [156-60-5] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| trans-1,3-Dichloropropene [10061-02-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Trichloroethene [79-01-6] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Trichlorofluoromethane [75-69-4] | 21 | U | ppbv | 1 | 21 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Vinyl acetate [108-05-4] | 16 | U | ppbv | 1 | 16 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Vinyl chloride [75-01-4] | 19 | U | ppbv | 1 | 19 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |
| Xylenes (Total) [1330-20-7] | 34 | U | ppbv | 1 | 34 | 40 | 0D01021 | TO-15 | 04/01/10 22:19 | LTS | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *31* | *1* | *31.2* | *98.3 %* | *70-130* | *0D01021* | *TO-15* | *04/01/10 22:19* | *LTS* | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

## QUALITY CONTROL

### Volatile Organic Compounds by GCMS - Quality Control

*Batch 0D01021 - NO PREP*

**Blank (0D01021-BLK1)** Prepared: 04/01/2010 12:15 Analyzed: 04/01/2010 14:00

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 1.2 | U | 2.5 | ppbv | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,1,2-Trichloroethane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,1-Dichloroethane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,1-Dichloroethene | 1.2 | U | 2.5 | ppbv | | | | | | | |
| 1,2,4-Trichlorobenzene | 0.74 | U | 2.5 | ppbv | | | | | | | |
| 1,2,4-Trimethylbenzene | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,2-Dibromoethane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,2-Dichlorobenzene | 0.99 | U | 2.5 | ppbv | | | | | | | |
| 1,2-Dichloroethane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,2-Dichloropropane | 1.4 | U | 2.5 | ppbv | | | | | | | |
| 1,3,5-Trimethylbenzene | 1.1 | U | 2.5 | ppbv | | | | | | | |
| 1,3-Butadiene | 1.3 | U | 2.5 | ppbv | | | | | | | |
| 1,3-Dichlorobenzene | 0.93 | U | 2.5 | ppbv | | | | | | | |
| 1,4-Dichlorobenzene | 0.85 | U | 2.5 | ppbv | | | | | | | |
| 1,4-Dioxane | 1.2 | U | 2.5 | ppbv | | | | | | | |
| 2,2,4-Trimethylpentane | 1.2 | U | 2.5 | ppbv | | | | | | | |
| 2-Butanone | 1.3 | U | 2.5 | ppbv | | | | | | | |
| 2-Hexanone | 1.3 | U | 2.5 | ppbv | | | | | | | |
| 2-Propanol | 1.2 | U | 2.5 | ppbv | | | | | | | |
| 3-Chloropropene | 1.2 | U | 2.5 | ppbv | | | | | | | |
| 4-Ethyltoluene | 0.98 | U | 2.5 | ppbv | | | | | | | |
| 4-Methyl-2-pentanone | 1.6 | U | 2.5 | ppbv | | | | | | | |
| Acetone | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Benzene | 0.93 | U | 2.5 | ppbv | | | | | | | |
| Benzyl chloride | 0.87 | U | 2.5 | ppbv | | | | | | | |
| Bromodichloromethane | 1.5 | U | 2.5 | ppbv | | | | | | | |
| Bromoethene | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Bromoform | 0.84 | U | 2.5 | ppbv | | | | | | | |
| Bromomethane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| **Carbon disulfide** | **2.6** | | 2.5 | ppbv | | | | | | | |
| Carbon tetrachloride | 1.1 | U | 2.5 | ppbv | | | | | | | |
| Chlorobenzene | 0.97 | U | 2.5 | ppbv | | | | | | | |
| Chloroethane | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Chloroform | 1.1 | U | 2.5 | ppbv | | | | | | | |
| Chloromethane | 1.2 | U | 2.5 | ppbv | | | | | | | |
| cis-1,2-Dichloroethene | 1.1 | U | 2.5 | ppbv | | | | | | | |
| cis-1,3-Dichloropropene | 1.3 | U | 2.5 | ppbv | | | | | | | |
| Cyclohexane | 1.1 | U | 2.5 | ppbv | | | | | | | |
| Dibromochloromethane | 1.4 | U | 2.5 | ppbv | | | | | | | |
| Dichlorodifluoromethane | 1.3 | U | 2.5 | ppbv | | | | | | | |
| Ethyl Acetate | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Ethylbenzene | 0.99 | U | 2.5 | ppbv | | | | | | | |
| Freon 113 | 1.9 | U | 2.5 | ppbv | | | | | | | |
| Freon 114 | 0.99 | U | 2.5 | ppbv | | | | | | | |
| Heptane | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Hexachlorobutadiene | 0.89 | U | 2.5 | ppbv | | | | | | | |
| m,p-Xylenes | 2.1 | U | 5.0 | ppbv | | | | | | | |
| **Methylene chloride** | **3.3** | | 2.5 | ppbv | | | | | | | |

## QUALITY CONTROL

### Volatile Organic Compounds by GCMS - Quality Control

*Batch 0D01021 - NO PREP*

**Blank (0D01021-BLK1) Continued** Prepared: 04/01/2010 12:15 Analyzed: 04/01/2010 14:00

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl-tert-butyl ether | 0.98 | U | 2.5 | ppbv | | | | | | | |
| n-Hexane | 1.0 | U | 2.5 | ppbv | | | | | | | |
| o-Xylene | 1.1 | U | 2.5 | ppbv | | | | | | | |
| Propene | 1.3 | U | 2.5 | ppbv | | | | | | | |
| Styrene | 1.0 | U | 2.5 | ppbv | | | | | | | |
| Tetrachloroethene | 1.4 | U | 2.5 | ppbv | | | | | | | |
| Tetrahydrofuran | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Toluene | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Total Light Petroleum Hydrocarbons | 240 | U | 240 | ppbv | | | | | | | |
| trans-1,2-Dichloroethene | 1.2 | U | 2.5 | ppbv | | | | | | | |
| trans-1,3-Dichloropropene | 1.3 | U | 2.5 | ppbv | | | | | | | |
| Trichloroethene | 1.3 | U | 2.5 | ppbv | | | | | | | |
| Trichlorofluoromethane | 1.3 | U | 2.5 | ppbv | | | | | | | |
| Vinyl acetate | 1.0 | U | 2.5 | ppbv | | | | | | | |
| Vinyl chloride | 1.2 | U | 2.5 | ppbv | | | | | | | |
| Xylenes (Total) | 2.1 | U | 2.5 | ppbv | | | | | | | |
| *Surrogate: 4-Bromofluorobenzene* | *28* | | | *ppbv* | *31.2* | | *90.5* | *70-130* | | | |

**LCS (0D01021-BS1)** Prepared: 04/01/2010 12:15 Analyzed: 04/01/2010 15:11

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 11 | | 2.5 | ppbv | 10.0 | | 111 | 44-153 | | | |
| 1,2-Dichlorobenzene | 10 | | 2.5 | ppbv | 10.0 | | 104 | 29-165 | | | |
| Chlorobenzene | 10 | | 2.5 | ppbv | 10.0 | | 104 | 59-130 | | | |
| Propene | 13 | | 2.5 | ppbv | 10.0 | | 127 | 70-130 | | | |
| Toluene | 10 | | 2.5 | ppbv | 10.0 | | 104 | 39-172 | | | |
| Trichloroethene | 9.5 | | 2.5 | ppbv | 10.0 | | 94.8 | 52-130 | | | |
| *Surrogate: 4-Bromofluorobenzene* | *29* | | | *ppbv* | *31.2* | | *92.6* | *70-130* | | | |

**Matrix Spike (0D01021-MS1)** Prepared: 04/01/2010 12:15 Analyzed: 04/01/2010 23:28

**Source: B001130-01**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 11 | | 2.5 | ppbv | 10.0 | 1.2 U | 114 | 44-153 | | | |
| Benzene | 11 | | 2.5 | ppbv | 10.0 | 0.93 U | 108 | 50-157 | | | |
| Chlorobenzene | 11 | | 2.5 | ppbv | 10.0 | 0.97 U | 110 | 59-130 | | | |
| Toluene | 11 | | 2.5 | ppbv | 10.0 | 1.2 U | 114 | 39-172 | | | |
| Trichloroethene | 12 | | 2.5 | ppbv | 10.0 | 3.2 | 89.7 | 52-130 | | | |
| *Surrogate: 4-Bromofluorobenzene* | *30* | | | *ppbv* | *31.2* | | *95.3* | *70-130* | | | |

**Matrix Spike Dup (0D01021-MSD1)** Prepared: 04/01/2010 12:15 Analyzed: 04/02/2010 00:03

**Source: B001130-01**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 12 | | 2.5 | ppbv | 10.0 | 1.2 U | 120 | 44-153 | 5.04 | 17 | |
| Benzene | 12 | | 2.5 | ppbv | 10.0 | 0.93 U | 116 | 50-157 | 6.79 | 19 | |

## QUALITY CONTROL

### Volatile Organic Compounds by GCMS - Quality Control

*Batch 0D01021 - NO PREP*

**Matrix Spike Dup (0D01021-MSD1) Continued** Prepared: 04/01/2010 12:15 Analyzed: 04/02/2010 00:03

**Source: B001130-01**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chlorobenzene | 11 | | 2.5 | ppbv | 10.0 | 0.97 U | 113 | 59-130 | 2.24 | 15 | |
| Toluene | 12 | | 2.5 | ppbv | 10.0 | 1.2 U | 116 | 39-172 | 1.65 | 23 | |
| Trichloroethene | 12 | | 2.5 | ppbv | 10.0 | 3.2 | 92.5 | 52-130 | 2.28 | 14 | |
| *Surrogate: 4-Bromofluorobenzene* | *30* | | | *ppbv* | *31.2* | | *95.4* | *70-130* | | | |

## FLAGS/NOTES AND DEFINITIONS

| | |
|---|---|
| B | The analyte was detected in the associated method blank. |
| D | The sample was analyzed at dilution. |
| J | The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable. |
| U | The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable. |
| E | The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate. |
| MRL | Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content. |
| J-01 | Result is estimated due to positive results in the associated method blank. |
| O-01 | This compound is a common laboratory contaminant. |
| QB-01 | The method blank had a positive result for the analyte; however, the concentration in the method blank is less than 10% of the sample result, which minimizes the impact of the deviation. |
| QV-01 | The associated continuing calibration verification standard exhibited high bias; since the result is ND, the impact on data quality is minimal. |

# ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr.
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 211
Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

1015 Passport Way
Cary, NC 27513
(919) 677-1669 Fax (919) 677-9846

Page 1 of 1

| | |
|---|---|
| Client Name: Golder Associates, Inc. (GO007) | Project Number: 083965060 ~~10.100~~ 09.900 |
| Address: The Wingate Building 4900 Koger Blvd., Suite 140 | Project Name/Desc: Henderson County Landfills |
| City/ST/Zip: Greensboro, NC 27407 | PO # / Billing Info: |
| Tel: (336) 852-4903 Fax: (336) 852-4904 | Reporting Contact: David Reedy II |
| Sampler(s) Name, Affiliation (Print): David Reedy, Golder | Billing Contact: Accounts Payable |
| Sampler(s) Signature: [signature] | Facility # (if required): |

Requested Analyses: TO15 (SUMMA)

Requested Turnaround Times
Note: Rush requests subject to acceptance by the facility
✓ Standard
___ Expedited
Due ___/___/___

Lab Workorder: B001371

| Item # | Sample ID (Field Identification) | Collection Date | Collection Time | Comp / Grab | Matrix (see codes) | Total # of Containers | TO15 (SUMMA) | Sample Comments |
|---|---|---|---|---|---|---|---|---|
| | 45-01 - MW-10 | 3-26-10 | 1540 | Grab | AIR | 1 | X | |
| | 45-01 - MW-11 | 3-26-10 | 1632 | Grab | AIR | 1 | X | |
| | 45-01 - MW-12 | 3-26-10 | 1617 | Grab | AIR | 1 | X | |
| | 45-01 - MW-13 | 3-26-10 | 1600 | Grab | AIR | 1 | X | |
| | | | | | | <-- Total # of Containers | | |

Preservation (See Codes) (Combine as necessary)

| Sample Kit Prepared By | Date/Time | Relinquished By | Date/Time | Received By | Date/Time |
|---|---|---|---|---|---|
| | | [signature] | 3-26-10/1715 | [signature] | 3/23/10 9:30 |
| | | Relinquished By | Date/Time | Received By | Date/Time |
| | | Relinquished By | Date/Time | Received By | Date/Time |

Comments: 1. 4 boxes / Please provide a level 2 report
2. Unit rates per "basic ordering agreement" dated April 9, 2004 and the 2010 Price List
3. Need 7-10 day TAT w/o surcharge.

Cooler #'s & Temps on Receipt: N/A

Condition Upon Receipt: ___ Acceptable ___ Unacceptable

Matrix: GW-Groundwater SO-Soil SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments)

Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

LOA per Dusty Reedy: [signature]

Approved By: _____

# APPENDIX B

# MARCH 2010 SAMPLING LOGS

Golder Associates

DATE: 3/23/2010

## GROUNDWATER SAMPLING LOG

**Project Name:** Henderson County LF
**Project No./Phase No.:** 0839-650609.800
**Well ID:** MW-10 (background)
**Sampler(s):** D. Reedy/R. Stringfellow
**Well Diameter:** 2 inches
**Int. Depth to Water:** 28.24 feet
**Depth to Bottom:** 46.50 feet
**Total Water Column:** 18.26 feet
**Well Volume:** 3.0 gallons
**3x Well Volume:** 9.0 gallons
**Well Location:** overlooking C&D landfill
**Equipment:** Disposable Poly Bailer, YSI 556, Hach 2100P, WL Meter

| Time | pH (S.U.) | Cond. (mS/cm) | Turb. (NTU) | Temp. (°C) | Vol. (gallons) |
|---|---|---|---|---|---|
| 9:20 | 6.44 | 35 | 223 | 11.79 | 0.0 |
| 9:26 | 5.98 | 42 | 319 | 13.10 | 3.0 |
| 9:32 | 5.78 | 44 | 533 | 13.11 | 6.0 |
| 9:37 | 5.63 | 44 | 645 | 13.28 | 9.0 |
| ***Sampled 3/24/10 at 9:10*** | | | | | |
| 9:10 | 7.47 | 42 | 6.36 | 13.36 | -- |
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**Comments (weather conditions, color, type of sample, purge-water management, etc.):**
Weather - Mean Temp: 52°F, Average Humidity: 57%, Some Wind, Clear

**Signature:** [signature] **Date:** 3-23-10

**QA/QC Sign Off:** [signature] **Date:** 5-20-10

Golder Associates

DATE: 3/23/2010

## GROUNDWATER SAMPLING LOG

**Project Name:** Henderson County LF
**Project No./Phase No.:** 0839-650609.800
**Well ID:** MW-11
**Sampler(s):** D. Reedy/R. Stringfellow
**Well Diameter:** 2 inches
**Int. Depth to Water:** 38.83 feet
**Depth to Bottom:** 48.20 feet
**Total Water Column:** 9.37 feet
**Well Volume:** 1.5 gallons
**3x Well Volume:** 4.5 gallons
**Well Location:** at base of C&D landfill in sediment basin
**Equipment:** Disposable Poly Bailer, YSI 556, Hach 2100P, WL Meter

| Time | pH (S.U.) | Cond. (mS/cm) | Turb. (NTU) | Temp. (°C) | Vol. (gallons) |
|---|---|---|---|---|---|
| 14:38 | 5.76 | 186 | 15.5 | 15.42 | 0.0 |
| 14:40 | 5.40 | 217 | 55.2 | 15.65 | 1.5 |
| 14:43 | 5.37 | 171 | 23.4 | 14.70 | 3.0 |
| 14:45 | 5.28 | 167 | 34.5 | 14.39 | 4.5 |
| ***Sampled 3/24/10 at 10:00*** | | | | | |
| 10:00 | 5.64 | 170 | 16.6 | 14.12 | -- |
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**Comments (weather conditions, color, type of sample, purge-water management, etc.):**
*Weather - Mean Temp: 52°F, Average Humidity: 57%, Some Wind, Clear*

**Signature:** [signature] **Date:** 3-23-10

**QA/QC Sign Off:** [signature] **Date:** 5-20-10

Golder Associates

DATE: 3/23/2010

## GROUNDWATER SAMPLING LOG

**Project Name:** Henderson County LF
**Project No./Phase No.:** 0839-650609.800
**Well ID:** MW-12
**Sampler(s):** D. Reedy/R. Stringfellow
**Well Diameter:** 2 inches
**Int. Depth to Water:** 49.49 feet
**Depth to Bottom:** 61.71 feet
**Total Water Column:** 12.22 feet
**Well Volume:** 2.0 gallons
**3x Well Volume:** 6.0 gallons
**Well Location:** alond access road below C&D landfill
**Equipment:** Disposable Poly Bailer, YSI 556, Hach 2100P, WL Meter

| Time | pH (S.U.) | Cond. (mS/cm) | Turb. (NTU) | Temp. (°C) | Vol. (gallons) |
|---|---|---|---|---|---|
| 14:06 | 5.57 | 243 | 25.0 | 14.50 | 0.0 |
| 14:11 | 5.36 | 260 | >1000 | 13.77 | 2.0 |
| 14:15 | 5.32 | 261 | >1000 | 13.79 | 4.0 |
| 14:19 | 5.63 | 256 | >1000 | 13.83 | 6.0 |
| ***Sampled 3/24/10 at 9:45*** | | | | | |
| 9:45 | 5.90 | 249 | 51.1 | 13.13 | -- |
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**Comments (weather conditions, color, type of sample, purge-water management, etc.):**
Weather - Mean Temp: 52°F, Average Humidity: 57%, Some Wind, Clear

**Signature:** Paul Reedy **Date:** 3-23-10

**QA/QC Sign Off:** [illegible] **Date:** 5-20-10

Golder Associates

DATE: 3/23/2010

## GROUNDWATER SAMPLING LOG

**Project Name:** Henderson County LF
**Project No./Phase No.:** 0839-650609.800
**Well ID:** MW-13
**Sampler(s):** D. Reedy/R. Stringfellow
**Well Diameter:** 2 inches
**Int. Depth to Water:** 47.07 feet
**Depth to Bottom:** 90.60 feet
**Total Water Column:** 43.53 feet
**Well Volume:** 7.1 gallons
**3x Well Volume:** 21.3 gallons
**Well Location:** alond access road below C&D landfill
**Equipment:** Disposable Poly Bailer, YSI 556, Hach 2100P, WL Meter

| Time | pH (S.U.) | Cond. (mS/cm) | Turb. (NTU) | Temp. (°C) | Vol. (gallons) |
|---|---|---|---|---|---|
| 9:51 | 5.90 | 153 | 12.9 | 12.16 | 0.0 |
| 10:05 | 5.63 | 176 | 77.0 | 12.53 | 7.1 |
| 10:20 | 5.67 | 177 | 497 | 12.87 | 14.2 |
| 10:46 | 5.63 | 156 | >1000 | 12.65 | 21.3 |
| ***Sampled 3/24/10 at 9:30*** | | | | | |
| 9:30 | 6.61 | 191 | 19.7 | 12.31 | -- |
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| | | | | | |

**Comments (weather conditions, color, type of sample, purge-water management, etc.):**
Weather - Mean Temp: 52°F, Average Humidity: 57%, Some Wind, Clear

**Signature:** Paul Reedy **Date:** 3-23-10

**QA/QC Sign Off:** R. Stringfellow **Date:** 5-20-10

# APPENDIX C

## ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES COLLECTED DURING THE MARCH 2010 SAMPLING EVENT

**Environmental Conservation Laboratories, Inc.**
**102-A Woodwinds Industrial Court**
**Cary NC, 27511**
**Phone: 919.467.3090 FAX: 919.467.3515**
**www.encolabs.com**

Tuesday, April 6, 2010

Golder Associates, Inc. (GO007)

Attn: Dusty Reedy

The Wingate Building 4900 Koger Blvd., Suite 140

Greensboro, NC 27407

**RE: Laboratory Results for**
**Project Number: 08396506010.100, Project Name/Desc: Henderson Co. LF C&D**
**ENCO Workorder: C002861**

Dear Dusty Reedy,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Thursday, March 25, 2010.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Stephanie Franz
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 35.

# PROJECT NARRATIVE

Date: 06 April 2010
Client: Golder Associates, Inc. (GO007)
Project: Henderson Co. LF C&D
Lab ID: C002861

Overview

This report is an amendment to the original report dated 05 April 2010. This report was revised to divide the report into C&D parameters and Indicator parameters.

Environmental Conservation Laboratories, Inc. (ENCO) analyzed all submitted samples in accordance with the methods referenced in the laboratory report. Any particular difficulties encountered during sample handling by ENCO are discussed in the QC Remarks section below.

Quality Control Samples

The spike recovery of Total Alkalinity could not be accurately calculated in the MS and MSD samples due to the high concentration of analyte in the source sample. The QC batch was approved based on acceptable LCS recovery of this analyte.

The spike recovery of Trichloroethane was outside of control limits in the MS and MSD samples. The QC batch was approved based on acceptable LCS recovery of this analyte.

The spike recoveries of Manganese and Selenium in the 6010C and 6020A Post Spike samples were outside of control limits due to confirmed matrix effects.

Quality Control Remarks

No Comments

Other Comments

All samples received under this work order arrived in acceptable conditions. The samples were not checked for residual chlorine, as it is not required.

The analytical data presented in this report are consistent with the methods as referenced in the analytical report. Any exceptions or deviations are noted in the QC remarks section of this narrative or in the Flags/Notes and Definitions section of the report.

Released By:
Environmental Conservation Laboratories, Inc.

Stephanie Franz
Project Manager

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## SAMPLE SUMMARY/LABORATORY CHRONICLE

**Client ID: 4501-MW10 | Lab ID: C002861-01 | Sampled: 03/24/10 09:10 | Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 04/21/10 | 03/30/10 07:22 | 3/30/2010 11:57 |
| EPA 310.2 | 04/07/10 | 04/02/10 07:57 | 4/2/2010 11:49 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:42 |
| EPA 6020A | 09/20/10 | 03/26/10 10:33 | 3/30/2010 11:40 |
| EPA 7470A | 04/21/10 | 03/26/10 10:08 | 3/26/2010 15:35 |
| EPA 8260B | 04/07/10 | 03/26/10 09:19 | 3/26/2010 16:54 |
| SM 2540C | 03/31/10 | 03/30/10 16:45 | 3/30/2010 16:45 |
| SM4500-Cl/E | 04/21/10 | 03/26/10 09:30 | 3/26/2010 11:17 |

**Client ID: 4501-MW11 (MS/MSD) | Lab ID: C002861-02 | Sampled: 03/24/10 10:00 | Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 04/21/10 | 03/30/10 07:22 | 3/30/2010 13:02 |
| EPA 310.2 | 04/07/10 | 04/02/10 07:57 | 4/2/2010 11:50 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:29 |
| EPA 6020A | 09/20/10 | 03/26/10 10:33 | 3/30/2010 11:22 |
| EPA 7470A | 04/21/10 | 03/26/10 10:08 | 3/26/2010 15:20 |
| EPA 8260B | 04/07/10 | 03/26/10 09:19 | 3/26/2010 19:21 |
| SM 2540C | 03/31/10 | 03/25/10 17:45 | 3/25/2010 17:45 |
| SM4500-Cl/E | 04/21/10 | 03/26/10 09:30 | 3/26/2010 11:18 |

**Client ID: 4501-MW12 | Lab ID: C002861-03 | Sampled: 03/24/10 09:45 | Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 04/21/10 | 03/30/10 07:22 | 3/30/2010 13:45 |
| EPA 310.2 | 04/07/10 | 04/02/10 07:57 | 4/2/2010 11:52 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:44 |
| EPA 6020A | 09/20/10 | 03/26/10 10:33 | 3/30/2010 11:44 |
| EPA 7470A | 04/21/10 | 03/26/10 10:08 | 3/26/2010 15:42 |
| EPA 8260B | 04/07/10 | 03/26/10 09:19 | 3/26/2010 19:50 |
| SM 2540C | 03/31/10 | 03/30/10 16:45 | 3/30/2010 16:45 |
| SM4500-Cl/E | 04/21/10 | 03/26/10 09:30 | 3/26/2010 11:45 |

**Client ID: 4501-MW13 | Lab ID: C002861-04 | Sampled: 03/24/10 09:30 | Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 04/21/10 | 03/30/10 07:22 | 3/30/2010 14:07 |
| EPA 310.2 | 04/07/10 | 04/02/10 07:57 | 4/2/2010 11:53 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:46 |
| EPA 6020A | 09/20/10 | 03/26/10 10:33 | 3/30/2010 11:47 |
| EPA 7470A | 04/21/10 | 03/26/10 10:08 | 3/26/2010 15:45 |
| EPA 8260B | 04/07/10 | 03/26/10 09:19 | 3/26/2010 20:20 |
| SM 2540C | 03/31/10 | 03/30/10 16:45 | 3/30/2010 16:45 |
| SM4500-Cl/E | 04/21/10 | 03/26/10 09:30 | 3/26/2010 11:45 |

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## NORTH CAROLINA SWS SAMPLE DETECTION SUMMARY

**Client ID: 4501-MW10** **Lab ID: C002861-01**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Barium - Total | 2.75 | J | 1 | 1.00 | 10.0 | 100 | ug/L | EPA 6010C | |
| Beryllium - Total | 0.178 | J | 1 | 0.100 | 1.00 | 1 | ug/L | EPA 6010C | |
| Iron - Total | 151 | J | 1 | 22.0 | 50.0 | 300 | ug/L | EPA 6010C | |
| Manganese - Total | 4.51 | J | 1 | 1.10 | 10.0 | 50 | ug/L | EPA 6010C | |
| Total Alkalinity | 9.6 | J | 1 | 8.0 | 15 | NE | mg/L | EPA 310.2 | |
| Total Dissolved Solids | 22 | | 1 | 10 | 10 | NE | mg/L | SM 2540C | |
| Zinc - Total | 13.2 | | 1 | 3.80 | 10.0 | 10 | ug/L | EPA 6010C | |

**Client ID: 4501-MW11 (MS/MSD)** **Lab ID: C002861-02**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 1,4-Dichlorobenzene | 0.46 | J | 1 | 0.10 | 1.0 | 1 | ug/L | EPA 8260B | |
| Acetone | 19 | J | 1 | 1.5 | 5.0 | 100 | ug/L | EPA 8260B | |
| Barium - Total | 33.7 | J | 1 | 1.00 | 10.0 | 100 | ug/L | EPA 6010C | |
| Beryllium - Total | 1.46 | | 1 | 0.100 | 1.00 | 1 | ug/L | EPA 6010C | |
| Chloride | 1.7 | J | 1 | 1.2 | 5.0 | NE | mg/L | SM4500-Cl/E | |
| cis-1,2-Dichloroethene | 5.3 | | 1 | 0.075 | 1.0 | 5 | ug/L | EPA 8260B | |
| Cobalt - Total | 4.30 | J | 1 | 1.10 | 10.0 | 10 | ug/L | EPA 6010C | |
| Copper - Total | 2.76 | J | 1 | 1.60 | 10.0 | 10 | ug/L | EPA 6010C | |
| Iron - Total | 2050 | | 1 | 22.0 | 50.0 | 300 | ug/L | EPA 6010C | |
| Manganese - Total | 1780 | | 1 | 1.10 | 10.0 | 50 | ug/L | EPA 6010C | |
| Mercury - Total | 0.0586 | J | 1 | 0.0540 | 0.200 | 0.2 | ug/L | EPA 7470A | |
| Sulfate as SO4 | 5.3 | J | 1 | 0.12 | 5.0 | 250000 | mg/L | EPA 300.0 | |
| Tetrachloroethene | 3.4 | | 1 | 0.099 | 1.0 | 1 | ug/L | EPA 8260B | |
| Total Alkalinity | 57 | | 1 | 8.0 | 15 | NE | mg/L | EPA 310.2 | |
| Total Dissolved Solids | 110 | | 1 | 10 | 10 | NE | mg/L | SM 2540C | |
| Trichloroethene | 0.90 | J | 1 | 0.13 | 1.0 | 1 | ug/L | EPA 8260B | |
| Vanadium - Total | 2.62 | J | 1 | 1.40 | 10.0 | 25 | ug/L | EPA 6010C | |
| Xylenes (Total) | 0.62 | J | 1 | 0.22 | 1.0 | 5 | ug/L | EPA 8260B | |
| Zinc - Total | 20.0 | | 1 | 3.80 | 10.0 | 10 | ug/L | EPA 6010C | |

**Client ID: 4501-MW12** **Lab ID: C002861-03**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethane | 0.47 | J | 1 | 0.050 | 1.0 | 5 | ug/L | EPA 8260B | |
| Acetone | 13 | J | 1 | 1.5 | 5.0 | 100 | ug/L | EPA 8260B | |
| Barium - Total | 14.3 | J | 1 | 1.00 | 10.0 | 100 | ug/L | EPA 6010C | |
| Beryllium - Total | 0.130 | J | 1 | 0.100 | 1.00 | 1 | ug/L | EPA 6010C | |
| Chloride | 7.3 | | 1 | 1.2 | 5.0 | NE | mg/L | SM4500-Cl/E | |
| Iron - Total | 830 | | 1 | 22.0 | 50.0 | 300 | ug/L | EPA 6010C | |
| Lead - Total | 2.18 | J | 1 | 1.90 | 10.0 | 10 | ug/L | EPA 6010C | |
| Manganese - Total | 142 | | 1 | 1.10 | 10.0 | 50 | ug/L | EPA 6010C | |
| Mercury - Total | 0.144 | J | 1 | 0.0540 | 0.200 | 0.2 | ug/L | EPA 7470A | |
| Methylene chloride | 0.92 | J | 1 | 0.070 | 1.0 | 1 | ug/L | EPA 8260B | |
| Sulfate as SO4 | 16 | J | 1 | 0.12 | 5.0 | 250000 | mg/L | EPA 300.0 | |
| Tetrachloroethene | 1.6 | | 1 | 0.099 | 1.0 | 1 | ug/L | EPA 8260B | |
| Total Alkalinity | 76 | | 1 | 8.0 | 15 | NE | mg/L | EPA 310.2 | |
| Total Dissolved Solids | 170 | | 1 | 10 | 10 | NE | mg/L | SM 2540C | |
| Trichloroethene | 0.52 | J | 1 | 0.13 | 1.0 | 1 | ug/L | EPA 8260B | |
| Trichlorofluoromethane | 2.6 | | 1 | 0.15 | 1.0 | 1 | ug/L | EPA 8260B | |
| Vanadium - Total | 1.57 | J | 1 | 1.40 | 10.0 | 25 | ug/L | EPA 6010C | |

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| Client ID: 4501-MW12 | | | | Lab ID: C002861-03 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Analyte** | **Results** | **Flag** | **DF** | **MDL** | **MRL** | **NC SWSL** | **Units** | **Method** | **Notes** |
| Zinc - Total | 21.5 | | 1 | 3.80 | 10.0 | 10 | ug/L | EPA 6010C | |

| Client ID: 4501-MW13 | | | | Lab ID: C002861-04 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Analyte** | **Results** | **Flag** | **DF** | **MDL** | **MRL** | **NC SWSL** | **Units** | **Method** | **Notes** |
| 1,4-Dichlorobenzene | 0.45 | J | 1 | 0.10 | 1.0 | 1 | ug/L | EPA 8260B | |
| Barium - Total | 12.1 | J | 1 | 1.00 | 10.0 | 100 | ug/L | EPA 6010C | |
| Chloride | 2.5 | J | 1 | 1.2 | 5.0 | NE | mg/L | SM4500-Cl/E | |
| cis-1,2-Dichloroethene | 0.84 | J | 1 | 0.075 | 1.0 | 5 | ug/L | EPA 8260B | |
| Iron - Total | 564 | | 1 | 22.0 | 50.0 | 300 | ug/L | EPA 6010C | |
| Manganese - Total | 111 | | 1 | 1.10 | 10.0 | 50 | ug/L | EPA 6010C | |
| Sulfate as SO4 | 2.1 | J | 1 | 0.12 | 5.0 | 250000 | mg/L | EPA 300.0 | |
| Tetrachloroethene | 0.56 | J | 1 | 0.099 | 1.0 | 1 | ug/L | EPA 8260B | |
| Total Alkalinity | 75 | | 1 | 8.0 | 15 | NE | mg/L | EPA 310.2 | |
| Total Dissolved Solids | 140 | | 1 | 10 | 10 | NE | mg/L | SM 2540C | |
| Trichlorofluoromethane | 1.0 | | 1 | 0.15 | 1.0 | 1 | ug/L | EPA 8260B | |
| Zinc - Total | 12.2 | | 1 | 3.80 | 10.0 | 10 | ug/L | EPA 6010C | |

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## ANALYTICAL RESULTS

**Description:** 4501-MW10 **Lab Sample ID:** C002861-01 **Received:** 03/25/10 10:50
**Matrix:** Ground Water **Sampled:** 03/24/10 09:10 **Work Order:** C002861
**Project:** Henderson Co. LF C&D **Sampled By:** Ryan Stringfellow

### Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane [630-20-6] ^ | 0.091 | U | ug/L | 1 | 0.091 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,1,1-Trichloroethane [71-55-6] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,1,2,2-Tetrachloroethane [79-34-5] ^ | 0.085 | U | ug/L | 1 | 0.085 | 1.0 | 3 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,1,2-Trichloroethane [79-00-5] ^ | 0.068 | U | ug/L | 1 | 0.068 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,1-Dichloroethane [75-34-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,1-Dichloroethene [75-35-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,2,3-Trichloropropane [96-18-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,2-Dibromo-3-chloropropane [96-12-8] ^ | 0.48 | U | ug/L | 1 | 0.48 | 1.0 | 13 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,2-Dibromoethane [106-93-4] ^ | 0.42 | U | ug/L | 1 | 0.42 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,2-Dichlorobenzene [95-50-1] ^ | 0.052 | U | ug/L | 1 | 0.052 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,2-Dichloroethane [107-06-2] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,2-Dichloropropane [78-87-5] ^ | 0.098 | U | ug/L | 1 | 0.098 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 1,4-Dichlorobenzene [106-46-7] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 2-Butanone [78-93-3] ^ | 1.0 | U | ug/L | 1 | 1.0 | 5.0 | 100 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 2-Hexanone [591-78-6] ^ | 0.69 | U | ug/L | 1 | 0.69 | 5.0 | 50 | EPA 8260B | 03/26/10 16:54 | JKG | |
| 4-Methyl-2-pentanone [108-10-1] ^ | 1.1 | U | ug/L | 1 | 1.1 | 5.0 | 100 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Acetone [67-64-1] ^ | 1.5 | U | ug/L | 1 | 1.5 | 5.0 | 100 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Acrylonitrile [107-13-1] ^ | 2.1 | U | ug/L | 1 | 2.1 | 10 | 200 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Benzene [71-43-2] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Bromochloromethane [74-97-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 3 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Bromodichloromethane [75-27-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Bromoform [75-25-2] ^ | 0.20 | U | ug/L | 1 | 0.20 | 1.0 | 3 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Bromomethane [74-83-9] ^ | 0.28 | U | ug/L | 1 | 0.28 | 1.0 | 10 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Carbon disulfide [75-15-0] ^ | 0.54 | U | ug/L | 1 | 0.54 | 5.0 | 100 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Carbon tetrachloride [56-23-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Chlorobenzene [108-90-7] ^ | 0.069 | U | ug/L | 1 | 0.069 | 1.0 | 3 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Chloroethane [75-00-3] ^ | 0.18 | U | ug/L | 1 | 0.18 | 1.0 | 10 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Chloroform [67-66-3] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Chloromethane [74-87-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| cis-1,2-Dichloroethene [156-59-2] ^ | 0.075 | U | ug/L | 1 | 0.075 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| cis-1,3-Dichloropropene [10061-01-5] ^ | 0.073 | U | ug/L | 1 | 0.073 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Dibromochloromethane [124-48-1] ^ | 0.067 | U | ug/L | 1 | 0.067 | 1.0 | 3 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Dibromomethane [74-95-3] ^ | 0.13 | U | ug/L | 1 | 0.13 | 1.0 | 10 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Ethylbenzene [100-41-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Iodomethane [74-88-4] ^ | 0.52 | U | ug/L | 1 | 0.52 | 5.0 | 10 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Methylene chloride [75-09-2] ^ | 0.070 | U | ug/L | 1 | 0.070 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Styrene [100-42-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Tetrachloroethene [127-18-4] ^ | 0.099 | U | ug/L | 1 | 0.099 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Toluene [108-88-3] ^ | 0.053 | U | ug/L | 1 | 0.053 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| trans-1,2-Dichloroethene [156-60-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |
| trans-1,3-Dichloropropene [10061-02-6] ^ | 0.080 | U | ug/L | 1 | 0.080 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| trans-1,4-Dichloro-2-butene [110-57-6] ^ | 0.54 | U | ug/L | 1 | 0.54 | 1.0 | 100 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Trichloroethene [79-01-6] ^ | 0.13 | U | ug/L | 1 | 0.13 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |

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**Description:** 4501-MW10
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-01
**Sampled:** 03/24/10 09:10
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trichlorofluoromethane [75-69-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Vinyl acetate [108-05-4] ^ | 0.98 | U | ug/L | 1 | 0.98 | 5.0 | 50 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Vinyl chloride [75-01-4] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 1 | EPA 8260B | 03/26/10 16:54 | JKG | |
| Xylenes (Total) [1330-20-7] ^ | 0.22 | U | ug/L | 1 | 0.22 | 1.0 | 5 | EPA 8260B | 03/26/10 16:54 | JKG | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *36* | *1* | *50.0* | *71 %* | *51-122* | *0C26006* | *EPA 8260B* | *03/26/10 16:54* | *JKG* | |
| *Dibromofluoromethane* | *40* | *1* | *50.0* | *80 %* | *68-117* | *0C26006* | *EPA 8260B* | *03/26/10 16:54* | *JKG* | |
| *Toluene-d8* | *44* | *1* | *50.0* | *88 %* | *69-110* | *0C26006* | *EPA 8260B* | *03/26/10 16:54* | *JKG* | |

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**Description:** 4501-MW10
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-01
**Sampled:** 03/24/10 09:10
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Metals by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury [7439-97-6] ^ | 0.0540 | U | ug/L | 1 | 0.0540 | 0.200 | 0.2 | EPA 7470A | 03/26/10 15:35 | NLH | |

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**Description:** 4501-MW10 | **Lab Sample ID:** C002861-01 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:10 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony [7440-36-0] ^ | 0.220 | U | ug/L | 1 | 0.220 | 2.00 | 6 | EPA 6020A | 03/30/10 11:40 | JDH | |
| Arsenic [7440-38-2] ^ | 2.80 | U | ug/L | 1 | 2.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Barium [7440-39-3] ^** | **2.75** | J | ug/L | 1 | 1.00 | 10.0 | 100 | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Beryllium [7440-41-7] ^** | **0.178** | J | ug/L | 1 | 0.100 | 1.00 | 1 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Cadmium [7440-43-9] ^ | 0.360 | U | ug/L | 1 | 0.360 | 1.00 | 1 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Chromium [7440-47-3] ^ | 1.00 | U | ug/L | 1 | 1.00 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Cobalt [7440-48-4] ^ | 1.10 | U | ug/L | 1 | 1.10 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Copper [7440-50-8] ^ | 1.60 | U | ug/L | 1 | 1.60 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Iron [7439-89-6] ^** | **151** | J | ug/L | 1 | 22.0 | 50.0 | 300 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Lead [7439-92-1] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Manganese [7439-96-5] ^** | **4.51** | J | ug/L | 1 | 1.10 | 10.0 | 50 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Nickel [7440-02-0] ^ | 1.80 | U | ug/L | 1 | 1.80 | 10.0 | 50 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Selenium [7782-49-2] ^ | 0.830 | U | ug/L | 1 | 0.830 | 1.00 | 10 | EPA 6020A | 03/30/10 11:40 | JDH | |
| Silver [7440-22-4] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |
| Thallium [7440-28-0] ^ | 0.110 | U | ug/L | 1 | 0.110 | 1.00 | 5.5 | EPA 6020A | 03/30/10 11:40 | JDH | |
| Vanadium [7440-62-2] ^ | 1.40 | U | ug/L | 1 | 1.40 | 10.0 | 25 | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Zinc [7440-66-6] ^** | **13.2** | | ug/L | 1 | 3.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:42 | JDH | |

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**Description:** 4501-MW10
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-01
**Sampled:** 03/24/10 09:10
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride [16887-00-6] ^ | 1.2 | U | mg/L | 1 | 1.2 | 5.0 | NE | SM4500-Cl/E | 03/26/10 11:17 | PEV | |
| Sulfate as SO4 [14808-79-8] ^ | 0.12 | U | mg/L | 1 | 0.12 | 5.0 | 250000 | EPA 300.0 | 03/30/10 11:57 | PEV | |
| **Total Alkalinity [471-34-1] ^** | **9.6** | J | mg/L | 1 | 8.0 | 15 | NE | EPA 310.2 | 04/02/10 11:49 | PEV | |
| **Total Dissolved Solids [ECL-0156] ^** | **22** | | mg/L | 1 | 10 | 10 | NE | SM 2540C | 03/30/10 16:45 | CCB | |

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**Description:** 4501-MW11 (MS/MSD) **Lab Sample ID:** C002861-02 **Received:** 03/25/10 10:50

**Matrix:** Ground Water **Sampled:** 03/24/10 10:00 **Work Order:** C002861

**Project:** Henderson Co. LF C&D **Sampled By:** Ryan Stringfellow

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane [630-20-6] ^ | 0.091 | U | ug/L | 1 | 0.091 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,1,1-Trichloroethane [71-55-6] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,1,2,2-Tetrachloroethane [79-34-5] ^ | 0.085 | U | ug/L | 1 | 0.085 | 1.0 | 3 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,1,2-Trichloroethane [79-00-5] ^ | 0.068 | U | ug/L | 1 | 0.068 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,1-Dichloroethane [75-34-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,1-Dichloroethene [75-35-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,2,3-Trichloropropane [96-18-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,2-Dibromo-3-chloropropane [96-12-8] ^ | 0.48 | U | ug/L | 1 | 0.48 | 1.0 | 13 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,2-Dibromoethane [106-93-4] ^ | 0.42 | U | ug/L | 1 | 0.42 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,2-Dichlorobenzene [95-50-1] ^ | 0.052 | U | ug/L | 1 | 0.052 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,2-Dichloroethane [107-06-2] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 1,2-Dichloropropane [78-87-5] ^ | 0.098 | U | ug/L | 1 | 0.098 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| **1,4-Dichlorobenzene [106-46-7] ^** | **0.46** | J | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 2-Butanone [78-93-3] ^ | 1.0 | U | ug/L | 1 | 1.0 | 5.0 | 100 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 2-Hexanone [591-78-6] ^ | 0.69 | U | ug/L | 1 | 0.69 | 5.0 | 50 | EPA 8260B | 03/26/10 19:21 | JKG | |
| 4-Methyl-2-pentanone [108-10-1] ^ | 1.1 | U | ug/L | 1 | 1.1 | 5.0 | 100 | EPA 8260B | 03/26/10 19:21 | JKG | |
| **Acetone [67-64-1] ^** | **19** | J | ug/L | 1 | 1.5 | 5.0 | 100 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Acrylonitrile [107-13-1] ^ | 2.1 | U | ug/L | 1 | 2.1 | 10 | 200 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Benzene [71-43-2] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Bromochloromethane [74-97-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 3 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Bromodichloromethane [75-27-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Bromoform [75-25-2] ^ | 0.20 | U | ug/L | 1 | 0.20 | 1.0 | 3 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Bromomethane [74-83-9] ^ | 0.28 | U | ug/L | 1 | 0.28 | 1.0 | 10 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Carbon disulfide [75-15-0] ^ | 0.54 | U | ug/L | 1 | 0.54 | 5.0 | 100 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Carbon tetrachloride [56-23-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Chlorobenzene [108-90-7] ^ | 0.069 | U | ug/L | 1 | 0.069 | 1.0 | 3 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Chloroethane [75-00-3] ^ | 0.18 | U | ug/L | 1 | 0.18 | 1.0 | 10 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Chloroform [67-66-3] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Chloromethane [74-87-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| **cis-1,2-Dichloroethene [156-59-2] ^** | **5.3** | | ug/L | 1 | 0.075 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| cis-1,3-Dichloropropene [10061-01-5] ^ | 0.073 | U | ug/L | 1 | 0.073 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Dibromochloromethane [124-48-1] ^ | 0.067 | U | ug/L | 1 | 0.067 | 1.0 | 3 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Dibromomethane [74-95-3] ^ | 0.13 | U | ug/L | 1 | 0.13 | 1.0 | 10 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Ethylbenzene [100-41-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Iodomethane [74-88-4] ^ | 0.52 | U | ug/L | 1 | 0.52 | 5.0 | 10 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Methylene chloride [75-09-2] ^ | 0.070 | U | ug/L | 1 | 0.070 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Styrene [100-42-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| **Tetrachloroethene [127-18-4] ^** | **3.4** | | ug/L | 1 | 0.099 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Toluene [108-88-3] ^ | 0.053 | U | ug/L | 1 | 0.053 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| trans-1,2-Dichloroethene [156-60-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |
| trans-1,3-Dichloropropene [10061-02-6] ^ | 0.080 | U | ug/L | 1 | 0.080 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| trans-1,4-Dichloro-2-butene [110-57-6] ^ | 0.54 | U | ug/L | 1 | 0.54 | 1.0 | 100 | EPA 8260B | 03/26/10 19:21 | JKG | |
| **Trichloroethene [79-01-6] ^** | **0.90** | J | ug/L | 1 | 0.13 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Trichlorofluoromethane [75-69-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Vinyl acetate [108-05-4] ^ | 0.98 | U | ug/L | 1 | 0.98 | 5.0 | 50 | EPA 8260B | 03/26/10 19:21 | JKG | |
| Vinyl chloride [75-01-4] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 1 | EPA 8260B | 03/26/10 19:21 | JKG | |

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**Description:** 4501-MW11 (MS/MSD) | **Lab Sample ID:** C002861-02 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 10:00 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Xylenes (Total) [1330-20-7] ^** | **0.62** | J | ug/L | 1 | 0.22 | 1.0 | 5 | EPA 8260B | 03/26/10 19:21 | JKG | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *38* | *1* | *50.0* | *75 %* | *51-122* | *0C26006* | *EPA 8260B* | *03/26/10 19:21* | *JKG* | |
| *Dibromofluoromethane* | *42* | *1* | *50.0* | *84 %* | *68-117* | *0C26006* | *EPA 8260B* | *03/26/10 19:21* | *JKG* | |
| *Toluene-d8* | *44* | *1* | *50.0* | *89 %* | *69-110* | *0C26006* | *EPA 8260B* | *03/26/10 19:21* | *JKG* | |

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| | | | | | |
|---|---|---|---|---|---|
| **Description:** | 4501-MW11 (MS/MSD) | **Lab Sample ID:** | C002861-02 | **Received:** | 03/25/10 10:50 |
| **Matrix:** | Ground Water | **Sampled:** | 03/24/10 10:00 | **Work Order:** | C002861 |
| **Project:** | Henderson Co. LF C&D | **Sampled By:** | Ryan Stringfellow | | |

## Metals by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mercury [7439-97-6] ^** | **0.0586** | J | ug/L | 1 | 0.0540 | 0.200 | 0.2 | EPA 7470A | 03/26/10 15:20 | NLH | |

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**Description:** 4501-MW11 (MS/MSD) **Lab Sample ID:** C002861-02 **Received:** 03/25/10 10:50

**Matrix:** Ground Water **Sampled:** 03/24/10 10:00 **Work Order:** C002861

**Project:** Henderson Co. LF C&D **Sampled By:** Ryan Stringfellow

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony [7440-36-0] ^ | 0.220 | U | ug/L | 1 | 0.220 | 2.00 | 6 | EPA 6020A | 03/30/10 11:22 | JDH | |
| Arsenic [7440-38-2] ^ | 2.80 | U | ug/L | 1 | 2.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Barium [7440-39-3] ^** | **33.7** | J | ug/L | 1 | 1.00 | 10.0 | 100 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Beryllium [7440-41-7] ^** | **1.46** | | ug/L | 1 | 0.100 | 1.00 | 1 | EPA 6010C | 03/28/10 13:29 | JDH | |
| Cadmium [7440-43-9] ^ | 0.360 | U | ug/L | 1 | 0.360 | 1.00 | 1 | EPA 6010C | 03/28/10 13:29 | JDH | |
| Chromium [7440-47-3] ^ | 1.00 | U | ug/L | 1 | 1.00 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Cobalt [7440-48-4] ^** | **4.30** | J | ug/L | 1 | 1.10 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Copper [7440-50-8] ^** | **2.76** | J | ug/L | 1 | 1.60 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Iron [7439-89-6] ^** | **2050** | | ug/L | 1 | 22.0 | 50.0 | 300 | EPA 6010C | 03/28/10 13:29 | JDH | |
| Lead [7439-92-1] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Manganese [7439-96-5] ^** | **1780** | | ug/L | 1 | 1.10 | 10.0 | 50 | EPA 6010C | 03/28/10 13:29 | JDH | |
| Nickel [7440-02-0] ^ | 1.80 | U | ug/L | 1 | 1.80 | 10.0 | 50 | EPA 6010C | 03/28/10 13:29 | JDH | |
| Selenium [7782-49-2] ^ | 0.830 | U | ug/L | 1 | 0.830 | 1.00 | 10 | EPA 6020A | 03/30/10 11:22 | JDH | |
| Silver [7440-22-4] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |
| Thallium [7440-28-0] ^ | 0.110 | U | ug/L | 1 | 0.110 | 1.00 | 5.5 | EPA 6020A | 03/30/10 11:22 | JDH | |
| **Vanadium [7440-62-2] ^** | **2.62** | J | ug/L | 1 | 1.40 | 10.0 | 25 | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Zinc [7440-66-6] ^** | **20.0** | | ug/L | 1 | 3.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:29 | JDH | |

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**Description:** 4501-MW11 (MS/MSD) | **Lab Sample ID:** C002861-02 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 10:00 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chloride [16887-00-6] ^** | **1.7** | J | mg/L | 1 | 1.2 | 5.0 | NE | SM4500-Cl/E | 03/26/10 11:18 | PEV | |
| **Sulfate as SO4 [14808-79-8] ^** | **5.3** | J | mg/L | 1 | 0.12 | 5.0 | 250000 | EPA 300.0 | 03/30/10 13:02 | PEV | |
| **Total Alkalinity [471-34-1] ^** | **57** | | mg/L | 1 | 8.0 | 15 | NE | EPA 310.2 | 04/02/10 11:50 | PEV | |
| **Total Dissolved Solids [ECL-0156] ^** | **110** | | mg/L | 1 | 10 | 10 | NE | SM 2540C | 03/25/10 17:45 | CCB | |

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**Description:** 4501-MW12 | **Lab Sample ID:** C002861-03 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:45 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane [630-20-6] ^ | 0.091 | U | ug/L | 1 | 0.091 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,1,1-Trichloroethane [71-55-6] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,1,2,2-Tetrachloroethane [79-34-5] ^ | 0.085 | U | ug/L | 1 | 0.085 | 1.0 | 3 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,1,2-Trichloroethane [79-00-5] ^ | 0.068 | U | ug/L | 1 | 0.068 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| **1,1-Dichloroethane [75-34-3] ^** | **0.47** | J | ug/L | 1 | 0.050 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,1-Dichloroethene [75-35-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,2,3-Trichloropropane [96-18-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,2-Dibromo-3-chloropropane [96-12-8] ^ | 0.48 | U | ug/L | 1 | 0.48 | 1.0 | 13 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,2-Dibromoethane [106-93-4] ^ | 0.42 | U | ug/L | 1 | 0.42 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,2-Dichlorobenzene [95-50-1] ^ | 0.052 | U | ug/L | 1 | 0.052 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,2-Dichloroethane [107-06-2] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,2-Dichloropropane [78-87-5] ^ | 0.098 | U | ug/L | 1 | 0.098 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 1,4-Dichlorobenzene [106-46-7] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 2-Butanone [78-93-3] ^ | 1.0 | U | ug/L | 1 | 1.0 | 5.0 | 100 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 2-Hexanone [591-78-6] ^ | 0.69 | U | ug/L | 1 | 0.69 | 5.0 | 50 | EPA 8260B | 03/26/10 19:50 | JKG | |
| 4-Methyl-2-pentanone [108-10-1] ^ | 1.1 | U | ug/L | 1 | 1.1 | 5.0 | 100 | EPA 8260B | 03/26/10 19:50 | JKG | |
| **Acetone [67-64-1] ^** | **13** | J | ug/L | 1 | 1.5 | 5.0 | 100 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Acrylonitrile [107-13-1] ^ | 2.1 | U | ug/L | 1 | 2.1 | 10 | 200 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Benzene [71-43-2] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Bromochloromethane [74-97-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 3 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Bromodichloromethane [75-27-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Bromoform [75-25-2] ^ | 0.20 | U | ug/L | 1 | 0.20 | 1.0 | 3 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Bromomethane [74-83-9] ^ | 0.28 | U | ug/L | 1 | 0.28 | 1.0 | 10 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Carbon disulfide [75-15-0] ^ | 0.54 | U | ug/L | 1 | 0.54 | 5.0 | 100 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Carbon tetrachloride [56-23-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Chlorobenzene [108-90-7] ^ | 0.069 | U | ug/L | 1 | 0.069 | 1.0 | 3 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Chloroethane [75-00-3] ^ | 0.18 | U | ug/L | 1 | 0.18 | 1.0 | 10 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Chloroform [67-66-3] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Chloromethane [74-87-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| cis-1,2-Dichloroethene [156-59-2] ^ | 0.075 | U | ug/L | 1 | 0.075 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| cis-1,3-Dichloropropene [10061-01-5] ^ | 0.073 | U | ug/L | 1 | 0.073 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Dibromochloromethane [124-48-1] ^ | 0.067 | U | ug/L | 1 | 0.067 | 1.0 | 3 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Dibromomethane [74-95-3] ^ | 0.13 | U | ug/L | 1 | 0.13 | 1.0 | 10 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Ethylbenzene [100-41-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Iodomethane [74-88-4] ^ | 0.52 | U | ug/L | 1 | 0.52 | 5.0 | 10 | EPA 8260B | 03/26/10 19:50 | JKG | |
| **Methylene chloride [75-09-2] ^** | **0.92** | J | ug/L | 1 | 0.070 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Styrene [100-42-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| **Tetrachloroethene [127-18-4] ^** | **1.6** | | ug/L | 1 | 0.099 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Toluene [108-88-3] ^ | 0.053 | U | ug/L | 1 | 0.053 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| trans-1,2-Dichloroethene [156-60-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |
| trans-1,3-Dichloropropene [10061-02-6] ^ | 0.080 | U | ug/L | 1 | 0.080 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| trans-1,4-Dichloro-2-butene [110-57-6] ^ | 0.54 | U | ug/L | 1 | 0.54 | 1.0 | 100 | EPA 8260B | 03/26/10 19:50 | JKG | |
| **Trichloroethene [79-01-6] ^** | **0.52** | J | ug/L | 1 | 0.13 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| **Trichlorofluoromethane [75-69-4] ^** | **2.6** | | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Vinyl acetate [108-05-4] ^ | 0.98 | U | ug/L | 1 | 0.98 | 5.0 | 50 | EPA 8260B | 03/26/10 19:50 | JKG | |
| Vinyl chloride [75-01-4] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 1 | EPA 8260B | 03/26/10 19:50 | JKG | |

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**Description:** 4501-MW12 | **Lab Sample ID:** C002861-03 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:45 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Xylenes (Total) [1330-20-7] ^ | 0.22 | U | ug/L | 1 | 0.22 | 1.0 | 5 | EPA 8260B | 03/26/10 19:50 | JKG | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *38* | *1* | *50.0* | *75 %* | *51-122* | *0C26006* | *EPA 8260B* | *03/26/10 19:50* | *JKG* | |
| *Dibromofluoromethane* | *42* | *1* | *50.0* | *83 %* | *68-117* | *0C26006* | *EPA 8260B* | *03/26/10 19:50* | *JKG* | |
| *Toluene-d8* | *43* | *1* | *50.0* | *86 %* | *69-110* | *0C26006* | *EPA 8260B* | *03/26/10 19:50* | *JKG* | |

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| | | | | | |
|---|---|---|---|---|---|
| **Description:** | 4501-MW12 | **Lab Sample ID:** | C002861-03 | **Received:** | 03/25/10 10:50 |
| **Matrix:** | Ground Water | **Sampled:** | 03/24/10 09:45 | **Work Order:** | C002861 |
| **Project:** | Henderson Co. LF C&D | **Sampled By:** | Ryan Stringfellow | | |

## Metals by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mercury [7439-97-6] ^** | **0.144** | J | ug/L | 1 | 0.0540 | 0.200 | 0.2 | EPA 7470A | 03/26/10 15:42 | NLH | |

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**Description:** 4501-MW12 | **Lab Sample ID:** C002861-03 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:45 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony [7440-36-0] ^ | 0.220 | U | ug/L | 1 | 0.220 | 2.00 | 6 | EPA 6020A | 03/30/10 11:44 | JDH | |
| Arsenic [7440-38-2] ^ | 2.80 | U | ug/L | 1 | 2.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Barium [7440-39-3] ^** | **14.3** | J | ug/L | 1 | 1.00 | 10.0 | 100 | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Beryllium [7440-41-7] ^** | **0.130** | J | ug/L | 1 | 0.100 | 1.00 | 1 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Cadmium [7440-43-9] ^ | 0.360 | U | ug/L | 1 | 0.360 | 1.00 | 1 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Chromium [7440-47-3] ^ | 1.00 | U | ug/L | 1 | 1.00 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Cobalt [7440-48-4] ^ | 1.10 | U | ug/L | 1 | 1.10 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Copper [7440-50-8] ^ | 1.60 | U | ug/L | 1 | 1.60 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Iron [7439-89-6] ^** | **830** | | ug/L | 1 | 22.0 | 50.0 | 300 | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Lead [7439-92-1] ^** | **2.18** | J | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Manganese [7439-96-5] ^** | **142** | | ug/L | 1 | 1.10 | 10.0 | 50 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Nickel [7440-02-0] ^ | 1.80 | U | ug/L | 1 | 1.80 | 10.0 | 50 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Selenium [7782-49-2] ^ | 0.830 | U | ug/L | 1 | 0.830 | 1.00 | 10 | EPA 6020A | 03/30/10 11:44 | JDH | |
| Silver [7440-22-4] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |
| Thallium [7440-28-0] ^ | 0.110 | U | ug/L | 1 | 0.110 | 1.00 | 5.5 | EPA 6020A | 03/30/10 11:44 | JDH | |
| **Vanadium [7440-62-2] ^** | **1.57** | J | ug/L | 1 | 1.40 | 10.0 | 25 | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Zinc [7440-66-6] ^** | **21.5** | | ug/L | 1 | 3.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:44 | JDH | |

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**Description:** 4501-MW12
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-03
**Sampled:** 03/24/10 09:45
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chloride [16887-00-6] ^** | **7.3** | | mg/L | 1 | 1.2 | 5.0 | NE | SM4500-Cl/E | 03/26/10 11:45 | PEV | |
| **Sulfate as SO4 [14808-79-8] ^** | **16** | J | mg/L | 1 | 0.12 | 5.0 | 250000 | EPA 300.0 | 03/30/10 13:45 | PEV | |
| **Total Alkalinity [471-34-1] ^** | **76** | | mg/L | 1 | 8.0 | 15 | NE | EPA 310.2 | 04/02/10 11:52 | PEV | |
| **Total Dissolved Solids [ECL-0156] ^** | **170** | | mg/L | 1 | 10 | 10 | NE | SM 2540C | 03/30/10 16:45 | CCB | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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**Description:** 4501-MW13 | **Lab Sample ID:** C002861-04 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:30 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane [630-20-6] ^ | 0.091 | U | ug/L | 1 | 0.091 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,1,1-Trichloroethane [71-55-6] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,1,2,2-Tetrachloroethane [79-34-5] ^ | 0.085 | U | ug/L | 1 | 0.085 | 1.0 | 3 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,1,2-Trichloroethane [79-00-5] ^ | 0.068 | U | ug/L | 1 | 0.068 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,1-Dichloroethane [75-34-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,1-Dichloroethene [75-35-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,2,3-Trichloropropane [96-18-4] ^ | 0.15 | U | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,2-Dibromo-3-chloropropane [96-12-8] ^ | 0.48 | U | ug/L | 1 | 0.48 | 1.0 | 13 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,2-Dibromoethane [106-93-4] ^ | 0.42 | U | ug/L | 1 | 0.42 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,2-Dichlorobenzene [95-50-1] ^ | 0.052 | U | ug/L | 1 | 0.052 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,2-Dichloroethane [107-06-2] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 1,2-Dichloropropane [78-87-5] ^ | 0.098 | U | ug/L | 1 | 0.098 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| **1,4-Dichlorobenzene [106-46-7] ^** | **0.45** | J | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 2-Butanone [78-93-3] ^ | 1.0 | U | ug/L | 1 | 1.0 | 5.0 | 100 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 2-Hexanone [591-78-6] ^ | 0.69 | U | ug/L | 1 | 0.69 | 5.0 | 50 | EPA 8260B | 03/26/10 20:20 | JKG | |
| 4-Methyl-2-pentanone [108-10-1] ^ | 1.1 | U | ug/L | 1 | 1.1 | 5.0 | 100 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Acetone [67-64-1] ^ | 1.5 | U | ug/L | 1 | 1.5 | 5.0 | 100 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Acrylonitrile [107-13-1] ^ | 2.1 | U | ug/L | 1 | 2.1 | 10 | 200 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Benzene [71-43-2] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Bromochloromethane [74-97-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 3 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Bromodichloromethane [75-27-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Bromoform [75-25-2] ^ | 0.20 | U | ug/L | 1 | 0.20 | 1.0 | 3 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Bromomethane [74-83-9] ^ | 0.28 | U | ug/L | 1 | 0.28 | 1.0 | 10 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Carbon disulfide [75-15-0] ^ | 0.54 | U | ug/L | 1 | 0.54 | 5.0 | 100 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Carbon tetrachloride [56-23-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Chlorobenzene [108-90-7] ^ | 0.069 | U | ug/L | 1 | 0.069 | 1.0 | 3 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Chloroethane [75-00-3] ^ | 0.18 | U | ug/L | 1 | 0.18 | 1.0 | 10 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Chloroform [67-66-3] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Chloromethane [74-87-3] ^ | 0.050 | U | ug/L | 1 | 0.050 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| **cis-1,2-Dichloroethene [156-59-2] ^** | **0.84** | J | ug/L | 1 | 0.075 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| cis-1,3-Dichloropropene [10061-01-5] ^ | 0.073 | U | ug/L | 1 | 0.073 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Dibromochloromethane [124-48-1] ^ | 0.067 | U | ug/L | 1 | 0.067 | 1.0 | 3 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Dibromomethane [74-95-3] ^ | 0.13 | U | ug/L | 1 | 0.13 | 1.0 | 10 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Ethylbenzene [100-41-4] ^ | 0.10 | U | ug/L | 1 | 0.10 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Iodomethane [74-88-4] ^ | 0.52 | U | ug/L | 1 | 0.52 | 5.0 | 10 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Methylene chloride [75-09-2] ^ | 0.070 | U | ug/L | 1 | 0.070 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Styrene [100-42-5] ^ | 0.082 | U | ug/L | 1 | 0.082 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| **Tetrachloroethene [127-18-4] ^** | **0.56** | J | ug/L | 1 | 0.099 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Toluene [108-88-3] ^ | 0.053 | U | ug/L | 1 | 0.053 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| trans-1,2-Dichloroethene [156-60-5] ^ | 0.11 | U | ug/L | 1 | 0.11 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |
| trans-1,3-Dichloropropene [10061-02-6] ^ | 0.080 | U | ug/L | 1 | 0.080 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| trans-1,4-Dichloro-2-butene [110-57-6] ^ | 0.54 | U | ug/L | 1 | 0.54 | 1.0 | 100 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Trichloroethene [79-01-6] ^ | 0.13 | U | ug/L | 1 | 0.13 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| **Trichlorofluoromethane [75-69-4] ^** | **1.0** | | ug/L | 1 | 0.15 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Vinyl acetate [108-05-4] ^ | 0.98 | U | ug/L | 1 | 0.98 | 5.0 | 50 | EPA 8260B | 03/26/10 20:20 | JKG | |
| Vinyl chloride [75-01-4] ^ | 0.083 | U | ug/L | 1 | 0.083 | 1.0 | 1 | EPA 8260B | 03/26/10 20:20 | JKG | |

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**Description:** 4501-MW13 | **Lab Sample ID:** C002861-04 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:30 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Volatile Organic Compounds by GCMS

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Xylenes (Total) [1330-20-7] ^ | 0.22 | U | ug/L | 1 | 0.22 | 1.0 | 5 | EPA 8260B | 03/26/10 20:20 | JKG | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *36* | *1* | *50.0* | *72 %* | *51-122* | *0C26006* | *EPA 8260B* | *03/26/10 20:20* | *JKG* | |
| *Dibromofluoromethane* | *40* | *1* | *50.0* | *81 %* | *68-117* | *0C26006* | *EPA 8260B* | *03/26/10 20:20* | *JKG* | |
| *Toluene-d8* | *43* | *1* | *50.0* | *85 %* | *69-110* | *0C26006* | *EPA 8260B* | *03/26/10 20:20* | *JKG* | |

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**Description:** 4501-MW13
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-04
**Sampled:** 03/24/10 09:30
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Metals by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury [7439-97-6] ^ | 0.0540 | U | ug/L | 1 | 0.0540 | 0.200 | 0.2 | EPA 7470A | 03/26/10 15:45 | NLH | |

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**Description:** 4501-MW13 | **Lab Sample ID:** C002861-04 | **Received:** 03/25/10 10:50

**Matrix:** Ground Water | **Sampled:** 03/24/10 09:30 | **Work Order:** C002861

**Project:** Henderson Co. LF C&D | **Sampled By:** Ryan Stringfellow

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony [7440-36-0] ^ | 0.220 | U | ug/L | 1 | 0.220 | 2.00 | 6 | EPA 6020A | 03/30/10 11:47 | JDH | |
| Arsenic [7440-38-2] ^ | 2.80 | U | ug/L | 1 | 2.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Barium [7440-39-3] ^** | **12.1** | J | ug/L | 1 | 1.00 | 10.0 | 100 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Beryllium [7440-41-7] ^ | 0.100 | U | ug/L | 1 | 0.100 | 1.00 | 1 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Cadmium [7440-43-9] ^ | 0.360 | U | ug/L | 1 | 0.360 | 1.00 | 1 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Chromium [7440-47-3] ^ | 1.00 | U | ug/L | 1 | 1.00 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Cobalt [7440-48-4] ^ | 1.10 | U | ug/L | 1 | 1.10 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Copper [7440-50-8] ^ | 1.60 | U | ug/L | 1 | 1.60 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Iron [7439-89-6] ^** | **564** | | ug/L | 1 | 22.0 | 50.0 | 300 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Lead [7439-92-1] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Manganese [7439-96-5] ^** | **111** | | ug/L | 1 | 1.10 | 10.0 | 50 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Nickel [7440-02-0] ^ | 1.80 | U | ug/L | 1 | 1.80 | 10.0 | 50 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Selenium [7782-49-2] ^ | 0.830 | U | ug/L | 1 | 0.830 | 1.00 | 10 | EPA 6020A | 03/30/10 11:47 | JDH | |
| Silver [7440-22-4] ^ | 1.90 | U | ug/L | 1 | 1.90 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |
| Thallium [7440-28-0] ^ | 0.110 | U | ug/L | 1 | 0.110 | 1.00 | 5.5 | EPA 6020A | 03/30/10 11:47 | JDH | |
| Vanadium [7440-62-2] ^ | 1.40 | U | ug/L | 1 | 1.40 | 10.0 | 25 | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Zinc [7440-66-6] ^** | **12.2** | | ug/L | 1 | 3.80 | 10.0 | 10 | EPA 6010C | 03/28/10 13:46 | JDH | |

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**Description:** 4501-MW13
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-04
**Sampled:** 03/24/10 09:30
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chloride [16887-00-6] ^** | **2.5** | J | mg/L | 1 | 1.2 | 5.0 | NE | SM4500-Cl/E | 03/26/10 11:45 | PEV | |
| **Sulfate as SO4 [14808-79-8] ^** | **2.1** | J | mg/L | 1 | 0.12 | 5.0 | 250000 | EPA 300.0 | 03/30/10 14:07 | PEV | |
| **Total Alkalinity [471-34-1] ^** | **75** | | mg/L | 1 | 8.0 | 15 | NE | EPA 310.2 | 04/02/10 11:53 | PEV | |
| **Total Dissolved Solids [ECL-0156] ^** | **140** | | mg/L | 1 | 10 | 10 | NE | SM 2540C | 03/30/10 16:45 | CCB | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

## QUALITY CONTROL

### Volatile Organic Compounds by GCMS - Quality Control

*Batch 0C26006 - EPA 5030B_MS*

**Blank (0C26006-BLK1)** Prepared: 03/26/2010 09:19 Analyzed: 03/26/2010 14:27

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | 0.091 | U | 1.0 | ug/L | | | | | | | |
| 1,1,1-Trichloroethane | 0.15 | U | 1.0 | ug/L | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 0.085 | U | 1.0 | ug/L | | | | | | | |
| 1,1,2-Trichloroethane | 0.068 | U | 1.0 | ug/L | | | | | | | |
| 1,1-Dichloroethane | 0.050 | U | 1.0 | ug/L | | | | | | | |
| 1,1-Dichloroethene | 0.15 | U | 1.0 | ug/L | | | | | | | |
| 1,2,3-Trichloropropane | 0.15 | U | 1.0 | ug/L | | | | | | | |
| 1,2-Dibromo-3-chloropropane | 0.48 | U | 1.0 | ug/L | | | | | | | |
| 1,2-Dibromoethane | 0.42 | U | 1.0 | ug/L | | | | | | | |
| 1,2-Dichlorobenzene | 0.052 | U | 1.0 | ug/L | | | | | | | |
| 1,2-Dichloroethane | 0.082 | U | 1.0 | ug/L | | | | | | | |
| 1,2-Dichloropropane | 0.098 | U | 1.0 | ug/L | | | | | | | |
| 1,4-Dichlorobenzene | 0.10 | U | 1.0 | ug/L | | | | | | | |
| 2-Butanone | 1.0 | U | 5.0 | ug/L | | | | | | | |
| 2-Hexanone | 0.69 | U | 5.0 | ug/L | | | | | | | |
| 4-Methyl-2-pentanone | 1.1 | U | 5.0 | ug/L | | | | | | | |
| Acetone | 1.5 | U | 5.0 | ug/L | | | | | | | |
| Acrylonitrile | 2.1 | U | 10 | ug/L | | | | | | | |
| Benzene | 0.050 | U | 1.0 | ug/L | | | | | | | |
| Bromochloromethane | 0.11 | U | 1.0 | ug/L | | | | | | | |
| Bromodichloromethane | 0.10 | U | 1.0 | ug/L | | | | | | | |
| Bromoform | 0.20 | U | 1.0 | ug/L | | | | | | | |
| Bromomethane | 0.28 | U | 1.0 | ug/L | | | | | | | |
| Carbon disulfide | 0.54 | U | 5.0 | ug/L | | | | | | | |
| Carbon tetrachloride | 0.082 | U | 1.0 | ug/L | | | | | | | |
| Chlorobenzene | 0.069 | U | 1.0 | ug/L | | | | | | | |
| Chloroethane | 0.18 | U | 1.0 | ug/L | | | | | | | |
| Chloroform | 0.083 | U | 1.0 | ug/L | | | | | | | |
| Chloromethane | 0.050 | U | 1.0 | ug/L | | | | | | | |
| cis-1,2-Dichloroethene | 0.075 | U | 1.0 | ug/L | | | | | | | |
| cis-1,3-Dichloropropene | 0.073 | U | 1.0 | ug/L | | | | | | | |
| Dibromochloromethane | 0.067 | U | 1.0 | ug/L | | | | | | | |
| Dibromomethane | 0.13 | U | 1.0 | ug/L | | | | | | | |
| Ethylbenzene | 0.10 | U | 1.0 | ug/L | | | | | | | |
| Iodomethane | 0.52 | U | 5.0 | ug/L | | | | | | | |
| Methylene chloride | 0.070 | U | 1.0 | ug/L | | | | | | | |
| Styrene | 0.082 | U | 1.0 | ug/L | | | | | | | |
| Tetrachloroethene | 0.099 | U | 1.0 | ug/L | | | | | | | |
| Toluene | 0.053 | U | 1.0 | ug/L | | | | | | | |
| trans-1,2-Dichloroethene | 0.11 | U | 1.0 | ug/L | | | | | | | |
| trans-1,3-Dichloropropene | 0.080 | U | 1.0 | ug/L | | | | | | | |
| trans-1,4-Dichloro-2-butene | 0.54 | U | 1.0 | ug/L | | | | | | | |
| Trichloroethene | 0.13 | U | 1.0 | ug/L | | | | | | | |
| Trichlorofluoromethane | 0.15 | U | 1.0 | ug/L | | | | | | | |
| Vinyl acetate | 0.98 | U | 5.0 | ug/L | | | | | | | |
| Vinyl chloride | 0.083 | U | 1.0 | ug/L | | | | | | | |
| Xylenes (Total) | 0.22 | U | 1.0 | ug/L | | | | | | | |
| *Surrogate: 4-Bromofluorobenzene* | *36* | | | *ug/L* | *50.0* | | *72* | *51-122* | | | |

# QUALITY CONTROL

## Volatile Organic Compounds by GCMS - Quality Control

*Batch 0C26006 - EPA 5030B_MS*

**Blank (0C26006-BLK1) Continued** Prepared: 03/26/2010 09:19 Analyzed: 03/26/2010 14:27

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Surrogate: Dibromofluoromethane* | *42* | | | *ug/L* | *50.0* | | *85* | *68-117* | | | |
| *Surrogate: Toluene-d8* | *45* | | | *ug/L* | *50.0* | | *90* | *69-110* | | | |

**LCS (0C26006-BS1)** Prepared: 03/26/2010 09:19 Analyzed: 03/26/2010 14:56

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 19 | | 1.0 | ug/L | 20.0 | | 97 | 75-133 | | | |
| Benzene | 19 | | 1.0 | ug/L | 20.0 | | 94 | 81-134 | | | |
| Chlorobenzene | 20 | | 1.0 | ug/L | 20.0 | | 98 | 83-117 | | | |
| Toluene | 19 | | 1.0 | ug/L | 20.0 | | 95 | 71-118 | | | |
| Trichloroethene | 22 | | 1.0 | ug/L | 20.0 | | 110 | 75-115 | | | |

**Matrix Spike (0C26006-MS1)** Prepared: 03/26/2010 09:19 Analyzed: 03/26/2010 15:26

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 22 | | 1.0 | ug/L | 20.0 | 0.15 U | 110 | 75-133 | | | |
| Benzene | 21 | | 1.0 | ug/L | 20.0 | 0.050 U | 106 | 81-134 | | | |
| Chlorobenzene | 21 | | 1.0 | ug/L | 20.0 | 0.069 U | 104 | 83-117 | | | |
| Toluene | 20 | | 1.0 | ug/L | 20.0 | 0.053 U | 101 | 71-118 | | | |
| Trichloroethene | 26 | | 1.0 | ug/L | 20.0 | 0.90 | 125 | 75-115 | | | QM-07 |

**Matrix Spike Dup (0C26006-MSD1)** Prepared: 03/26/2010 09:19 Analyzed: 03/26/2010 15:55

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 22 | | 1.0 | ug/L | 20.0 | 0.15 U | 112 | 75-133 | 2 | 20 | |
| Benzene | 22 | | 1.0 | ug/L | 20.0 | 0.050 U | 109 | 81-134 | 3 | 17 | |
| Chlorobenzene | 22 | | 1.0 | ug/L | 20.0 | 0.069 U | 109 | 83-117 | 4 | 16 | |
| Toluene | 21 | | 1.0 | ug/L | 20.0 | 0.053 U | 105 | 71-118 | 5 | 17 | |
| Trichloroethene | 26 | | 1.0 | ug/L | 20.0 | 0.90 | 126 | 75-115 | 0.6 | 18 | QM-07 |

## Metals by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26013 - EPA 245.1*

**Blank (0C26013-BLK1)** Prepared: 03/26/2010 10:08 Analyzed: 03/26/2010 15:12

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0540 | U | 0.200 | ug/L | | | | | | | |

**LCS (0C26013-BS1)** Prepared: 03/26/2010 10:08 Analyzed: 03/26/2010 15:18

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 5.48 | | 0.200 | ug/L | 5.00 | | 110 | 85-115 | | | |

**Matrix Spike (0C26013-MS1)** Prepared: 03/26/2010 10:08 Analyzed: 03/26/2010 15:24

# QUALITY CONTROL

## Metals by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26013 - EPA 245.1*

**Matrix Spike (0C26013-MS1) Continued** Prepared: 03/26/2010 10:08 Analyzed: 03/26/2010 15:24

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 5.67 | | 0.200 | ug/L | 5.00 | 0.0586 | 112 | 85-115 | | | |

**Matrix Spike Dup (0C26013-MSD1)** Prepared: 03/26/2010 10:08 Analyzed: 03/26/2010 15:26

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 5.57 | | 0.200 | ug/L | 5.00 | 0.0586 | 110 | 85-115 | 2 | 15 | |

**Post Spike (0C26013-PS1)** Prepared: 03/26/2010 10:08 Analyzed: 03/26/2010 15:29

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 5.37 | | 0.200 | ug/L | 5.00 | 0.0586 | 106 | 75-125 | | | |

## Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26014 - EPA 3005A*

**Blank (0C26014-BLK1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:21

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 2.80 | U | 10.0 | ug/L | | | | | | | |
| Barium | 1.00 | U | 10.0 | ug/L | | | | | | | |
| Beryllium | 0.100 | U | 1.00 | ug/L | | | | | | | |
| Cadmium | 0.360 | U | 1.00 | ug/L | | | | | | | |
| Chromium | 1.00 | U | 10.0 | ug/L | | | | | | | |
| Cobalt | 1.10 | U | 10.0 | ug/L | | | | | | | |
| Copper | 1.60 | U | 10.0 | ug/L | | | | | | | |
| Iron | 22.0 | U | 50.0 | ug/L | | | | | | | |
| Lead | 1.90 | U | 10.0 | ug/L | | | | | | | |
| Manganese | 1.10 | U | 10.0 | ug/L | | | | | | | |
| Nickel | 1.80 | U | 10.0 | ug/L | | | | | | | |
| Silver | 1.90 | U | 10.0 | ug/L | | | | | | | |
| Vanadium | 1.40 | U | 10.0 | ug/L | | | | | | | |
| Zinc | 3.80 | U | 10.0 | ug/L | | | | | | | |

**LCS (0C26014-BS1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:23

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1110 | | 10.0 | ug/L | 1000 | | 111 | 80-120 | | | |
| Barium | 1100 | | 10.0 | ug/L | 1000 | | 110 | 80-120 | | | |
| Beryllium | 566 | | 1.00 | ug/L | 500 | | 113 | 80-120 | | | |
| Cadmium | 556 | | 1.00 | ug/L | 500 | | 111 | 80-120 | | | |
| Chromium | 1110 | | 10.0 | ug/L | 1000 | | 111 | 80-120 | | | |
| Cobalt | 1090 | | 10.0 | ug/L | 1000 | | 109 | 80-120 | | | |
| Copper | 562 | | 10.0 | ug/L | 500 | | 112 | 80-120 | | | |
| Iron | 11000 | | 50.0 | ug/L | 10000 | | 110 | 80-120 | | | |

## QUALITY CONTROL

### Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26014 - EPA 3005A*

**LCS (0C26014-BS1) Continued** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:23

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 1100 | | 10.0 | ug/L | 1000 | | 110 | 80-120 | | | |
| Manganese | 554 | | 10.0 | ug/L | 500 | | 111 | 80-120 | | | |
| Nickel | 1100 | | 10.0 | ug/L | 1000 | | 110 | 80-120 | | | |
| Silver | 109 | | 10.0 | ug/L | 100 | | 109 | 80-120 | | | |
| Vanadium | 545 | | 10.0 | ug/L | 500 | | 109 | 80-120 | | | |
| Zinc | 1110 | | 10.0 | ug/L | 1000 | | 111 | 80-120 | | | |

**Matrix Spike (0C26014-MS1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:31

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1080 | | 10.0 | ug/L | 1000 | 2.80 U | 108 | 75-125 | | | |
| Barium | 1110 | | 10.0 | ug/L | 1000 | 33.7 | 108 | 75-125 | | | |
| Beryllium | 562 | | 1.00 | ug/L | 500 | 1.46 | 112 | 75-125 | | | |
| Cadmium | 545 | | 1.00 | ug/L | 500 | 0.360 U | 109 | 75-125 | | | |
| Chromium | 1090 | | 10.0 | ug/L | 1000 | 1.00 U | 109 | 75-125 | | | |
| Cobalt | 1080 | | 10.0 | ug/L | 1000 | 4.30 | 107 | 75-125 | | | |
| Copper | 551 | | 10.0 | ug/L | 500 | 2.76 | 110 | 75-125 | | | |
| Iron | 12700 | | 50.0 | ug/L | 10000 | 2050 | 107 | 75-125 | | | |
| Lead | 1080 | | 10.0 | ug/L | 1000 | 1.90 U | 108 | 75-125 | | | |
| Manganese | 2210 | | 10.0 | ug/L | 500 | 1780 | 87 | 75-125 | | | |
| Nickel | 1070 | | 10.0 | ug/L | 1000 | 1.80 U | 107 | 75-125 | | | |
| Silver | 107 | | 10.0 | ug/L | 100 | 1.90 U | 107 | 75-125 | | | |
| Vanadium | 536 | | 10.0 | ug/L | 500 | 2.62 | 107 | 75-125 | | | |
| Zinc | 1120 | | 10.0 | ug/L | 1000 | 20.0 | 110 | 75-125 | | | |

**Matrix Spike Dup (0C26014-MSD1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:34

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1050 | | 10.0 | ug/L | 1000 | 2.80 U | 105 | 75-125 | 3 | 20 | |
| Barium | 1090 | | 10.0 | ug/L | 1000 | 33.7 | 106 | 75-125 | 2 | 20 | |
| Beryllium | 556 | | 1.00 | ug/L | 500 | 1.46 | 111 | 75-125 | 1 | 20 | |
| Cadmium | 534 | | 1.00 | ug/L | 500 | 0.360 U | 107 | 75-125 | 2 | 20 | |
| Chromium | 1070 | | 10.0 | ug/L | 1000 | 1.00 U | 107 | 75-125 | 2 | 20 | |
| Cobalt | 1050 | | 10.0 | ug/L | 1000 | 4.30 | 105 | 75-125 | 2 | 20 | |
| Copper | 541 | | 10.0 | ug/L | 500 | 2.76 | 108 | 75-125 | 2 | 20 | |
| Iron | 12500 | | 50.0 | ug/L | 10000 | 2050 | 104 | 75-125 | 2 | 20 | |
| Lead | 1050 | | 10.0 | ug/L | 1000 | 1.90 U | 105 | 75-125 | 3 | 20 | |
| Manganese | 2180 | | 10.0 | ug/L | 500 | 1780 | 80 | 75-125 | 1 | 20 | |
| Nickel | 1050 | | 10.0 | ug/L | 1000 | 1.80 U | 105 | 75-125 | 2 | 20 | |
| Silver | 105 | | 10.0 | ug/L | 100 | 1.90 U | 105 | 75-125 | 2 | 20 | |
| Vanadium | 524 | | 10.0 | ug/L | 500 | 2.62 | 104 | 75-125 | 2 | 20 | |
| Zinc | 1090 | | 10.0 | ug/L | 1000 | 20.0 | 107 | 75-125 | 2 | 20 | |

**Post Spike (0C26014-PS1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:37

**Source: C002861-02**

## QUALITY CONTROL

### Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26014 - EPA 3005A*

**Post Spike (0C26014-PS1) Continued** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:37

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1.03 | | 0.0100 | mg/L | 1.00 | -0.00132 | 103 | 80-120 | | | |
| Barium | 1.08 | | 0.0100 | mg/L | 1.00 | 0.0337 | 104 | 80-120 | | | |
| Beryllium | 0.540 | | 0.00100 | mg/L | 0.500 | 0.00146 | 108 | 80-120 | | | |
| Cadmium | 0.526 | | 0.00100 | mg/L | 0.500 | 1.19E-5 | 105 | 80-120 | | | |
| Chromium | 1.05 | | 0.0100 | mg/L | 1.00 | 8.28E-6 | 105 | 80-120 | | | |
| Cobalt | 1.04 | | 0.0100 | mg/L | 1.00 | 0.00430 | 104 | 80-120 | | | |
| Copper | 0.534 | | 0.0100 | mg/L | 0.500 | 0.00276 | 106 | 80-120 | | | |
| Iron | 12.4 | | 0.0500 | mg/L | 10.0 | 2.05 | 103 | 80-120 | | | |
| Lead | 1.02 | | 0.0100 | mg/L | 1.00 | 0.000724 | 102 | 80-120 | | | |
| Manganese | 2.16 | | 0.0100 | mg/L | 0.500 | 1.78 | 76 | 80-120 | | | QM-08 |
| Nickel | 1.04 | | 0.0100 | mg/L | 1.00 | 0.000411 | 104 | 80-120 | | | |
| Silver | 0.104 | | 0.0100 | mg/L | 0.100 | 0.000721 | 103 | 80-120 | | | |
| Vanadium | 0.518 | | 0.0100 | mg/L | 0.500 | 0.00262 | 103 | 80-120 | | | |
| Zinc | 1.08 | | 0.0100 | mg/L | 1.00 | 0.0200 | 106 | 80-120 | | | |

*Batch 0C26016 - EPA 3005A*

**Blank (0C26016-BLK1)** Prepared: 03/26/2010 10:33 Analyzed: 03/30/2010 11:08

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.220 | U | 2.00 | ug/L | | | | | | | |
| Selenium | 0.830 | U | 1.00 | ug/L | | | | | | | |
| Thallium | 0.110 | U | 1.00 | ug/L | | | | | | | |

**LCS (0C26016-BS1)** Prepared: 03/26/2010 10:33 Analyzed: 03/30/2010 11:11

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 27.2 | | 2.00 | ug/L | 25.0 | | 109 | 80-120 | | | |
| Selenium | 27.6 | | 1.00 | ug/L | 25.0 | | 110 | 80-120 | | | |
| Thallium | 27.6 | | 1.00 | ug/L | 25.0 | | 111 | 80-120 | | | |

**Matrix Spike (0C26016-MS1)** Prepared: 03/26/2010 10:33 Analyzed: 03/30/2010 11:26

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 28.8 | | 2.00 | ug/L | 25.0 | 0.220 U | 115 | 75-125 | | | |
| Selenium | 27.6 | | 1.00 | ug/L | 25.0 | 0.830 U | 111 | 75-125 | | | |
| Thallium | 28.9 | | 1.00 | ug/L | 25.0 | 0.110 U | 116 | 75-125 | | | |

**Matrix Spike Dup (0C26016-MSD1)** Prepared: 03/26/2010 10:33 Analyzed: 03/30/2010 11:29

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 27.8 | | 2.00 | ug/L | 25.0 | 0.220 U | 111 | 75-125 | 4 | 20 | |
| Selenium | 27.7 | | 1.00 | ug/L | 25.0 | 0.830 U | 111 | 75-125 | 0.1 | 20 | |
| Thallium | 28.4 | | 1.00 | ug/L | 25.0 | 0.110 U | 114 | 75-125 | 2 | 20 | |

# QUALITY CONTROL

## Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26016 - EPA 3005A*

**Post Spike (0C26016-PS1)** Prepared: 03/26/2010 10:33 Analyzed: 03/30/2010 11:33

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 28.4 | | 2.00 | ug/L | 25.0 | 0.0500 | 113 | 80-120 | | | |
| Selenium | 29.9 | | 1.00 | ug/L | 25.0 | -0.253 | 121 | 80-120 | | | QM-08 |
| Thallium | 29.3 | | 1.00 | ug/L | 25.0 | 0.0720 | 117 | 80-120 | | | |

## Classical Chemistry Parameters - Quality Control

*Batch 0C25014 - NO PREP*

**Blank (0C25014-BLK1)** Prepared & Analyzed: 03/25/2010 17:45

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 10 | U | 10 | mg/L | | | | | | | |

**LCS (0C25014-BS1)** Prepared & Analyzed: 03/25/2010 17:45

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 300 | | 10 | mg/L | 300 | | 101 | 90-110 | | | |

**Duplicate (0C25014-DUP1)** Prepared & Analyzed: 03/25/2010 17:45

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 110 | | 10 | mg/L | | 110 | | | 0 | | |

*Batch 0C29017 - NO PREP*

**Blank (0C29017-BLK1)** Prepared: 03/26/2010 09:30 Analyzed: 03/26/2010 11:14

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 1.2 | U | 5.0 | mg/L | | | | | | | |

**LCS (0C29017-BS1)** Prepared: 03/26/2010 09:30 Analyzed: 03/26/2010 11:15

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 98 | | 5.0 | mg/L | 100 | | 98 | 80-120 | | | |

**Matrix Spike (0C29017-MS1)** Prepared: 03/26/2010 09:30 Analyzed: 03/26/2010 11:43

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 100 | | 5.0 | mg/L | 100 | 1.7 | 99 | 80-120 | | | |

**Matrix Spike Dup (0C29017-MSD1)** Prepared: 03/26/2010 09:30 Analyzed: 03/26/2010 11:43

**Source: C002861-02**

# QUALITY CONTROL

## Classical Chemistry Parameters - Quality Control

*Batch 0C29017 - NO PREP*

**Matrix Spike Dup (0C29017-MSD1) Continued** Prepared: 03/26/2010 09:30 Analyzed: 03/26/2010 11:43

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 100 | | 5.0 | mg/L | 100 | 1.7 | 100 | 80-120 | 0.8 | 25 | |

*Batch 0C30001 - NO PREP*

**Blank (0C30001-BLK1)** Prepared: 03/30/2010 07:22 Analyzed: 03/30/2010 08:42

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 | 0.12 | U | 5.0 | mg/L | | | | | | | |

**LCS (0C30001-BS1)** Prepared: 03/30/2010 07:22 Analyzed: 03/30/2010 09:03

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 | 47 | | 5.0 | mg/L | 50.0 | | 93 | 90-110 | | | |

**Matrix Spike (0C30001-MS1)** Prepared: 03/30/2010 07:22 Analyzed: 03/30/2010 09:25

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 55 | | 5.0 | mg/L | 50.0 | 3.5 | 102 | 80-120 | | | |
| Sulfate as SO4 | 53 | | 5.0 | mg/L | 50.0 | 5.3 | 96 | 80-120 | | | |

**Matrix Spike Dup (0C30001-MSD1)** Prepared: 03/30/2010 07:22 Analyzed: 03/30/2010 09:47

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 54 | | 5.0 | mg/L | 50.0 | 3.5 | 100 | 80-120 | 2 | 15 | |
| Sulfate as SO4 | 52 | | 5.0 | mg/L | 50.0 | 5.3 | 94 | 80-120 | 2 | 15 | |

*Batch 0C30013 - NO PREP*

**Blank (0C30013-BLK1)** Prepared & Analyzed: 03/30/2010 16:45

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 10 | U | 10 | mg/L | | | | | | | |

**LCS (0C30013-BS1)** Prepared & Analyzed: 03/30/2010 16:45

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 280 | | 10 | mg/L | 300 | | 95 | 90-110 | | | |

**Duplicate (0C30013-DUP1)** Prepared & Analyzed: 03/30/2010 16:45

**Source: C001080-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids | 530 | | 10 | mg/L | | 540 | | | 3 | | |

# QUALITY CONTROL

## Classical Chemistry Parameters - Quality Control

*Batch 0C30013 - NO PREP*

*Batch 0D02004 - NO PREP*

**Blank (0D02004-BLK1)** Prepared: 04/02/2010 07:57 Analyzed: 04/02/2010 11:46

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | 8.0 | U | 15 | mg/L | | | | | | | |

**LCS (0D02004-BS1)** Prepared: 04/02/2010 07:57 Analyzed: 04/02/2010 11:47

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | 100 | | 15 | mg/L | 100 | | 101 | 80-120 | | | |

**Matrix Spike (0D02004-MS1)** Prepared: 04/02/2010 07:57 Analyzed: 04/02/2010 11:51

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | 170 | | 15 | mg/L | 100 | 57 | 109 | 80-120 | | | |

**Matrix Spike (0D02004-MS2)** Prepared: 04/02/2010 07:57 Analyzed: 04/02/2010 12:00

**Source: C003766-04**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | 210 | E | 15 | mg/L | 100 | 140 | 70 | 80-120 | | | QM-02 |

**Matrix Spike Dup (0D02004-MSD1)** Prepared: 04/02/2010 07:57 Analyzed: 04/02/2010 11:52

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | 160 | | 15 | mg/L | 100 | 57 | 101 | 80-120 | 5 | 25 | |

**Matrix Spike Dup (0D02004-MSD2)** Prepared: 04/02/2010 07:57 Analyzed: 04/02/2010 12:01

**Source: C003766-04**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | 210 | E | 15 | mg/L | 100 | 140 | 70 | 80-120 | 0.09 | 25 | QM-02 |

## FLAGS/NOTES AND DEFINITIONS

| | |
|---|---|
| B | The analyte was detected in the associated method blank. |
| D | The sample was analyzed at dilution. |
| J | The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable. |
| U | The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable. |
| E | The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate. |
| MRL | Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content. |
| QM-02 | The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample. |
| QM-07 | The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery. |
| QM-08 | Post-digestion spike did not meet method requirements due to confirmed matrix effects (dilution test). |

# ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr.
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 211
Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Page ____ of ____

| | |
|---|---|
| Client Name: Golder Associates, Inc. (GO007) | Project Number: 08396506010.100 |
| Address: The Wingate Building 4900 Koger Blvd., Suite 140 | Project Name/Desc: Henderson Co. LF C&D |
| City/ST/Zip: Greensboro, NC 27407 | PO # / Billing Info |
| Tel: (336) 852-4903 Fax: (336) 852-4904 | Reporting Contact: Dusty Reedy |
| Sampler(s) Name, Affiliation (Print): Ryan Stringfellow, Golder | Billing Contact: Accounts Payable |
| Sampler(s) Signature: Ryan Stringfellow | Facility # (if required) |

Requested Analyses

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

✓ Standard

___ Expedited

Due ___/___/___

Lab Workorder: C002861

Preservation (See Codes) (Combine as necessary)

| Item # | Sample ID (Field Identification) | Collection Date | Collection Time | Comp / Grab | Matrix (see codes) | Total # of Containers | 8260B Appendix 1 | Ag,As,Ba,Be,Ca,Cd,Co,Cr,Cu,Fe,K,Mg,Mn,Na,Ni,Pb,Sb,Se,Tl,V,Zn | Alkalinity 310.2,Chloride 300,Nitrite as N 353.2,TDS SM2540C | Ammonia 350.1,NOX 353.2 | Hg | Nitrate Calc 353.2 | Sulfate 300 | Sulfide SM4500-S D | | | Sample Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4501-MW10 | 3-24-10 | 9:10 | G | GW | 7 | X | X | X | X | X | X | X | X | | | |
| | 4501-MW11 (MS/MSD) | 3.24.10 | 10:00 | G | GW | 11 | X | X | X | X | X | X | X | X | | | |
| | 4501-MW12 | 3.24.10 | 9.45 | G | GW | 7 | X | X | X | X | X | X | X | X | | | |
| | 4501-MW13 | 3.24.10 | 9:30 | G | GW | 7 | X | X | X | X | X | X | X | X | | | |

<-- Total # of Containers

| | | | | | |
|---|---|---|---|---|---|
| Sample Kit Prepared By: SK | Date/Time: 3/17/10 | Relinquished By: Ryan Stringfellow | Date/Time: 3.24.10 1:20 | Received By: Briana Gregory | Date/Time: 3/25/10 10:50 |
| Comments: Special reporting - see bottle wise request. SK 3/17/10 1. Please provide a level 2 report. 2. Unit rates per Basic Ordering Agreement dated April 9, 2004 and the 2010 Price List. | | Relinquished By: | Date/Time: | Received By: | Date/Time: |
| | | Relinquished By: | Date/Time: | Received By: | Date/Time: |
| | | Cooler #'s & Temps on Receipt: C-490 2.8°C | | Condition Upon Receipt: X Acceptable ___ Unacceptable | |

Matrix : GW-Groundwater SO-Soil SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments)

Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

LOA per Ryan Stringfellow: Ryan Stringfellow Approved By Stephen

**Environmental Conservation Laboratories, Inc.**
**102-A Woodwinds Industrial Court**
**Cary NC, 27511**
**Phone: 919.467.3090 FAX: 919.467.3515**
**www.encolabs.com**

Tuesday, April 6, 2010

Golder Associates, Inc. (GO007)

Attn: Dusty Reedy

The Wingate Building 4900 Koger Blvd., Suite 140

Greensboro, NC 27407

**RE: Laboratory Results for**
**Project Number: 08396506010.100, Project Name/Desc: Henderson Co. LF C&D**
**ENCO Workorder: C002861**

Dear Dusty Reedy,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Thursday, March 25, 2010.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Stephanie Franz
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 22.

# PROJECT NARRATIVE

Date: 06 April 2010
Client: Golder Associates, Inc. (GO007)
Project: Henderson Co. LF C&D
Lab ID: C002861

Overview

This report is an amendment to the original report dated 05 April 2010. This report was revised to divide the report into C&D parameters and Indicator parameters.

Environmental Conservation Laboratories, Inc. (ENCO) analyzed all submitted samples in accordance with the methods referenced in the laboratory report. Any particular difficulties encountered during sample handling by ENCO are discussed in the QC Remarks section below.

Quality Control Samples

The spike recovery of Methane could not be accurately calculated in the MS and MSD samples due to the high concentration of analyte in the source sample. The QC batch was approved based on acceptable LCS recovery of this analyte.

The spike recoveries of Nitrate/Nitrite (NOx) and Sulfide were outside of control limits in the MS and MSD samples. The QC batches were approved based on acceptable LCS recovery of these analytes.

Quality Control Remarks

No Comments

Other Comments

All samples received under this work order arrived in acceptable conditions. The samples were not checked for residual chlorine, as it is not required.

The analytical data presented in this report are consistent with the methods as referenced in the analytical report. Any exceptions or deviations are noted in the QC remarks section of this narrative or in the Flags/Notes and Definitions section of the report.

Released By:
Environmental Conservation Laboratories, Inc.

Stephanie Franz
Project Manager

www.encolabs.com

## SAMPLE SUMMARY/LABORATORY CHRONICLE

**Client ID: 4501-MW10** | **Lab ID: C002861-01** | **Sampled: 03/24/10 09:10** | **Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 350.1 | 04/21/10 | 03/31/10 07:25 | 3/31/2010 09:37 |
| EPA 353.2 | 03/26/10 09:10 | 03/26/10 06:25 | 3/26/2010 07:20 |
| EPA 353.2 | 04/21/10 | 03/29/10 06:30 | 3/29/2010 10:07 |
| EPA 353.2 | 04/21/10 | 03/30/10 09:36 | 3/30/2010 10:01 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:42 |
| RSK 175 | 04/07/10 | 03/30/10 10:53 | 3/31/2010 10:04 |
| SM18 4500-S D | 03/31/10 | 03/29/10 14:02 | 3/29/2010 14:36 |

**Client ID: 4501-MW11 (MS/MSD)** | **Lab ID: C002861-02** | **Sampled: 03/24/10 10:00** | **Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 350.1 | 04/21/10 | 03/31/10 07:25 | 3/31/2010 09:39 |
| EPA 353.2 | 03/26/10 10:00 | 03/26/10 06:25 | 3/26/2010 07:21 |
| EPA 353.2 | 04/21/10 | 03/29/10 06:30 | 3/29/2010 10:09 |
| EPA 353.2 | 04/21/10 | 03/30/10 09:36 | 3/30/2010 10:01 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:29 |
| RSK 175 | 04/07/10 | 03/30/10 10:53 | 3/31/2010 09:57 |
| SM18 4500-S D | 03/31/10 | 03/29/10 14:02 | 3/29/2010 14:36 |

**Client ID: 4501-MW12** | **Lab ID: C002861-03** | **Sampled: 03/24/10 09:45** | **Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 350.1 | 04/21/10 | 03/31/10 07:25 | 3/31/2010 09:45 |
| EPA 353.2 | 03/26/10 09:45 | 03/26/10 06:25 | 3/26/2010 07:23 |
| EPA 353.2 | 04/21/10 | 03/29/10 06:30 | 3/29/2010 10:16 |
| EPA 353.2 | 04/21/10 | 03/30/10 09:36 | 3/30/2010 10:01 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:44 |
| RSK 175 | 04/07/10 | 03/30/10 10:53 | 3/31/2010 10:08 |
| SM18 4500-S D | 03/31/10 | 03/29/10 14:02 | 3/29/2010 14:36 |

**Client ID: 4501-MW13** | **Lab ID: C002861-04** | **Sampled: 03/24/10 09:30** | **Received: 03/25/10 10:50**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 350.1 | 04/21/10 | 03/31/10 07:25 | 3/31/2010 09:47 |
| EPA 353.2 | 03/26/10 09:30 | 03/26/10 06:25 | 3/26/2010 07:24 |
| EPA 353.2 | 04/21/10 | 03/29/10 06:30 | 3/29/2010 10:22 |
| EPA 353.2 | 04/21/10 | 03/30/10 09:36 | 3/30/2010 10:01 |
| EPA 6010C | 09/20/10 | 03/26/10 10:16 | 3/28/2010 13:46 |
| RSK 175 | 04/07/10 | 03/30/10 10:53 | 3/31/2010 10:12 |
| SM18 4500-S D | 03/31/10 | 03/29/10 14:02 | 3/29/2010 14:36 |

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## NORTH CAROLINA SWS SAMPLE DETECTION SUMMARY

**Client ID: 4501-MW10** **Lab ID: C002861-01**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Calcium - Total | 1630 | | 1 | 20.0 | 100 | NE | ug/L | EPA 6010C | |
| Magnesium - Total | 311 | | 1 | 23.0 | 100 | NE | ug/L | EPA 6010C | |
| Methane | 0.002 | | 1 | 0.0002 | 0.001 | NE | mg/L | RSK 175 | |
| Nitrate as N | 0.74 | J | 1 | 0.021 | 0.10 | 10000 | mg/L | EPA 353.2 | |
| Nitrate/Nitrite as N | 0.74 | | 1 | 0.021 | 0.10 | NE | mg/L | EPA 353.2 | |
| Potassium - Total | 1370 | | 1 | 150 | 500 | NE | ug/L | EPA 6010C | |
| Sodium - Total | 3630 | | 1 | 400 | 500 | NE | ug/L | EPA 6010C | |

**Client ID: 4501-MW11 (MS/MSD)** **Lab ID: C002861-02**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N | 0.077 | J | 1 | 0.010 | 0.10 | NE | mg/L | EPA 350.1 | |
| Calcium - Total | 19900 | | 1 | 20.0 | 100 | NE | ug/L | EPA 6010C | |
| Magnesium - Total | 2720 | | 1 | 23.0 | 100 | NE | ug/L | EPA 6010C | |
| Methane | 0.789 | | 1 | 0.0002 | 0.001 | NE | mg/L | RSK 175 | |
| Potassium - Total | 1940 | | 1 | 150 | 500 | NE | ug/L | EPA 6010C | |
| Sodium - Total | 9910 | | 1 | 400 | 500 | NE | ug/L | EPA 6010C | |

**Client ID: 4501-MW12** **Lab ID: C002861-03**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Calcium - Total | 26200 | | 1 | 20.0 | 100 | NE | ug/L | EPA 6010C | |
| Magnesium - Total | 5150 | | 1 | 23.0 | 100 | NE | ug/L | EPA 6010C | |
| Methane | 1.48 | | 1 | 0.0002 | 0.001 | NE | mg/L | RSK 175 | |
| Nitrate as N | 0.92 | J | 1 | 0.021 | 0.10 | 10000 | mg/L | EPA 353.2 | |
| Nitrate/Nitrite as N | 0.98 | | 1 | 0.021 | 0.10 | NE | mg/L | EPA 353.2 | |
| Nitrite as N | 0.067 | J | 1 | 0.0056 | 0.10 | 1000 | mg/L | EPA 353.2 | |
| Potassium - Total | 2980 | | 1 | 150 | 500 | NE | ug/L | EPA 6010C | |
| Sodium - Total | 18700 | | 1 | 400 | 500 | NE | ug/L | EPA 6010C | |

**Client ID: 4501-MW13** **Lab ID: C002861-04**

| Analyte | Results | Flag | DF | MDL | MRL | NC SWSL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Calcium - Total | 16500 | | 1 | 20.0 | 100 | NE | ug/L | EPA 6010C | |
| Magnesium - Total | 3510 | | 1 | 23.0 | 100 | NE | ug/L | EPA 6010C | |
| Methane | 0.010 | | 1 | 0.0002 | 0.001 | NE | mg/L | RSK 175 | |
| Nitrate as N | 0.15 | J | 1 | 0.021 | 0.10 | 10000 | mg/L | EPA 353.2 | |
| Nitrate/Nitrite as N | 0.16 | | 1 | 0.021 | 0.10 | NE | mg/L | EPA 353.2 | |
| Nitrite as N | 0.014 | J | 1 | 0.0056 | 0.10 | 1000 | mg/L | EPA 353.2 | |
| Potassium - Total | 3060 | | 1 | 150 | 500 | NE | ug/L | EPA 6010C | |
| Sodium - Total | 20200 | | 1 | 400 | 500 | NE | ug/L | EPA 6010C | |

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## ANALYTICAL RESULTS

**Description:** 4501-MW10
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-01
**Sampled:** 03/24/10 09:10
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

### Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Calcium [7440-70-2] ^** | **1630** | | ug/L | 1 | 20.0 | 100 | NE | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Magnesium [7439-95-4] ^** | **311** | | ug/L | 1 | 23.0 | 100 | NE | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Potassium [7440-09-7] ^** | **1370** | | ug/L | 1 | 150 | 500 | NE | EPA 6010C | 03/28/10 13:42 | JDH | |
| **Sodium [7440-23-5] ^** | **3630** | | ug/L | 1 | 400 | 500 | NE | EPA 6010C | 03/28/10 13:42 | JDH | |

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**Description:** 4501-MW10
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-01
**Sampled:** 03/24/10 09:10
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N [7664-41-7] ^ | 0.010 | U | mg/L | 1 | 0.010 | 0.10 | NE | EPA 350.1 | 03/31/10 09:37 | PEV | |
| **Nitrate as N [14797-55-8] ^** | **0.74** | J | mg/L | 1 | 0.021 | 0.10 | 10000 | EPA 353.2 | 03/30/10 10:01 | PEV | |
| **Nitrate/Nitrite as N [ECL-0010] ^** | **0.74** | | mg/L | 1 | 0.021 | 0.10 | NE | EPA 353.2 | 03/29/10 10:07 | PEV | |
| Nitrite as N [14797-65-0] ^ | 0.0056 | U | mg/L | 1 | 0.0056 | 0.10 | 1000 | EPA 353.2 | 03/26/10 07:20 | PEV | |
| Sulfide [18496-25-8] ^ | 0.031 | U | mg/L | 1 | 0.031 | 0.10 | 1000 | SM18 4500-S D | 03/29/10 14:36 | JOC | |

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**Description:** 4501-MW10
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-01
**Sampled:** 03/24/10 09:10
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Dissolved Gases by GC

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Methane [74-82-8]** | **0.002** | | mg/L | 1 | 0.0002 | 0.001 | NE | RSK 175 | 03/31/10 10:04 | LAC | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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**Description:** 4501-MW11 (MS/MSD)
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-02
**Sampled:** 03/24/10 10:00
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Calcium [7440-70-2] ^** | **19900** | | ug/L | 1 | 20.0 | 100 | NE | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Magnesium [7439-95-4] ^** | **2720** | | ug/L | 1 | 23.0 | 100 | NE | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Potassium [7440-09-7] ^** | **1940** | | ug/L | 1 | 150 | 500 | NE | EPA 6010C | 03/28/10 13:29 | JDH | |
| **Sodium [7440-23-5] ^** | **9910** | | ug/L | 1 | 400 | 500 | NE | EPA 6010C | 03/28/10 13:29 | JDH | |

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**Description:** 4501-MW11 (MS/MSD)
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-02
**Sampled:** 03/24/10 10:00
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ammonia as N [7664-41-7] ^** | **0.077** | J | mg/L | 1 | 0.010 | 0.10 | NE | EPA 350.1 | 03/31/10 09:39 | PEV | |
| Nitrate as N [14797-55-8] ^ | 0.021 | U | mg/L | 1 | 0.021 | 0.10 | 10000 | EPA 353.2 | 03/30/10 10:01 | PEV | |
| Nitrate/Nitrite as N [ECL-0010] ^ | 0.021 | U | mg/L | 1 | 0.021 | 0.10 | NE | EPA 353.2 | 03/29/10 10:09 | PEV | |
| Nitrite as N [14797-65-0] ^ | 0.0056 | U | mg/L | 1 | 0.0056 | 0.10 | 1000 | EPA 353.2 | 03/26/10 07:21 | PEV | |
| Sulfide [18496-25-8] ^ | 0.031 | U | mg/L | 1 | 0.031 | 0.10 | 1000 | SM18 4500-S D | 03/29/10 14:36 | JOC | |

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**Description:** 4501-MW11 (MS/MSD)
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-02
**Sampled:** 03/24/10 10:00
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Dissolved Gases by GC

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Methane [74-82-8]** | **0.789** | | mg/L | 1 | 0.0002 | 0.001 | NE | RSK 175 | 03/31/10 09:57 | LAC | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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**Description:** 4501-MW12
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-03
**Sampled:** 03/24/10 09:45
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Calcium [7440-70-2] ^** | **26200** | | ug/L | 1 | 20.0 | 100 | NE | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Magnesium [7439-95-4] ^** | **5150** | | ug/L | 1 | 23.0 | 100 | NE | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Potassium [7440-09-7] ^** | **2980** | | ug/L | 1 | 150 | 500 | NE | EPA 6010C | 03/28/10 13:44 | JDH | |
| **Sodium [7440-23-5] ^** | **18700** | | ug/L | 1 | 400 | 500 | NE | EPA 6010C | 03/28/10 13:44 | JDH | |

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**Description:** 4501-MW12
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-03
**Sampled:** 03/24/10 09:45
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N [7664-41-7] ^ | 0.010 | U | mg/L | 1 | 0.010 | 0.10 | NE | EPA 350.1 | 03/31/10 09:45 | PEV | |
| **Nitrate as N [14797-55-8] ^** | **0.92** | J | mg/L | 1 | 0.021 | 0.10 | 10000 | EPA 353.2 | 03/30/10 10:01 | PEV | |
| **Nitrate/Nitrite as N [ECL-0010] ^** | **0.98** | | mg/L | 1 | 0.021 | 0.10 | NE | EPA 353.2 | 03/29/10 10:16 | PEV | |
| **Nitrite as N [14797-65-0] ^** | **0.067** | J | mg/L | 1 | 0.0056 | 0.10 | 1000 | EPA 353.2 | 03/26/10 07:23 | PEV | |
| Sulfide [18496-25-8] ^ | 0.031 | U | mg/L | 1 | 0.031 | 0.10 | 1000 | SM18 4500-S D | 03/29/10 14:36 | JOC | |

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**Description:** 4501-MW12
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-03
**Sampled:** 03/24/10 09:45
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Dissolved Gases by GC

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Methane [74-82-8]** | **1.48** | | mg/L | 1 | 0.0002 | 0.001 | NE | RSK 175 | 03/31/10 10:08 | LAC | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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**Description:** 4501-MW13
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-04
**Sampled:** 03/24/10 09:30
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Calcium [7440-70-2] ^** | **16500** | | ug/L | 1 | 20.0 | 100 | NE | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Magnesium [7439-95-4] ^** | **3510** | | ug/L | 1 | 23.0 | 100 | NE | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Potassium [7440-09-7] ^** | **3060** | | ug/L | 1 | 150 | 500 | NE | EPA 6010C | 03/28/10 13:46 | JDH | |
| **Sodium [7440-23-5] ^** | **20200** | | ug/L | 1 | 400 | 500 | NE | EPA 6010C | 03/28/10 13:46 | JDH | |

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**Description:** 4501-MW13
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-04
**Sampled:** 03/24/10 09:30
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N [7664-41-7] ^ | 0.010 | U | mg/L | 1 | 0.010 | 0.10 | NE | EPA 350.1 | 03/31/10 09:47 | PEV | |
| **Nitrate as N [14797-55-8] ^** | **0.15** | J | mg/L | 1 | 0.021 | 0.10 | 10000 | EPA 353.2 | 03/30/10 10:01 | PEV | |
| **Nitrate/Nitrite as N [ECL-0010] ^** | **0.16** | | mg/L | 1 | 0.021 | 0.10 | NE | EPA 353.2 | 03/29/10 10:22 | PEV | |
| **Nitrite as N [14797-65-0] ^** | **0.014** | J | mg/L | 1 | 0.0056 | 0.10 | 1000 | EPA 353.2 | 03/26/10 07:24 | PEV | |
| Sulfide [18496-25-8] ^ | 0.031 | U | mg/L | 1 | 0.031 | 0.10 | 1000 | SM18 4500-S D | 03/29/10 14:36 | JOC | |

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**Description:** 4501-MW13
**Matrix:** Ground Water
**Project:** Henderson Co. LF C&D

**Lab Sample ID:** C002861-04
**Sampled:** 03/24/10 09:30
**Sampled By:** Ryan Stringfellow

**Received:** 03/25/10 10:50
**Work Order:** C002861

## Dissolved Gases by GC

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | MRL | NC SWSL | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Methane [74-82-8]** | **0.010** | | mg/L | 1 | 0.0002 | 0.001 | NE | RSK 175 | 03/31/10 10:12 | LAC | |

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

# QUALITY CONTROL

## Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

*Batch 0C26014 - EPA 3005A*

**Blank (0C26014-BLK1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:21

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 20.0 | U | 100 | ug/L | | | | | | | |
| Magnesium | 23.0 | U | 100 | ug/L | | | | | | | |
| Potassium | 150 | U | 500 | ug/L | | | | | | | |
| Sodium | 400 | U | 500 | ug/L | | | | | | | |

**LCS (0C26014-BS1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:23

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 10900 | | 100 | ug/L | 10000 | | 109 | 80-120 | | | |
| Magnesium | 10800 | | 100 | ug/L | 10000 | | 108 | 80-120 | | | |
| Potassium | 56300 | | 500 | ug/L | 50000 | | 113 | 80-120 | | | |
| Sodium | 53700 | | 500 | ug/L | 50000 | | 107 | 80-120 | | | |

**Matrix Spike (0C26014-MS1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:31

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 30300 | | 100 | ug/L | 10000 | 19900 | 104 | 75-125 | | | |
| Magnesium | 13600 | | 100 | ug/L | 10000 | 2720 | 109 | 75-125 | | | |
| Potassium | 59000 | | 500 | ug/L | 50000 | 1940 | 114 | 75-125 | | | |
| Sodium | 64500 | | 500 | ug/L | 50000 | 9910 | 109 | 75-125 | | | |

**Matrix Spike Dup (0C26014-MSD1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:34

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 28500 | | 100 | ug/L | 10000 | 19900 | 86 | 75-125 | 6 | 20 | |
| Magnesium | 13000 | | 100 | ug/L | 10000 | 2720 | 103 | 75-125 | 4 | 20 | |
| Potassium | 57100 | | 500 | ug/L | 50000 | 1940 | 110 | 75-125 | 3 | 20 | |
| Sodium | 61000 | | 500 | ug/L | 50000 | 9910 | 102 | 75-125 | 6 | 20 | |

**Post Spike (0C26014-PS1)** Prepared: 03/26/2010 10:16 Analyzed: 03/28/2010 13:37

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 29.0 | | 0.100 | mg/L | 10.0 | 19.9 | 92 | 80-120 | | | |
| Magnesium | 12.8 | | 0.100 | mg/L | 10.0 | 2.72 | 101 | 80-120 | | | |
| Potassium | 55.9 | | 0.500 | mg/L | 50.0 | 1.94 | 108 | 80-120 | | | |
| Sodium | 61.3 | | 0.500 | mg/L | 50.0 | 9.91 | 103 | 80-120 | | | |

## Classical Chemistry Parameters - Quality Control

*Batch 0C26001 - NO PREP*

**Blank (0C26001-BLK1)** Prepared: 03/26/2010 06:25 Analyzed: 03/26/2010 07:18

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|

# QUALITY CONTROL

## Classical Chemistry Parameters - Quality Control

*Batch 0C26001 - NO PREP*

**Blank (0C26001-BLK1) Continued** Prepared: 03/26/2010 06:25 Analyzed: 03/26/2010 07:18

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrite as N | 0.0056 | U | 0.10 | mg/L | | | | | | | |

**LCS (0C26001-BS1)** Prepared: 03/26/2010 06:25 Analyzed: 03/26/2010 07:19

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrite as N | 0.99 | | 0.10 | mg/L | 1.00 | | 99 | 80-120 | | | |

**Matrix Spike (0C26001-MS1)** Prepared: 03/26/2010 06:25 Analyzed: 03/26/2010 07:21

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrite as N | 1.0 | | 0.10 | mg/L | 1.00 | -0.0022 | 100 | 80-120 | | | |

**Matrix Spike Dup (0C26001-MSD1)** Prepared: 03/26/2010 06:25 Analyzed: 03/26/2010 07:22

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrite as N | 0.97 | | 0.10 | mg/L | 1.00 | -0.0022 | 97 | 80-120 | 4 | 25 | |

*Batch 0C29002 - NO PREP*

**Blank (0C29002-BLK1)** Prepared: 03/29/2010 06:30 Analyzed: 03/29/2010 09:39

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate/Nitrite as N | 0.021 | U | 0.10 | mg/L | | | | | | | |

**LCS (0C29002-BS1)** Prepared: 03/29/2010 06:30 Analyzed: 03/29/2010 09:41

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate/Nitrite as N | 1.3 | | 0.10 | mg/L | 1.25 | | 106 | 80-120 | | | |

**Matrix Spike (0C29002-MS1)** Prepared: 03/29/2010 06:30 Analyzed: 03/29/2010 10:12

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate/Nitrite as N | 1.0 | | 0.10 | mg/L | 1.28 | 0.002 | 79 | 80-120 | | | QM-07, QM-11 |

**Matrix Spike Dup (0C29002-MSD1)** Prepared: 03/29/2010 06:30 Analyzed: 03/29/2010 10:14

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate/Nitrite as N | 0.49 | | 0.10 | mg/L | 1.28 | 0.002 | 38 | 80-120 | 69 | 25 | QM-07, QM-11 |

*Batch 0C29024 - NO PREP*

**Blank (0C29024-BLK1)** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

# QUALITY CONTROL

## Classical Chemistry Parameters - Quality Control

*Batch 0C29024 - NO PREP*

**Blank (0C29024-BLK1) Continued** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfide | 0.031 | U | 0.10 | mg/L | | | | | | | |

**LCS (0C29024-BS1)** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfide | 0.41 | | 0.10 | mg/L | 0.401 | | 103 | 80-120 | | | |

**Matrix Spike (0C29024-MS1)** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfide | 0.21 | | 0.10 | mg/L | 0.401 | 0.0003 | 51 | 80-120 | | | QM-07 |

**Matrix Spike (0C29024-MS2)** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

**Source: C002862-01**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfide | -0.012 | U | 0.10 | mg/L | 0.401 | 0.031 U | | 80-120 | | | QM-07 |

**Matrix Spike Dup (0C29024-MSD1)** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfide | 0.20 | | 0.10 | mg/L | 0.401 | 0.0003 | 49 | 80-120 | 5 | 25 | QM-07 |

**Matrix Spike Dup (0C29024-MSD2)** Prepared: 03/29/2010 14:02 Analyzed: 03/29/2010 14:36

**Source: C002862-01**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfide | -0.012 | U | 0.10 | mg/L | 0.401 | 0.031 U | | 80-120 | | 25 | QM-07 |

*Batch 0C31003 - NO PREP*

**Blank (0C31003-BLK1)** Prepared: 03/31/2010 07:25 Analyzed: 03/31/2010 09:12

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N | 0.010 | U | 0.10 | mg/L | | | | | | | |

**LCS (0C31003-BS1)** Prepared: 03/31/2010 07:25 Analyzed: 03/31/2010 09:14

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N | 1.0 | | 0.10 | mg/L | 1.00 | | 101 | 80-120 | | | |

**Matrix Spike (0C31003-MS1)** Prepared: 03/31/2010 07:25 Analyzed: 03/31/2010 09:41

**Source: C002861-02**

## QUALITY CONTROL

### Classical Chemistry Parameters - Quality Control

*Batch 0C31003 - NO PREP*

**Matrix Spike (0C31003-MS1) Continued** Prepared: 03/31/2010 07:25 Analyzed: 03/31/2010 09:41

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N | 0.88 | | 0.10 | mg/L | 1.00 | 0.077 | 81 | 80-120 | | | |

**Matrix Spike Dup (0C31003-MSD1)** Prepared: 03/31/2010 07:25 Analyzed: 03/31/2010 09:43

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia as N | 0.91 | | 0.10 | mg/L | 1.00 | 0.077 | 83 | 80-120 | 3 | 25 | |

## QUALITY CONTROL

### Dissolved Gases by GC - Quality Control

*Batch 0C30003 - NO PREP ANALYTIX*

**Blank (0C30003-BLK1)** Prepared: 03/30/2010 10:53 Analyzed: 03/31/2010 09:25

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Methane | 0.0002 | U | 0.001 | mg/L | | | | | | | |

**LCS (0C30003-BS1)** Prepared: 03/30/2010 10:53 Analyzed: 03/31/2010 09:28

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Methane | 0.0888 | | 0.001 | mg/L | 0.0958 | | 93 | 74-116 | | | |

**Matrix Spike (0C30003-MS1)** Prepared: 03/30/2010 10:53 Analyzed: 03/31/2010 09:38

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Methane | 1.21 | | 0.001 | mg/L | 0.0958 | 0.789 | 444 | 74-116 | | | QM-02 |

**Matrix Spike Dup (0C30003-MSD1)** Prepared: 03/30/2010 10:53 Analyzed: 03/31/2010 09:42

**Source: C002861-02**

| Analyte | Result | Flag | MRL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Methane | 1.30 | | 0.001 | mg/L | 0.0958 | 0.789 | 537 | 74-116 | 7 | 18 | QM-02 |

## FLAGS/NOTES AND DEFINITIONS

| | |
|---|---|
| B | The analyte was detected in the associated method blank. |
| D | The sample was analyzed at dilution. |
| J | The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable. |
| U | The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable. |
| E | The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate. |
| MRL | Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content. |
| QM-02 | The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample. |
| QM-07 | The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery. |
| QM-11 | Precision between duplicate matrix spikes of the same sample was outside acceptance limits. |

# ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr.
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 211
Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Page ____ of ____

| | |
|---|---|
| Client Name: Golder Associates, Inc. (GO007) | Project Number: 08396506010.100 |
| Address: The Wingate Building 4900 Koger Blvd., Suite 140 | Project Name/Desc: Henderson Co. LF C&D |
| City/ST/Zip: Greensboro, NC 27407 | PO # / Billing Info |
| Tel: (336) 852-4903 Fax: (336) 852-4904 | Reporting Contact: Dusty Reedy |
| Sampler(s) Name, Affiliation (Print): Ryan Stringfellow, Golder | Billing Contact: Accounts Payable |
| Sampler(s) Signature: Ryan Stringfellow | Facility # (if required) |

Requested Analyses

Requested Turnaround Times

Note : Rush requests subject to acceptance by the facility

✓ Standard

___ Expedited

Due ___/___/___

Lab Workorder: C002861

Preservation (See Codes) (Combine as necessary)

| Item # | Sample ID (Field Identification) | Collection Date | Collection Time | Comp / Grab | Matrix (see codes) | Total # of Containers | 8260B Appendix 1 | Ag,As,Ba,Be,Ca,Cd,Co,Cr,Cu,Fe,K,Mg,Mn,Na,Ni,Pb,Sb,Se,Tl,V,Zn | Alkalinity 310.2,Chloride 300,Nitrite as N 353.2,TDS SM2540C | Ammonia 350.1,NOX 353.2 | Hg | Nitrate Calc 353.2 | Sulfate 300 | Sulfide SM4500-S D | | | Sample Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4501-MW10 | 3-24-10 | 9:10 | G | GW | 7 | X | X | X | X | X | X | X | X | | | |
| | 4501-MW11 (MS/MSD) | 3.24.10 | 10:00 | G | GW | 11 | X | X | X | X | X | X | X | X | | | |
| | 4501-MW12 | 3.24.10 | 9.45 | G | GW | 7 | X | X | X | X | X | X | X | X | | | |
| | 4501-MW13 | 3.24.10 | 9:30 | G | GW | 7 | X | X | X | X | X | X | X | X | | | |

<-- Total # of Containers

| | | | | | |
|---|---|---|---|---|---|
| Sample Kit Prepared By: SK | Date/Time: 3/17/10 | Relinquished By: Ryan Stringfellow | Date/Time: 3.24.10 1:20 | Received By: Briana Gregory | Date/Time: 3/25/10 10:50 |
| Comments: Special reporting - see bottle wise request. SK 3/17/10 1. Please provide a level 2 report. 2. Unit rates per Basic Ordering Agreement dated April 9, 2004 and the 2010 Price List. | | Relinquished By: | Date/Time: | Received By: | Date/Time: |
| | | Relinquished By: | Date/Time: | Received By: | Date/Time: |
| | | Cooler #'s & Temps on Receipt: C-490 2.8°C | | Condition Upon Receipt: X Acceptable ___ Unacceptable | |

Matrix : GW-Groundwater SO-Soil SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments)

Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

LOA per Ryan Stringfellow: Ryan Stringfellow Approved By Stephen

WORK ORDER

Printed: 4/8/2010 2:36:48PM

**C002862**

**ENCO Cary**

# Sample Receipt Conditions

| | | | |
|---|---|---|---|
| **Client:** | **Golder Associates, Inc. (GO007)** | **Lab Project Mgr:** | **Stephanie Franz** |
| **Project:** | **Henderson Co. LF** | **Project Number:** | **08396506010.100** |
| **PO #:** | | | |

**Report To:**

Golder Associates, Inc. (GO007)
Dusty Reedy
The Wingate Building 4900 Koger Blvd., Suite 140
Greensboro, NC 27407
Phone: (336) 852-4903
Fax: (336) 852-4904

**Invoice To:**

Golder Associates, Inc. (GO007)
Accounts Payable
The Wingate Building 4900 Koger Blvd., Suite 140
Greensboro, NC 27407
Phone :(804) 358-7900
Fax: 804-358-2900

| | | | |
|---|---|---|---|
| Received By: | Briana J Gregory | Date Received: | 25-Mar-10 10:50 |
| Logged In By: | Briana J Gregory | Date Logged In: | 25-Mar-10 12:39 |

**Work Order Comments:**

**C-507 received at 3.1°C**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Containers Intact | Y | Containers Properly Preserved | Y | Proper Containers Received | Y | All Samples in PreLog Received | N | COC/Labels Agree | Y |
| Custody Seals Intact | Y | Volatile Containers Preserved | Y | Volatile Containers Headspace Free | Y | Aqueous Samples Checked for Residual Cl | N | Received On Ice | Y |

**C-620 received at 2.4°C**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Containers Intact | Y | Containers Properly Preserved | Y | Proper Containers Received | Y | All Samples in PreLog Received | N | COC/Labels Agree | Y |
| Custody Seals Intact | Y | Volatile Containers Preserved | Y | Volatile Containers Headspace Free | Y | Aqueous Samples Checked for Residual Cl | N | Received On Ice | Y |

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.


| | |
|---|---|
| Africa | + 27 11 254 4800 |
| Asia | + 852 2562 3658 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 55 21 3095 9500 |

solutions@golder.com
www.golder.com

**Golder Associates Inc.**
**The Wingate Building**
**5B Oak Branch Drive**
**Greensboro, NC 27407 USA**
**(336) 852-4903 - Phone**
**(336) 852-4904 - Fax**


Golder Associates