



Kestrel Horizons, LLC
As Trustee for the
Pinewood Site Custodial Trust

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June 7, 2013

Ms. Cynde Devlin, Hydrogeologist
Division of Hydrogeology
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

RE: Pinewood Site
Addendum to Baseline Water Quality Technical Memorandum
SCD 070 375 985

Dear Ms. Devlin:

Please find enclosed the Addendum to Baseline Water Quality Technical Memorandum. AECOM prepared the memorandum on behalf of the Pinewood Site Custodial Trust. The report is being submitted in a reduced paper form and complete electronic form.

Please contact us at (864) 288-6353 if you have any questions or comments.

Sincerely,

A handwritten signature in blue ink, reading "Christopher J. Suttell".

Christopher J. Suttell
Kestrel Horizons, LLC, as Trustee for the Pinewood Site Custodial Trust

Enclosures

cc: Mr. Brian Burgess, STC (Pinewood Site File)
PSCT 06.26 (letter and report)
PSCT 03.80 (letter)

TECHNICAL MEMORANDUM

TO: Kestrel Horizons, LLC, as the Trustee for the Pinewood Site Custodial Trust
FROM: Anne Lewis-Russ, PhD, AECOM
 Thomas Fogg, PhD, AECOM
 Tom Champion, P.G., AECOM
 Leslee Alexander, P.G., AECOM
COPY: AECOM Project File 60271027
RE: Addendum to Baseline Water Quality Technical Memorandum
 Pinewood, South Carolina
 AECOM Project Number 60271027
DATE: June 6, 2013

TABLE OF CONTENTS

<u>SECTION</u>	<u>Page</u>
INTRODUCTION.....	2
FINDINGS.....	3
RECOMMENDATIONS FOR FUTURE STUDIES AND EVALUATIONS.....	4
GROUNDWATER PARAMETERS, MAJOR ION ANALYSIS, AND GRAPHIC EVALUATION.....	4
ISOTOPE ANALYSIS AND EVALUATION.....	5

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>
1	Sample Location Map
2	Piper Diagram – September 2012 and April 2013 Data
3	Stiff Diagrams – Uniform Scale for All Samples – September 2012 and April 2013
4	Stiff Diagrams – Different Scales for Sample Groups – September 2012 and April 2013
5	δD versus $\delta^{18}O$ – Pinewood by Aquifer Unit
6	δD and $\delta^{18}O$ Versus Screen Midpoint Elevation

LIST OF TABLES

<u>Table</u>	<u>Title</u>
1	Field Parameters Collected During Sampling
2	Summary of Major Ion Analysis
3	Summary of Isotopic Analysis

LIST OF ATTACHMENTS

<u>Attachment</u>	<u>Title</u>
A	Field Forms
B	Laboratory Analytical Data
C	Quality Assurance/Quality Control

This Addendum to the Baseline Water Quality Technical Memorandum (Baseline TM; AECOM, April 2013)) summarizes and interprets the additional cation, anion, and isotope hydrogeochemical data for groundwater data collected April 9 and 10, 2013. These data were collected to validate the Baseline TM conclusions that 1) little to no communication exists between the water table (WT) and deeper water-bearing zones beneath the Opaline Claystone (OC) at the Pinewood Landfill (the Site), 2) that landfill leachate is not affecting groundwater in aquifer units below the OC, and 3) the use of indicator parameters, such as chloride and TDS, is appropriate for the detection monitoring program in place of the larger analytical suite historically used at the Site.

INTRODUCTION

Major ion and isotopic water data were collected from six wells screened above the OC, Section 1 French drain discharge, surface water west of the Site, and two leachate locations for comparison with data from groundwater in water-bearing zones underlying the OC. The purpose of the comparison is to evaluate possible hydrogeologic connection between groundwater above and below the OC. These data can be used to assist in establishing an optimal monitoring program by aiding in defining groundwater flow paths and providing information about flow rates and baseline hydrogeochemistry in each monitoring zone.

As described in the Baseline TM, groundwater was previously collected from five aquifer zones underlying the OC: Transitional Lang Syne (TLS) including the TLS paleo-channel, Secondary Sawdust Landing (SSDL), Primary Sawdust Landing (PSDL), Upper Black Creek-A (UBC-A), and Upper Black Creek-B (UBC-B). These are collectively referred to as aquifer zones below the OC in this addendum. The hydrostratigraphy underlying the Site is illustrated on Figure 1 of the Baseline TM. Figure 1 of this addendum shows sample locations. The shallow groundwater samples from the Water Table (WT) zone wells, the surface water sample (SW1) from Lake Marion, and the French drain sample (FD1) were collected by AECOM personnel. Leachate samples were collected by Sumter Transport Company personnel as follows:

1. One leachate grab sample from Landfill Section I (Leachate 1) was collected at the header in the central tank farm (CTF).
2. Leachate aliquot samples from Landfill Section IIa/b were collected from each individual sump, composited or blended, and then one composite sample was collected from the blended leachate mixture (Leachate IIa/b).

Five of the groundwater samples (WT015, WT027, WT030, WT038, and WT040) were collected using a micropurge method and peristaltic pump. A disposable bailer was used to purge well WT033 because the water level was too low to be pumped with a peristaltic pump. The sample was collected after allowing time for settling; however, turbidity was still greater than 1000 nephelometric turbidity units (ntu), compared to 2.9 to 17.3 at other sampled locations. Field parameters were collected at sampled locations (Table 1) and field notes and forms are presented in Attachment A.

Analytical results for major cations (calcium [Ca], magnesium [Mg], potassium [K], sodium [Na]), major anions (bicarbonate/carbonate [HCO_3/CO_3], chloride [Cl], and sulfate [SO_4]), and isotopes [deuterium/hydrogen isotope ratios ($\delta\text{D}/\text{H}$), oxygen-18/oxygen-16 isotope ratios ($\delta^{18}\text{O}/^{16}\text{O}$), and tritium] are provided in Table 2 and Table 3, respectively.

This Addendum to the *Baseline TM* summarizes the data collected during April 2013 and provides conclusions. To streamline review of the most pertinent information, the findings are presented first, followed by descriptions of the analytical data and data evaluation. These findings incorporate information and findings presented in the *Baseline TM* along with additional findings based on the April 2013 data.

FINDINGS

1. Based on major ions, groundwater from the WT wells varies in major ion type (Ca- SO_4 , Ca- HCO_3 , Na-Cl, Na/Mg-Cl/ HCO_3). This indicates that groundwater is not present as a continuous aquifer in the WT zone.
2. Of the water samples collected, only one WT well, WT027, had the same water type (Ca- HCO_3/CO_3) as uniformly observed in groundwater samples collected from aquifer zones below the OC.
3. Major ions in leachate samples are sodium and chloride; chloride is present in large concentrations (10,000 and 16,000 milligrams per liter [mg/L]). Chloride travels with groundwater so the impact of leachate would be evident from the presence of chloride in a water sample. However, concentrations of chloride in shallow groundwater are similar to or less than those in the surface water sample, indicating a lack of impact from leachate.
4. Calculated total dissolved solids¹ (TDS) in leachate samples are much higher than TDS in shallow groundwater, surface water, French drain samples, and groundwater sampled below the OC. This indicates a lack of impact from leachate.
5. Two WT zone groundwater samples (WT015 and WT030) on the west side of the Site and the sample from the French drain discharge (FD1) had Ca- SO_4 type water and higher TDS concentrations compared to other groundwater samples. The source of this distinct water, although unknown, is not associated with leachate. The distinct ion type, along with TDS, indicates a lack of groundwater communication through the OC.
6. Background tritium values in rain typically range from approximately 4 to 8 tritium units (TU). Isotopic results showed tritium values in groundwater at the Site beneath the OC were all <1 TU, while tritium values in WT wells ranged from 4.8 to 8.1 TU. Tritium in the French drain sample was 6.58 TU and 6.85 TU in the surface water. Tritium in the leachate samples was 25.3 TU for Leachate I and 363 TU for Leachate IIa/b. Because there is no detectable tritium below the OC, these results confirm the conclusions from the major ion results that indicate little to no

¹ Total dissolved solids are calculated by summing the major ion concentrations, after dividing alkalinity (bicarbonate and carbonate) by two to account for presence as a gas.

communication exists between the WT and deeper water-bearing zones beneath the OC at the Site.

7. Isotopic ratio $\delta D/H$ and $\delta^{18}O/^{16}O$ results reflect natural or anthropogenic hydraulic processes, with no apparent effect from landfill leachate seen in groundwater above or below the OC.
8. Together, the results from the major ion and isotopic analyses indicate that leachate has not impacted groundwater present above or below the OC in the wells sampled during this study.

RECOMMENDATIONS FOR FUTURE STUDIES AND EVALUATIONS

1. Reduce the current analytical parameter list and focus future monitoring on indicator constituents, such as chloride, TDS, and 1,4-dioxane².
2. Utilize information from the baseline groundwater quality investigation along with that from the hydrogeologic evaluation to update the Conceptual Site Model and define sampling locations.

GROUNDWATER PARAMETERS, MAJOR ION ANALYSIS, AND GRAPHIC EVALUATION

Table 1 lists field parameter measurements for the shallow groundwater, surface water, and French drain water³. Also included are the minimum, maximum, and average values for parameters collected from aquifer zones below the OC. Due to the change in sampling methods, purge volumes were smaller and turbidities were less than the average for the previous sampling event, with the exception of groundwater at WT033 where a bailer was used to collect the sample. Shallow groundwater pH values were mostly less than those for samples from the deeper aquifer zones. With the exception of samples from WT033, WT040, and SW1, specific conductivities were higher than the average value for samples from the deeper aquifer zones. Two shallow groundwater samples (WT015 and WT030) and French drain discharge had higher specific conductivities than measured in groundwater samples from the deeper aquifer zones. Dissolved oxygen and oxidation-reduction potential (ORP) measurements indicate oxidizing conditions exist in shallow groundwater, except at well WT027.

Major ion analysis was performed by Shealy Environmental Services, Inc., West Columbia, South Carolina. Cations were analyzed by inductively coupled plasma – atomic emission spectrometry (Method 6010C), alkalinity by titration (Method 2320B), and chloride and sulfate by ion chromatography (Method 300.0). Laboratory data packages are included in Attachment B and quality assurance/quality control (QA/QC) information is provided in Attachment C. Charge balance for major ions was calculated as part of the QA/QC process (See Attachment C).

² As previously discussed in the *Baseline Water Quality Technical Memorandum* (AECOM, April 2013) and the *2010 Pinewood Site Improvement Projects, Pinewood, South Carolina, Volume 3 – Report of Project 3 Element 2: Review, Enhancement and Optimization of Environmental Monitoring Systems*. AECOM, March 2011.

³ Field parameters were not reported for leachate water.

Results for major ion analysis are provided in Table 2. The Piper diagram (Figure 2) and Stiff diagrams (Figure 3 and Figure 4) were prepared using major ion compositions to evaluate the differences in water type throughout the water column. These diagrams are helpful to visually distinguish major ion composition of water from different samples. Stiff diagrams on Figure 3 are provided using the same scale for all samples to facilitate comparison. Stiff diagrams on Figure 4 use different scales to facilitate comparison of diagram shapes, and thus, dominant ions.

As indicated by the Piper diagram, shallow groundwater samples (light blue symbols) include a large range of water types in contrast to water in the aquifer zones below the OC, which is uniformly calcium-bicarbonate/carbonate type. The Stiff diagrams for shallow groundwater indicate variations in TDS as well as water types, compared to water in the aquifer zones below the OC that are indistinguishable in shape and size at the scale used.

The Ca-SO₄ dominated water type at wells WT015 and WT030 closely resembles that of the French Drain water sample (Figure 2). TDS for these samples is higher than for other groundwater samples. The source of this water is not known; however, it is distinct from Na-Cl type leachate water, so does not appear to be impacted by leachate. Leachate composition and TDS are readily differentiated by the distinctive shape and much larger size of the Stiff diagrams (Figure 3). Water at wells WT015 and WT030, on the west side of the Site, are also distinct in type and TDS from water in the aquifer zones below the OC, indicating a lack of groundwater communication through the OC in this area.

As expected, TDS is low for the surface water sample (SW1) but even lower for shallow water samples WT033 and WT040. Ion balance is poor for these samples, likely because the concentrations are within or close to the expected error for the method (see Attachment C). Therefore, there is uncertainty about the major ion type of these samples. In any case, the low TDS indicates a lack of impact by leachate.

ISOTOPE ANALYSIS AND EVALUATION

Isotope analysis was performed by Isotech Laboratories, Inc., Champaign, Illinois. Cavity ring-down spectroscopy was used for analysis of $\delta^{18}\text{O}/^{16}\text{O}$ and $\delta\text{D}/\text{H}$, and tritium was analyzed by radiometric measurement. Results for isotope analyses are provided in Table 3. Laboratory data are presented in Attachment B and QA/QC information is provided in Attachment C.

Table 3 shows that tritium was detected at concentrations indicative of recent rain (4 to 8 TU) in all WT zone samples, in contrast to the previous work (AECOM, April 2013) which did not detect tritium in any wells screened below the OC. In addition, samples of the French drain, surface water, and leachate contained measurable concentrations of tritium. Thus, either no tritium containing groundwater has migrated from the shallow groundwater wells through the OC to the underlying groundwater, or since tritium has a half life of approximately 12.5 years, any water reaching the OC from the overlying shallow groundwater must either: 1) have taken 25-40 years to infiltrate; 2) or been diluted by a factor of 10. The

results show that the OC is acting as an effective barrier to prevent any significant migration of leachate to groundwater below the OC on a time scale of 25-40 years.

Figure 5a shows the δD and $\delta^{18}O$ results for all samples except the leachate. The WT well results plot along the expected lines for rain or river water (subject to some evaporation after infiltration), but are slightly more negative than samples from the deeper locations, suggesting that the water infiltrating to the WT wells may primarily be recharged during cooler months because cooler temperatures produce isotopically depleted (lighter) rain (Clark and Fritz, 1997⁴). The sample from the French drain is very similar in composition to the shallow groundwater samples, and the sample of surface water shows the effects of evaporation.

Figure 5b plots the same data as previously discussed for Figure 5a, but includes the leachate samples along with the Global Meteoric Water Line for comparison. The leachate samples are unique from any other samples collected at the landfill, and do not suggest a natural origin. The leachate samples may represent water resulting from an industrial process, which would also agree with the tritium values that are higher than present day natural background levels. Regardless of the origin of the leachate, the results indicate no mixing of leachate with groundwater at detectable levels.

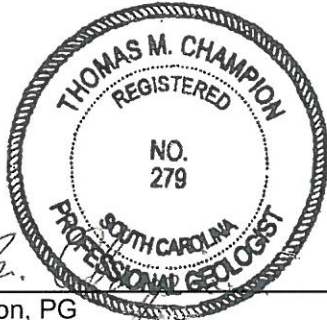
Figure 6 shows plots of the δD and $\delta^{18}O$ results versus screen midpoint elevation for samples from groundwater monitoring wells. In general, the shallow WT wells exhibit results that are isotopically slightly lighter than deeper wells, and more similar to deeper wells to the west of the paleo-channel than other deeper wells.


⁴ Clark, I. and P. Fritz, 1997. Environmental Isotopes in Hydrogeology, Lewis Publishers, New York, 328 pgs.

CERTIFICATION PAGE
Addendum to Baseline Water Quality Technical Memorandum
Pinewood Site Improvement Projects
Pinewood, South Carolina

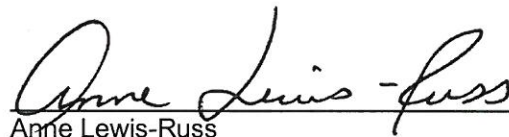
The undersigned certify that they have reviewed the attached document and that the document is in material compliance with the requirements of the *Agreement between Owner and Engineer for Professional Services* dated October 25, 2010 between Kestrel and AECOM. To the best of our knowledge, this Technical Memorandum is also in material compliance with applicable state and federal regulations. The data presentations contained herein are consistent with Consultant standards and generally accepted practices in the environmental profession.


Prepared by:




Thomas M. Champion, PG
South Carolina PG No. 279
June 6, 2013


Prepared by:


Anne Lewis-Russ
Senior Geochemist
June 6, 2013

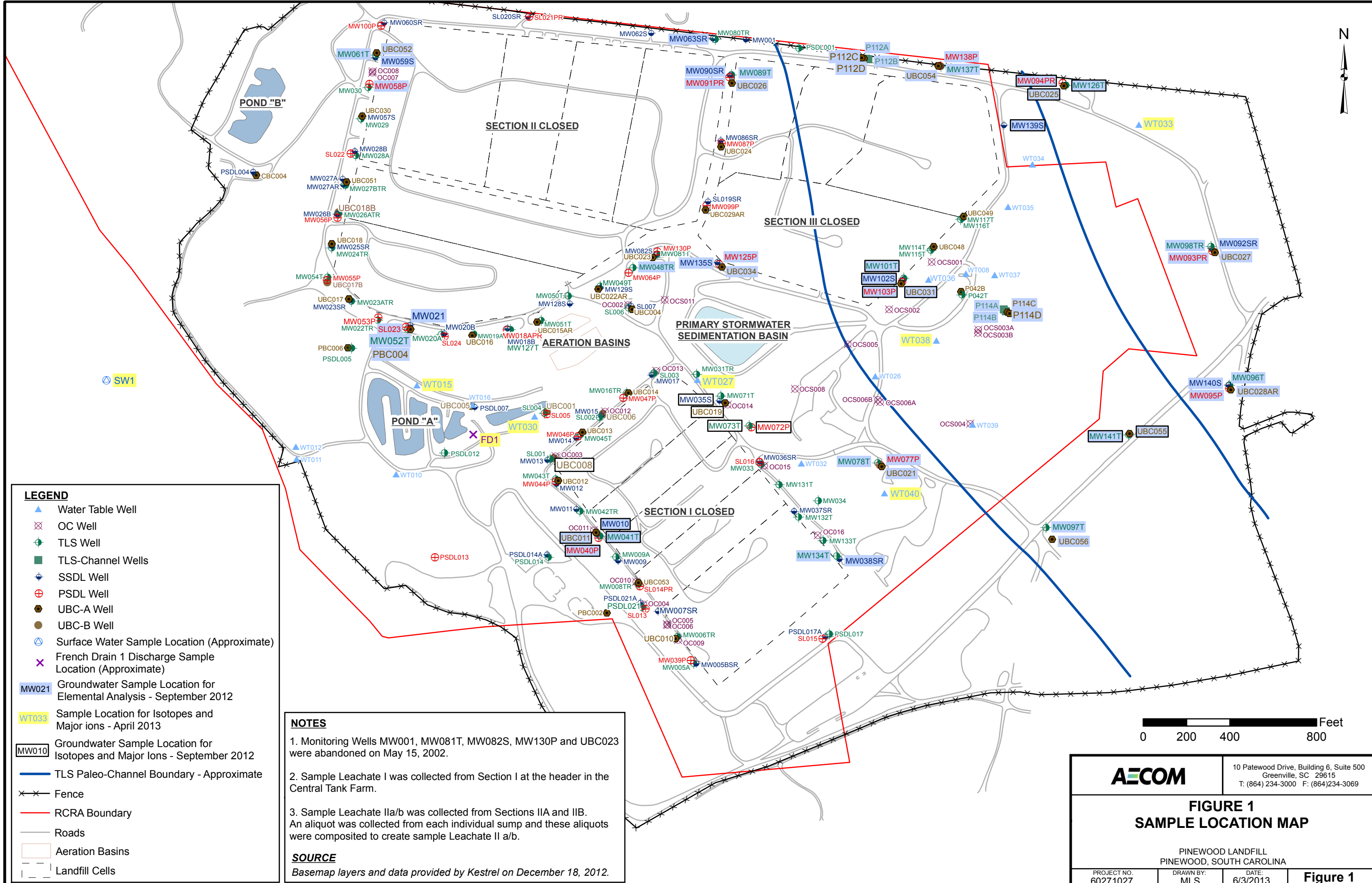

Thomas Fogg, PhD
June 6, 2013

Reviewed by:




Leslee J. Alexander, PG
South Carolina PG No. 2433
June 6, 2013

FIGURES



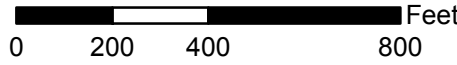
- LEGEND**
- ▲ Water Table Well
 - ⊗ OC Well
 - ⊕ TLS Well
 - TLS-Channel Wells
 - ⊕ SSDL Well
 - ⊕ PSDL Well
 - UBC-A Well
 - UBC-B Well
 - Surface Water Sample Location (Approximate)
 - ⊗ French Drain 1 Discharge Sample Location (Approximate)

- MW021 Groundwater Sample Location for Elemental Analysis - September 2012
- WT033 Sample Location for Isotopes and Major Ions - April 2013
- MW010 Groundwater Sample Location for Isotopes and Major Ions - September 2012
- TLS Paleo-Channel Boundary - Approximate
- ⊗ Fence
- RCRA Boundary
- Roads
- Aeration Basins
- Landfill Cells

NOTES

- Monitoring Wells MW001, MW081T, MW082S, MW130P and UBC023 were abandoned on May 15, 2002.
- Sample Leachate I was collected from Section I at the header in the Central Tank Farm.
- Sample Leachate IIa/b was collected from Sections IIA and IIB. An aliquot was collected from each individual sump and these aliquots were composited to create sample Leachate II a/b.

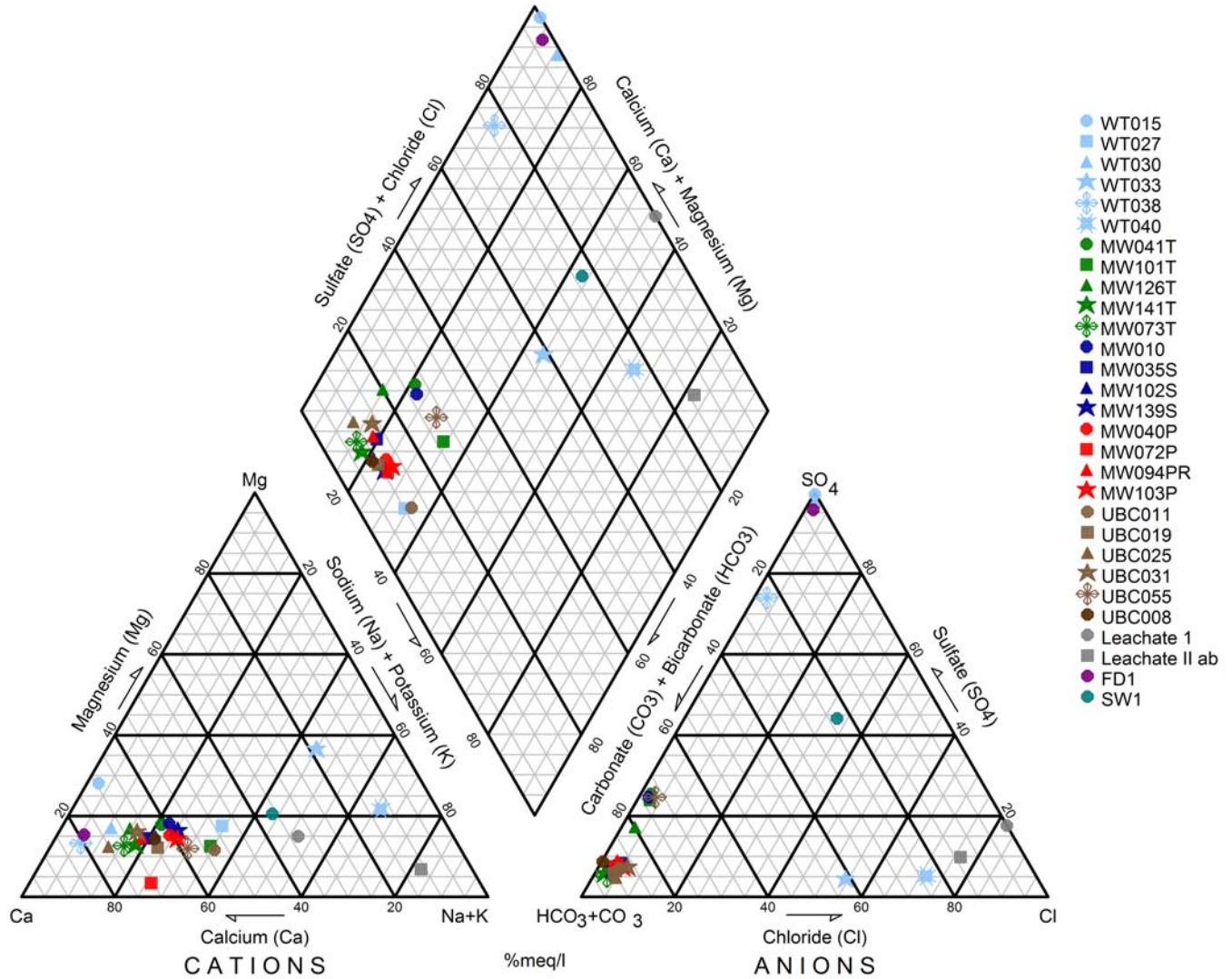
SOURCE
 Basemap layers and data provided by Kestrel on December 18, 2012.



		10 Patewood Drive, Building 6, Suite 500 Greenville, SC 29615 T: (864) 234-3000 F: (864) 234-3069	
		FIGURE 1 SAMPLE LOCATION MAP	
PROJECT NO. 60271027	DRAWN BY: MLS	DATE: 6/3/2013	Figure 1

Piper Diagram - September 2012 and April 2013 Data - Select

Pinewood Site - 2012 Improvement Projects



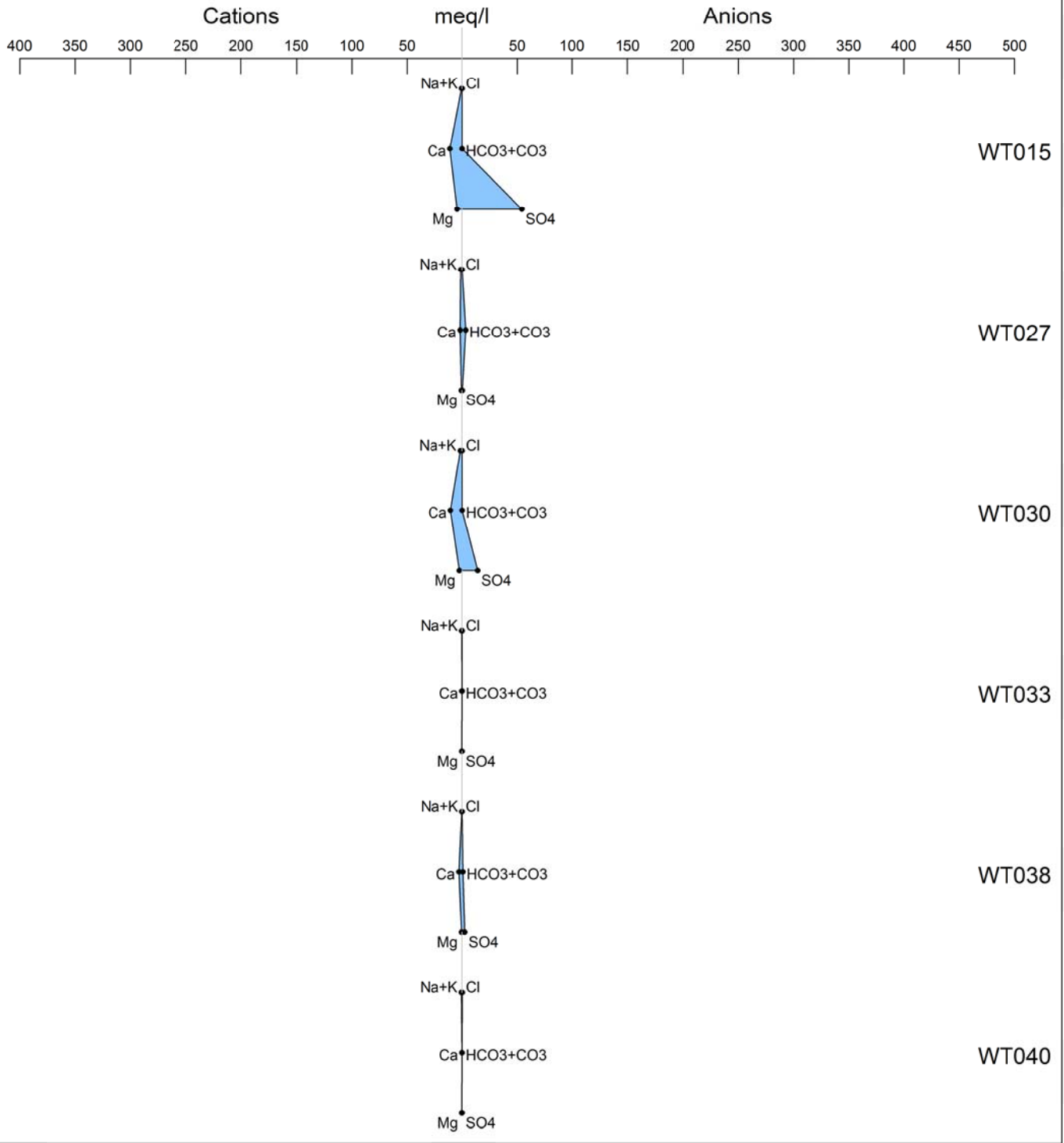
Note:

Sample locations are color coded by aquifer zone / sample type as follows:

- Light Blue - Water Table
- Green - Transitional Lang Syne (TLS)
- Dark Blue - Secondary Sawdust Landing (SSDL)
- Red - Primary Sawdust Landing (PSDL)
- Brown - Upper Black Creek-A (UBC-A)
- Dark Brown - Upper Black Creek-B (UBC-B)
- Gray - Leachate
- Magenta - French Drain
- Dark Teal - Surface Water

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	Figure 2 Piper Diagram September 2012 and April 2013 Data		
Pinewood Landfill Pinewood, South Carolina			Figure 2
PROJECT NO. 60271027	PREPARED BY: LJA	DATE: June 2013	Figure 2

Stiff Diagram - September 2012 and April 2013 Data Pinewood Site - 2012 Improvement Projects



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Figure 3
Stiff Diagrams - Uniform Scale for All Samples
September 2012 and April 2013
(Page 1 of 5)

Pinewood Landfill
Pinewood, South Carolina

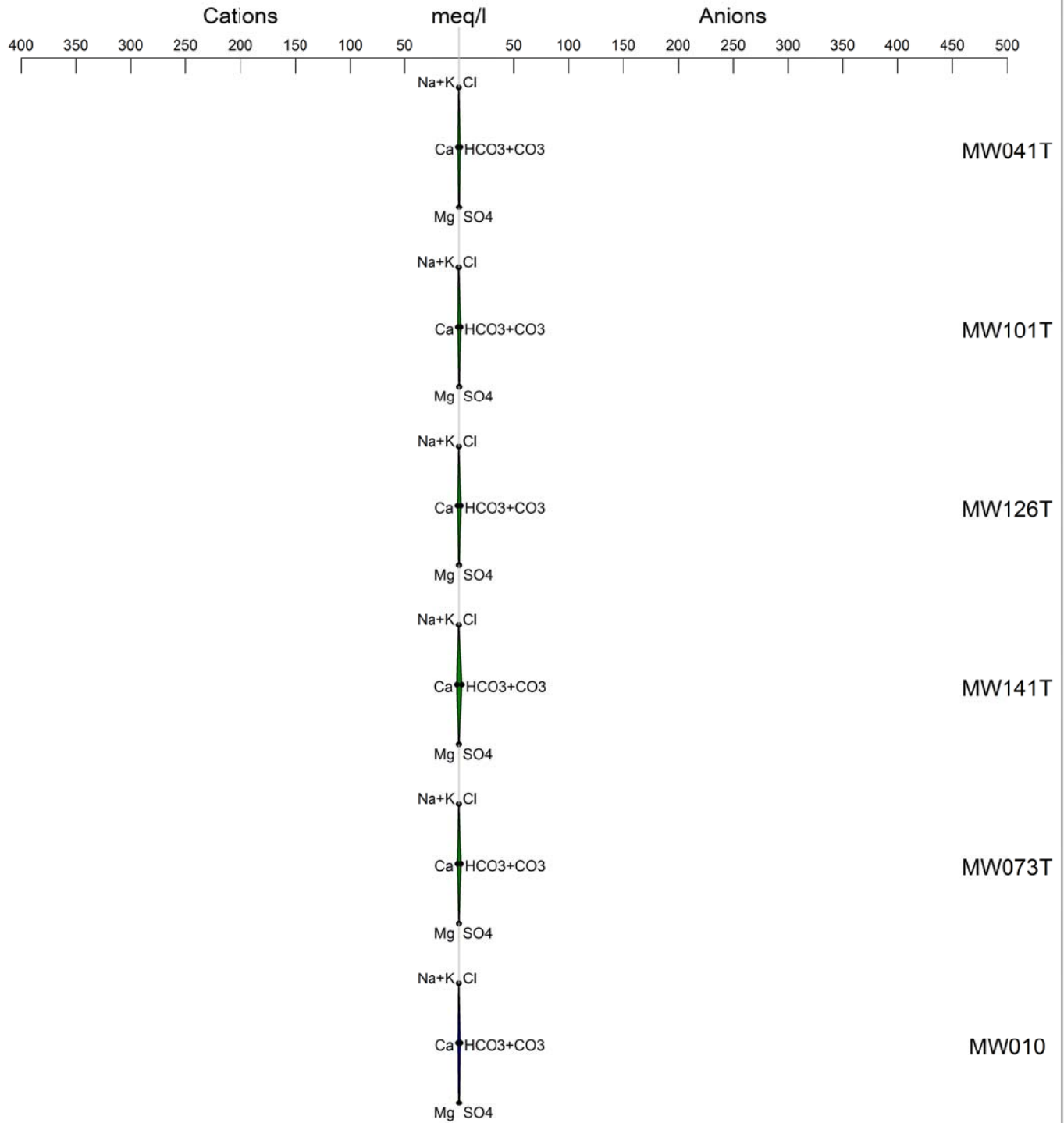
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Figure 3

Stiff Diagram - September 2012 and April 2013 Data Pinewood Site - 2012 Improvement Projects



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Figure 3
Stiff Diagrams - Uniform Scale for All Samples
September 2012 and April 2013
(Page 2 of 5)

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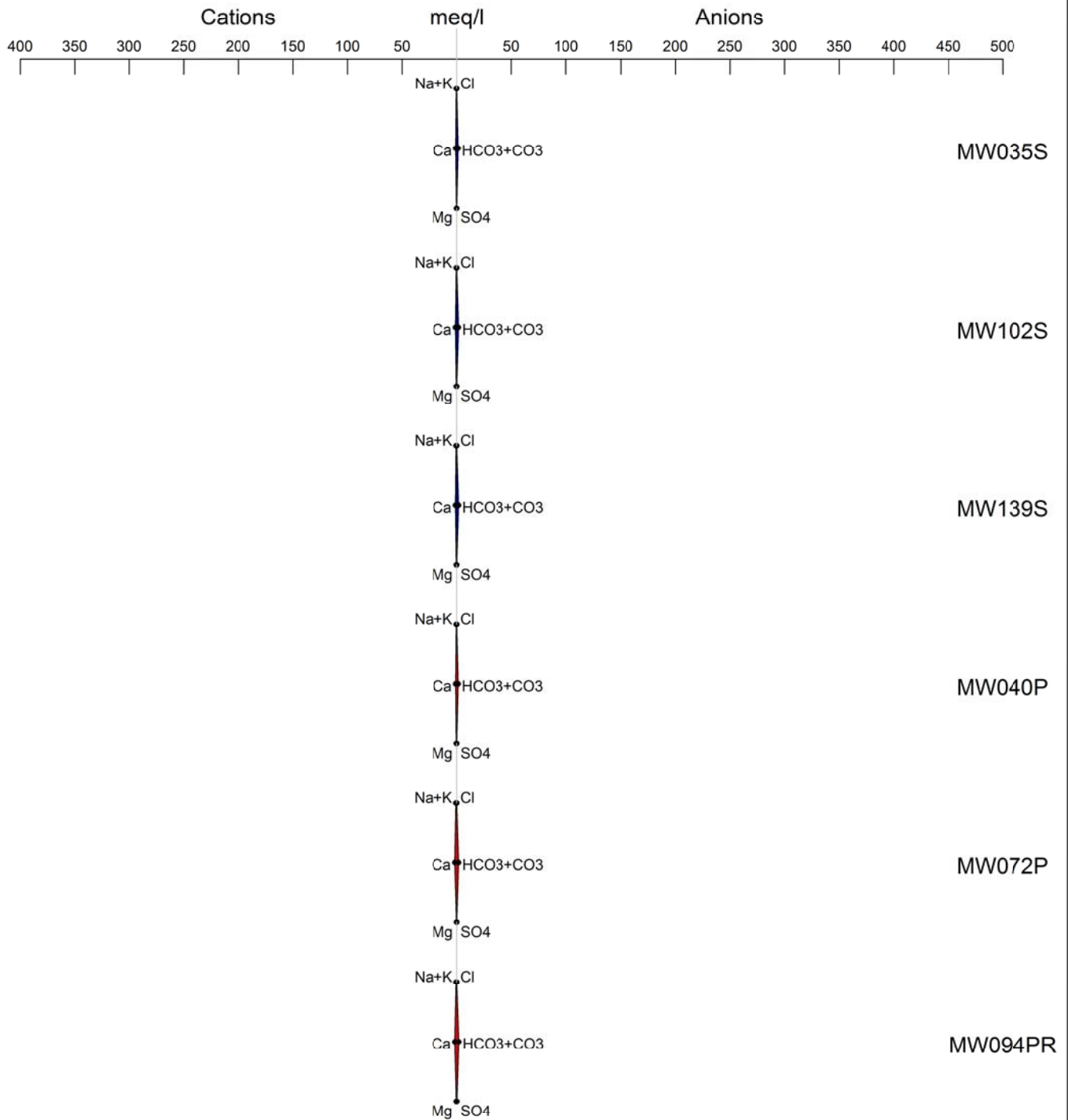
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Figure 3

Stiff Diagram - September 2012 and April 2013 Data Pinewood Site - 2012 Improvement Projects



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Figure 3
Stiff Diagrams - Uniform Scale for All Samples
September 2012 and April 2013
(Page 3 of 5)

Pinewood Landfill
Pinewood, South Carolina

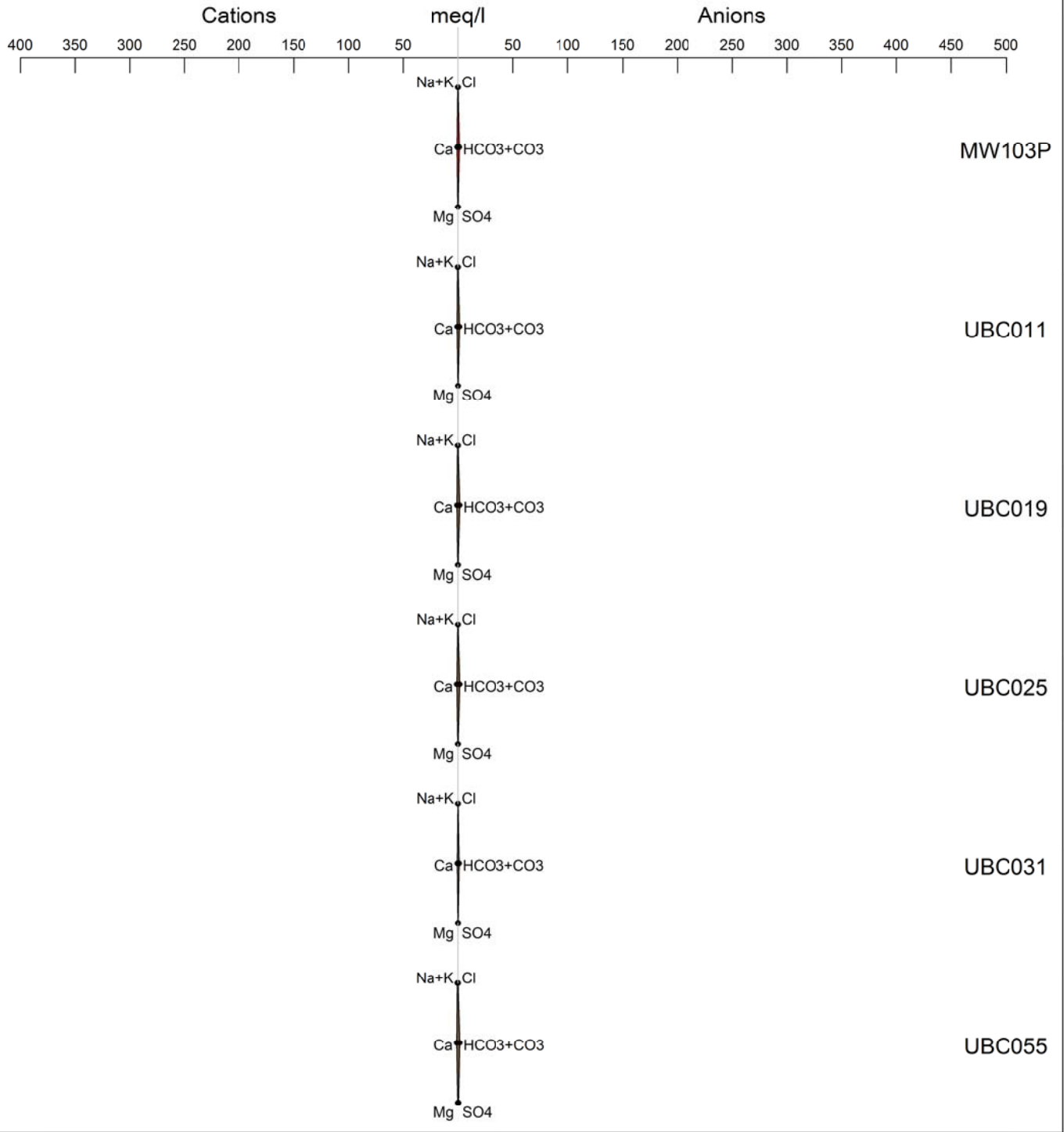
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Figure 3

Stiff Diagram - September 2012 and April 2013 Data Pinewood Site - 2012 Improvement Projects



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Figure 3
Stiff Diagrams - Uniform Scale for All Samples
September 2012 and April 2013
(Page 4 of 5)

Pinewood Landfill
Pinewood, South Carolina

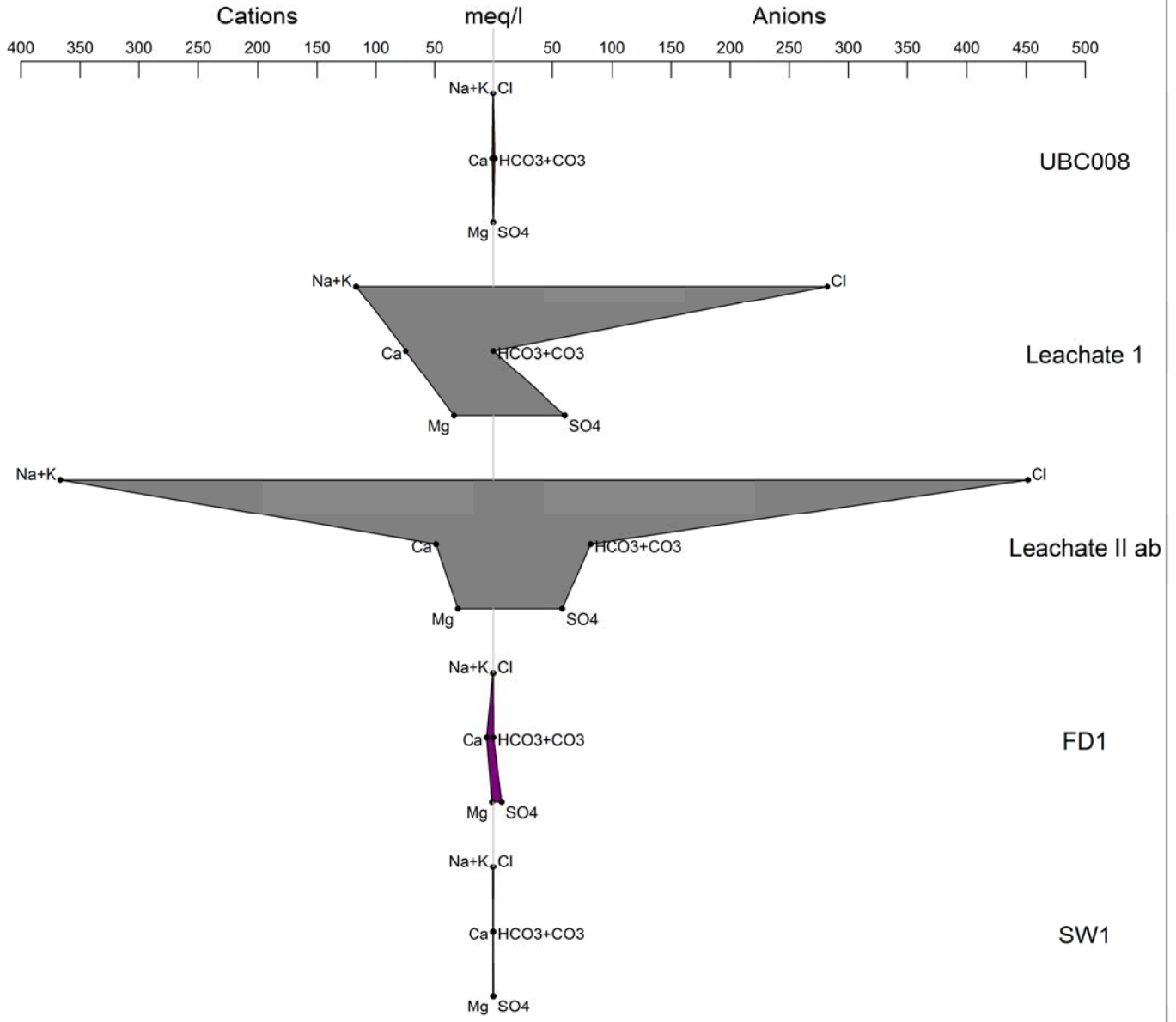
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Figure 3

Stiff Diagram - September 2012 and April 2013 Data Pinewood Site - 2012 Improvement Projects



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Figure 3
Stiff Diagrams - Uniform Scale for All Samples
September 2012 and April 2013
(Page 5 of 5)

Pinewood Landfill
Pinewood, South Carolina

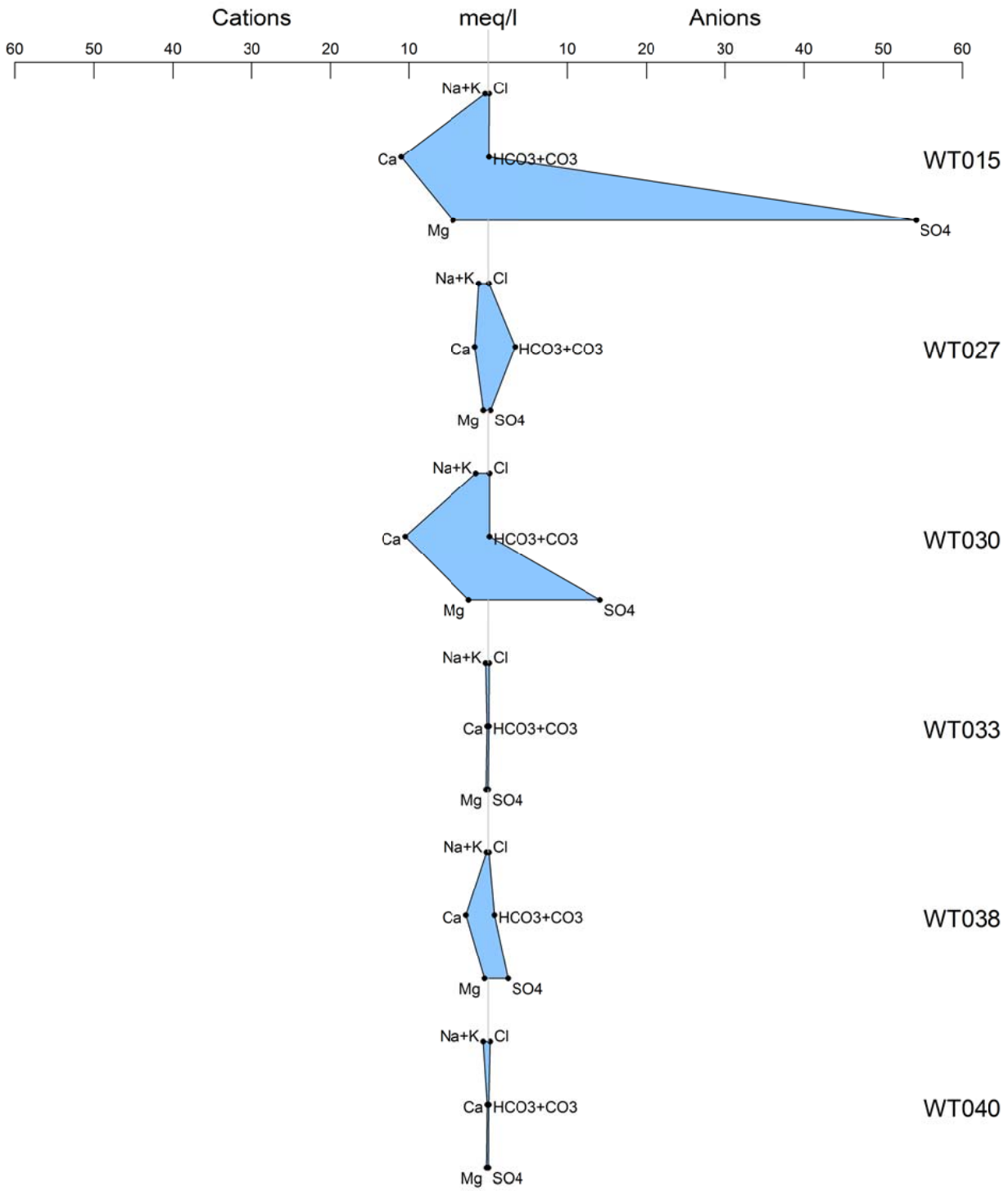
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Figure 3

Stiff Diagram - April 2013 Data - WT Wells Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 1 of 9)
Pinewood Landfill
Pinewood, South Carolina

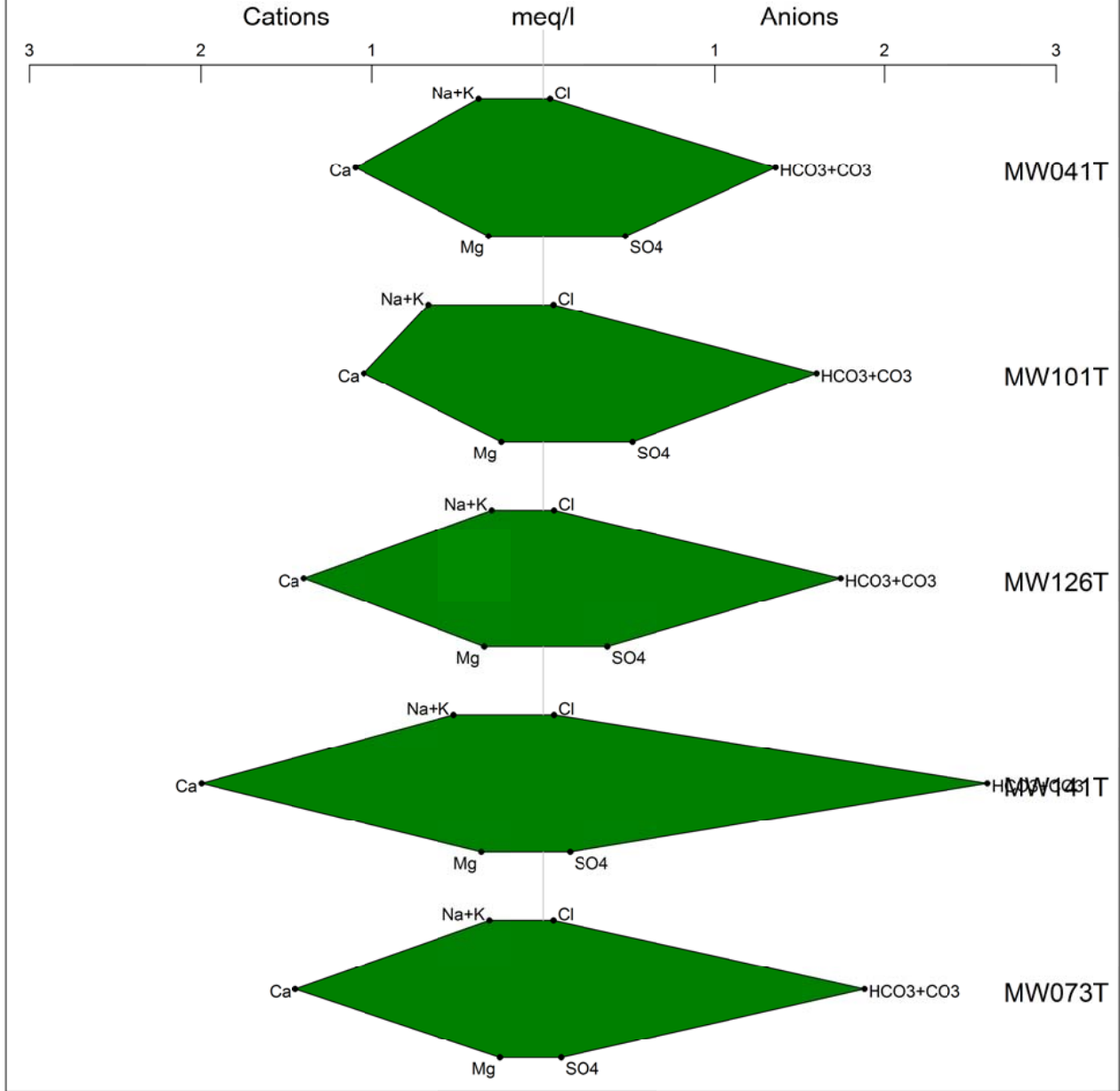
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Figure 4

Stiff Diagram - September 2012 Data - TLS Wells Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 2 of 9)
Pinewood Landfill
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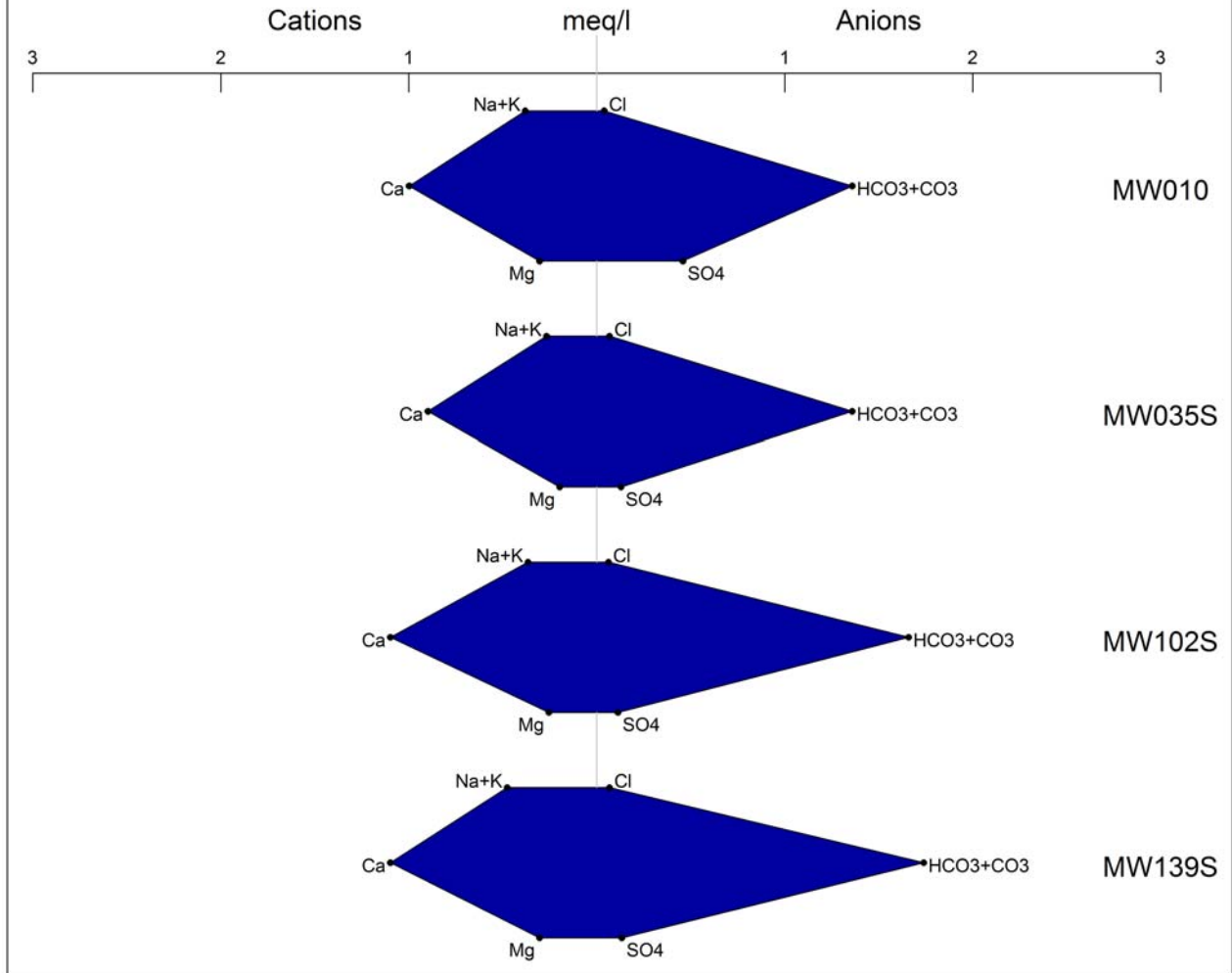
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Figure 4

Stiff Diagram - September 2012 Data - SSDL Wells Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 3 of 9)
Pinewood Landfill
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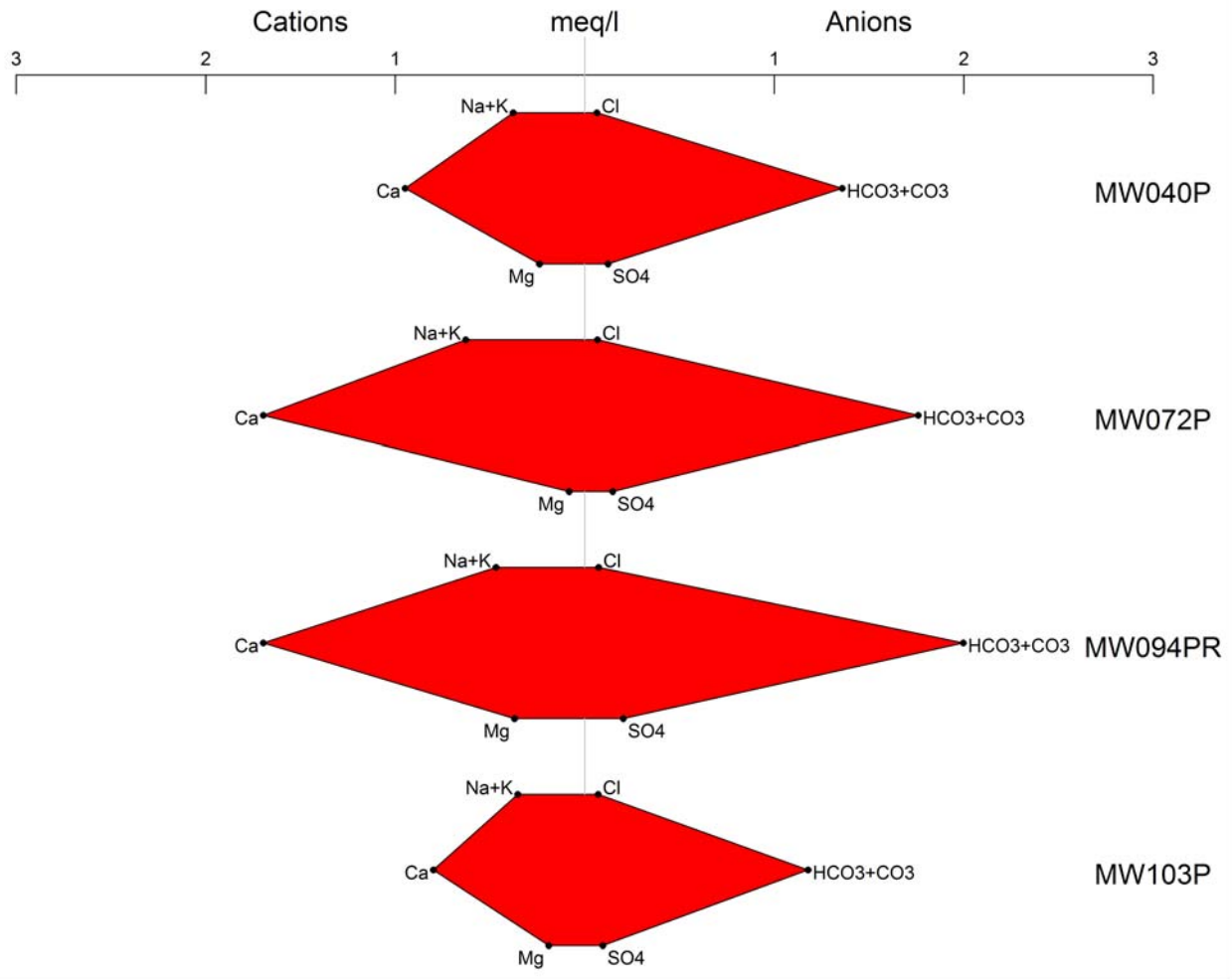
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Figure 4

Stiff Diagram - September 2012 Data - PSDL Wells Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 4 of 9)
Pinewood Landfill
Pinewood, South Carolina

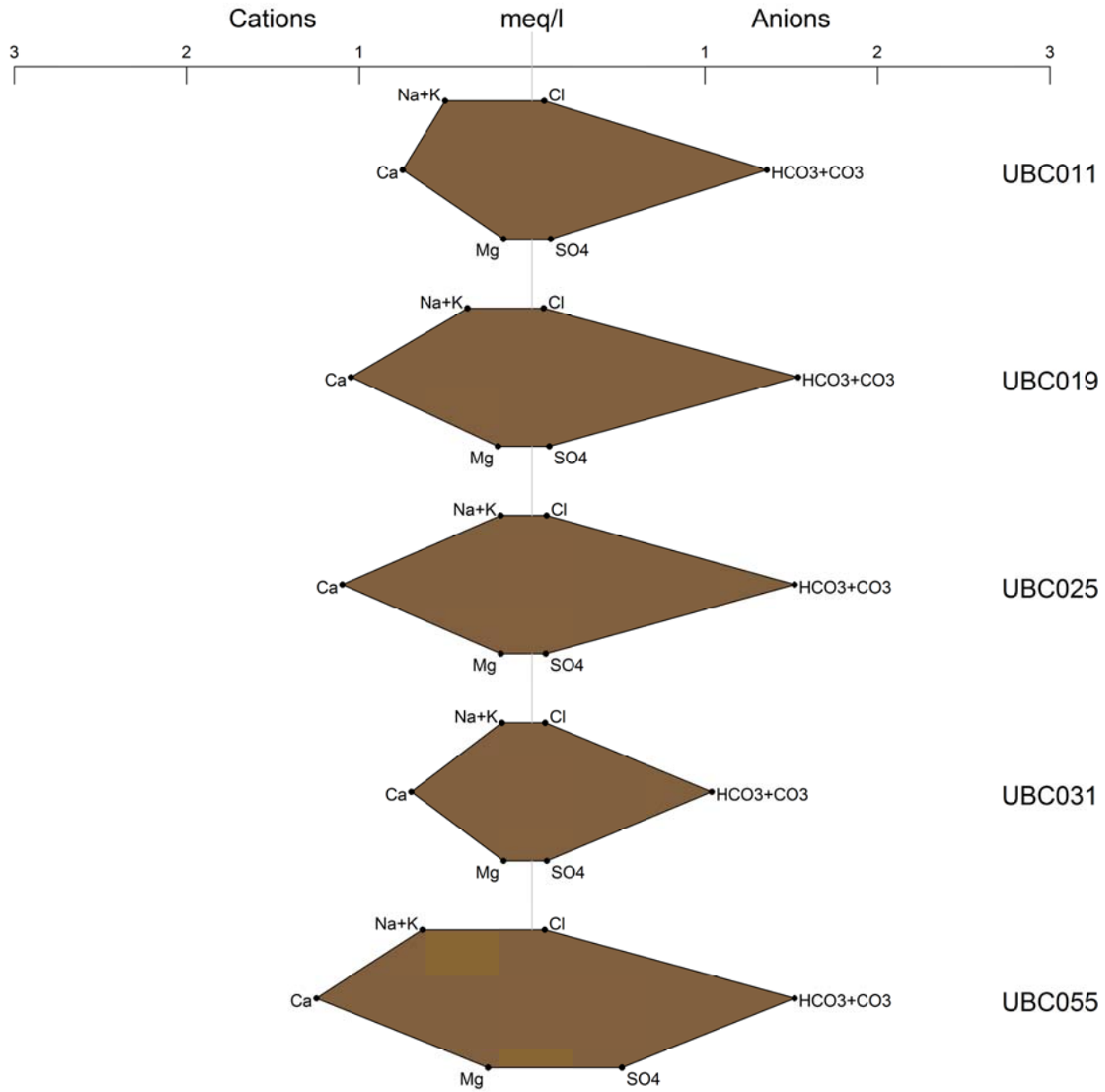
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Figure 4

Stiff Diagram - September 2012 Data - UBC-A Wells Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 5 of 9)
Pinewood Landfill
Pinewood, South Carolina

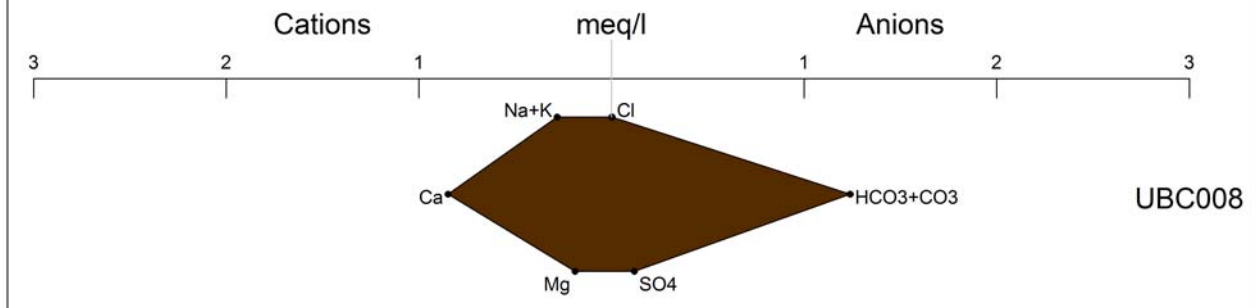
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Figure 4

Stiff Diagram - September 2012 Data - UBC-B Wells Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 6 of 9)
Pinewood Landfill
Pinewood, South Carolina

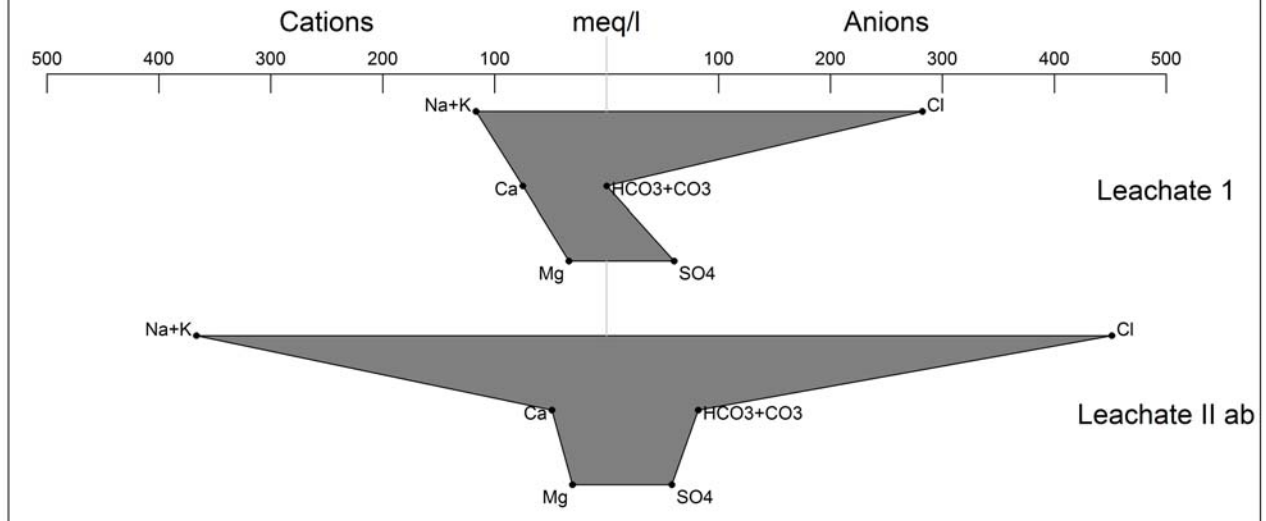
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Figure 4

Stiff Diagram - April 2013 Data - Leachate Samples Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013
(Page 7 of 9)
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Pinewood, South Carolina

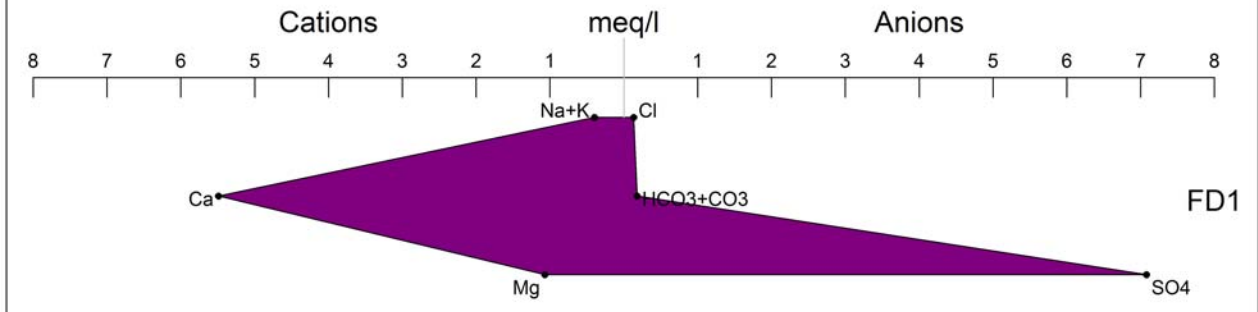
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Figure 4

Stiff Diagram - April 2013 Data - French Drain Sample Pinewood Site - 2012 Improvement Projects



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Figure 4 Stiff Diagrams - Different Scales for Sample Groups September 2012 and April 2013

(Page 8 of 9)
Pinewood Landfill
Pinewood, South Carolina

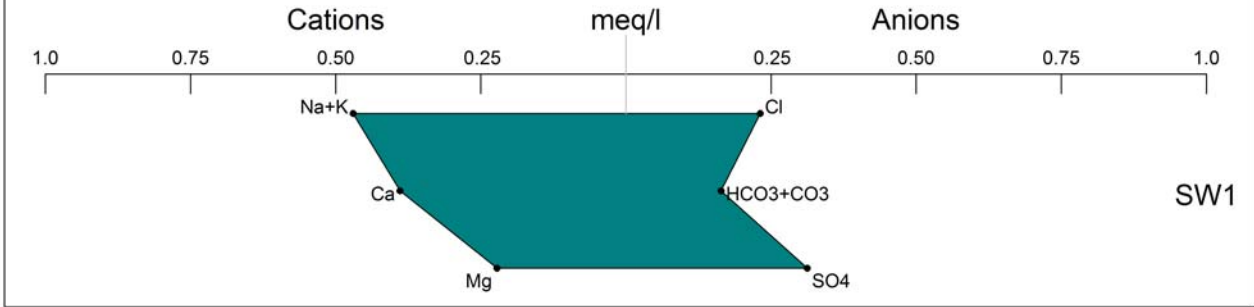
PROJECT NO.
60271027

PREPARED BY:
LJA

DATE:
June 2013

Figure 4

Stiff Diagram - April 2013 Data - Surface Water Sample Pinewood Site - 2012 Improvement Projects



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Figure 4
Stiff Diagrams - Different Scales for Sample Groups
September 2012 and April 2013

(Page 9 of 9)
Pinewood Landfill
Pinewood, South Carolina

PROJECT NO.
60271027

PREPARED BY:
LJA

DATE:
June 2013

Figure 4

Figure 5a: δD versus $\delta^{18}O$ - Without Leachate Samples

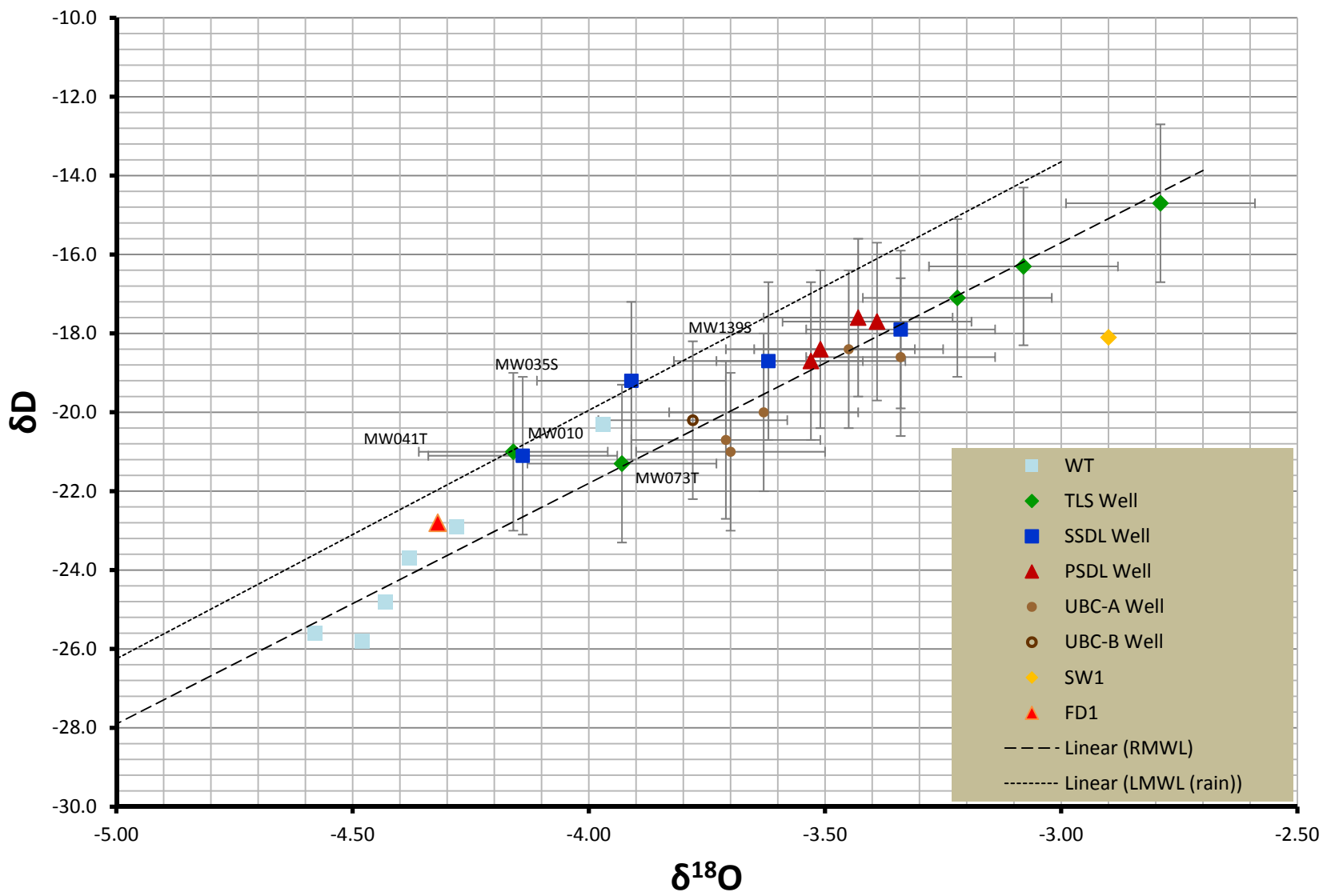
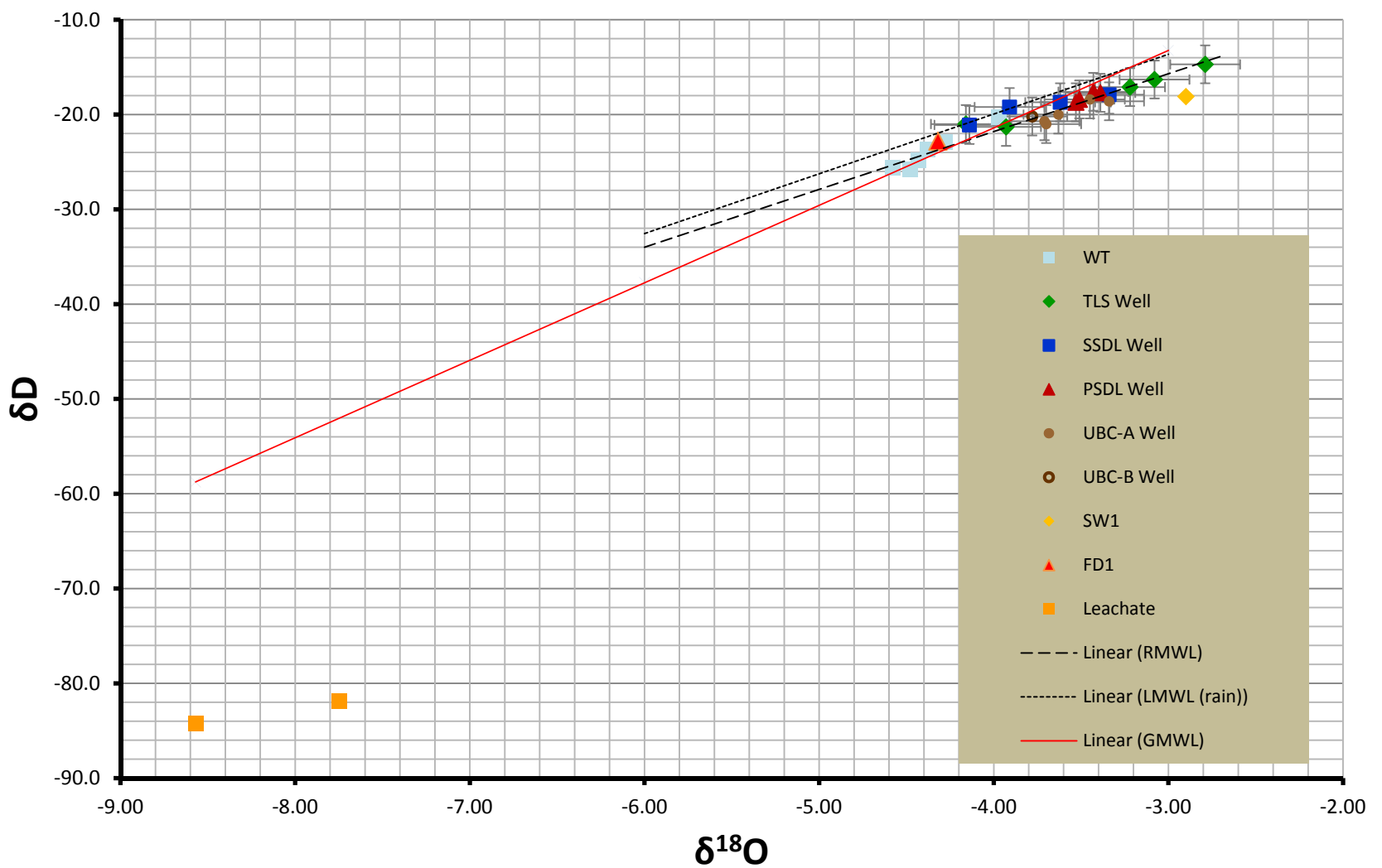


Figure 5b: δD versus $\delta^{18}O$ - Including Leachate Samples



Notes:
 GMWL – Global Meteoric Water Line
 LMWL – Local Meteoric Water Line
 RMWL – River Meteoric Water Line
 Error bars represent general analytical measurements uncertainty (one standard deviation)



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Figure 5
 δD Versus $\delta^{18}O$ – Pinewood by Aquifer Unit

Pinewood Landfill
 Pinewood, South Carolina

Figure 6a: $\delta^{18}\text{O}$ Versus Screen Elevation

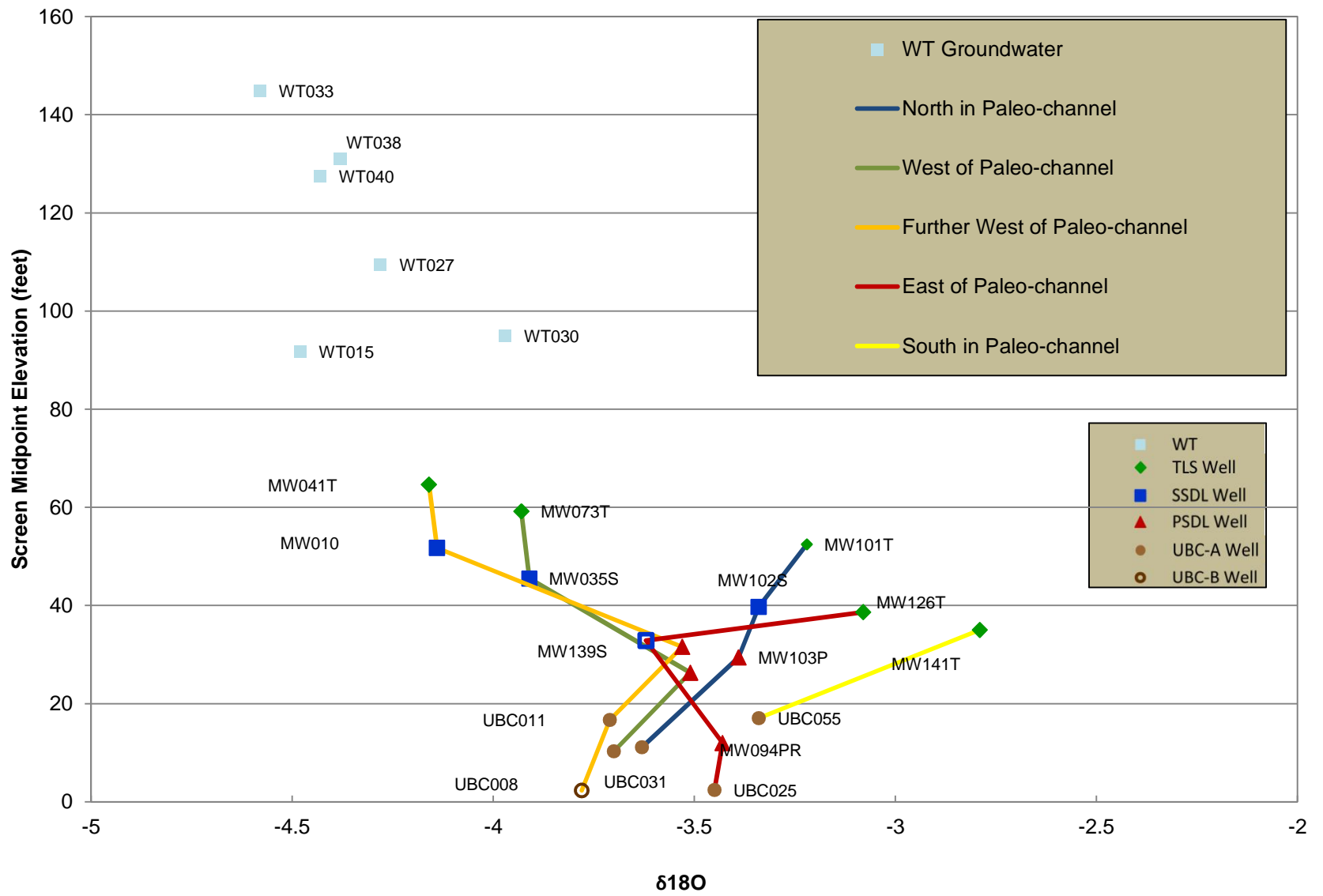
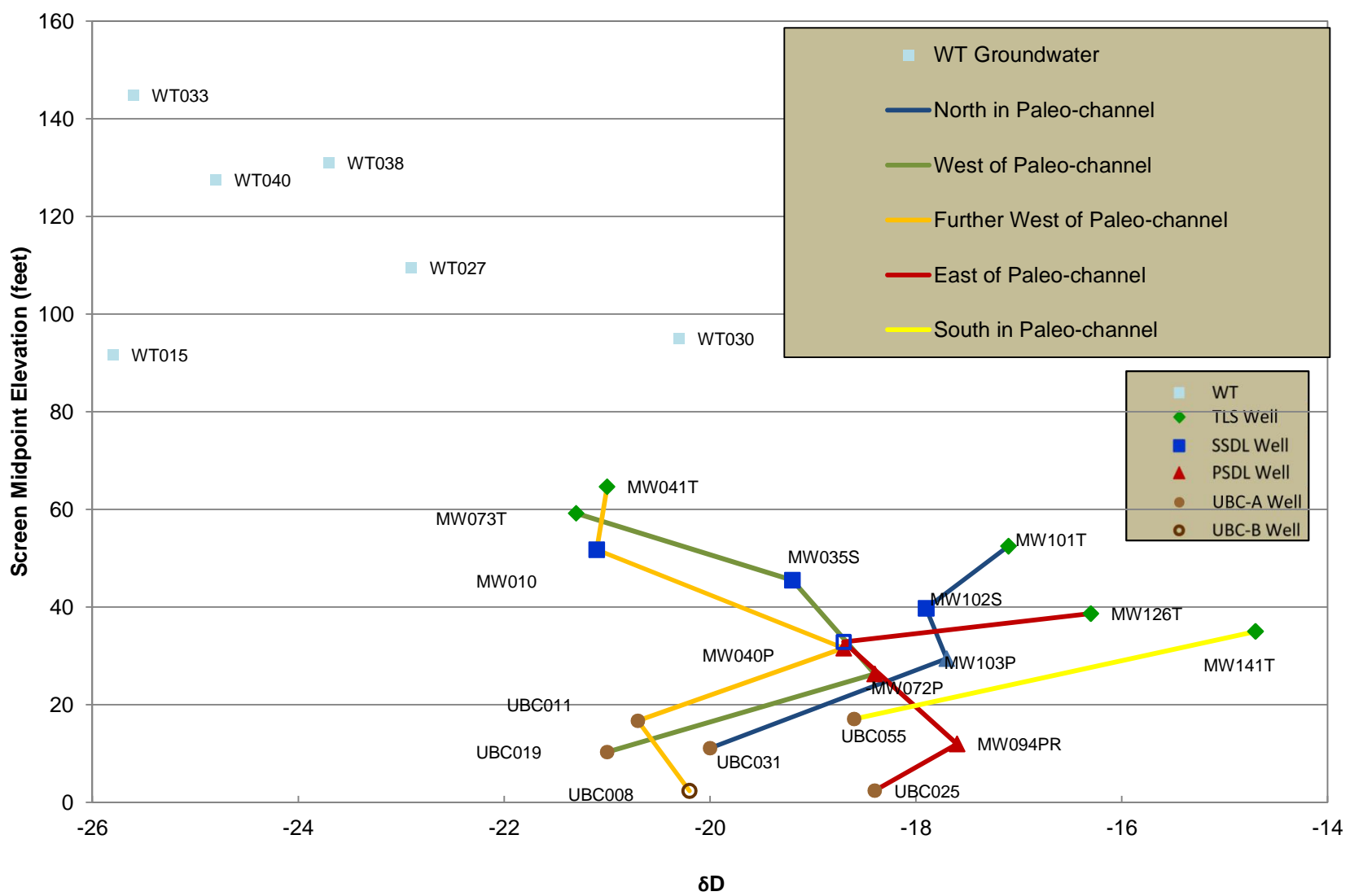


Figure 6b: δD Versus Screen Elevation



Notes:

1. Symbol shape and color for each aquifer unit corresponds to symbols/colors in Figure 5; open square is within channel on east side.
2. The vertical Datum at the Site is a Site-specific datum that is 1.9 feet higher than the North American Vertical Datum of 1988 (NAVD88).



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Figure 6
 δD and $\delta^{18}\text{O}$ Versus Screen
Midpoint Elevation

Pinewood Landfill
Pinewood, South Carolina

TABLES

Table 1
Field Parameters Collected During Sampling
Pinewood Landfill
Pinewood, South Carolina

Sample Identification	Formation/ Location	Volume Purged (gallons)	Water Temperature °C	pH	SpC (mmhos/cm)	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (ntu)
FD1	French Drain Discharge	--	17.36	4.78	0.62	282.3	8.86	3.99
SW1	Surface Water	--	22.59	5.99	0.084	50.4	6.41	10.67
Shallow Groundwater above Opaline Claystone								
WT015	Water Table	1.75	17.26	3.31	2.49	444.1	2.38	9.22
WT027	Water Table	2.2	17.03	6.16	0.43	-23.7	0.52	13.87
WT030	Water Table	1.4	16.33	4.86	1.22	44.7	5.2	3.96
WT033	Water Table	2.75	19.04	4.25	0.085	363.4	6.61	>1000
WT038	Water Table	1.6	18.28	5.65	0.31	243.9	5.65	6.6
WT040	Water Table	1.6	18.36	4.51	0.09	321.7	3.63	2.88
Groundwater from Aquifer Zones below Opaline Claystone								
Minimum	--	3.0	19.36	6.00	0.031	--	--	0
Maximum	--	153	24.65	10.88	0.488	--	--	218
Average	--	49.1	20.82	6.99	0.184	--	--	17

Notes:

-- = data not collected

> = greater than

°C = degrees Celsius

mV = milliVolts

mg/L = milligrams per liter

ntu = nephelometric turbidity units

SpC mmhos/cm = specific conductivity as millimhos per centimeter

Table 2
Summary of Major Ion Analysis
Pinewood Landfill
Pinewood, South Carolina

Sample ID	WT015	WT027	WT030	WT033	WT038	WT040	Leachate 1	Leachate II ab	FD1	SW1
Date Collected	04/10/13	04/10/13	04/09/13	04/10/13	04/10/13	04/10/13	04/10/13	04/10/13	04/10/13	04/10/13
Laboratory ID	OD10100-002	OD10100-003	OD10100-001	OD10100-010	OD10100-005	OD10100-004	OD10100-007	OD10100-008	OD10100-006	OD10100-009
Cations by USEPA Method 6010C (mg/L)										
Calcium	220	34	210	2.7 J//	56	2.3 J//	1500	980	110	7.8
Magnesium	54	7.5	30	3.2 J//	5.6	< 5	410	370	13	2.7 J//
Potassium	4.5 J//	6.2	15	2.2 J//	1.9 J//	2.4 J//	820	1400	4.5 J//	2.9 J//
Sodium	6.4	24	27	6.2	3.7 J//	13	2200	7600	6.5	9.1
Alkalinity by USEPA Method SM2320B (mg/L)										
Alkalinity	< 10 i/M/m	170	8.4 J//	< 10	39	4 J//	< 10	4100	9.2 J//	7.8 J//
Bicarbonate Alkalinity	< 10	170	8.4 J//	< 10	39	4 J//	< 10	4100	9.2 J//	7.8 J//
Carbonate Alkalinity	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Anions by USEPA Method 300 (mg/L)										
Chloride	4.2	3.2	6.1	4.6	3.3	8.8	10000	16000	4.7	8.2
Sulfate	2600	14	680	0.48 J//	120	0.86 J//	2900	2800	340	15

Notes:

mg/L = milligrams per liter

USEPA - United States Environmental Protection Agency

Bold and shading indicate detected concentrations.

J = Estimated Value

Table 3
Summary of Isotopic Analysis
Pinewood Landfill
Pinewood, South Carolina

Well Identification	Sample Source	δD	$\delta 18O$	Tritium
		VSMOW	VSMOW	TU
FD1	French Drain I	-22.8	-4.32	6.58 +/- 0.19
SW1	Surface Water	-18.1	-2.9	6.85 +/- 0.20
WT015	Water Table GW	-25.8	-4.48	6.38 +/- 0.20
WT027	Water Table GW	-22.9	-4.28	8.07 +/- 0.22
WT030	Water Table GW	-20.3	-3.97	7.80 +/- 0.19
WT033	Water Table GW	-25.6	-4.58	5.07 +/- 0.19
WT038	Water Table GW	-23.7	-4.38	7.12 +/- 0.21
WT040	Water Table GW	-24.8	-4.43	4.78 +/- 0.19
Leachate I	Section I Leachate	-84.2	-8.57	25.3 +/- 3.6
Leachate II ab	Section II Leachate	-81.9	-7.75	363 +/- 7.0

Notes:

δD = ratio of deuterium to hydrogen; measured relative to Vienna Standard Mean Ocean Water (VSMOW)

$\delta 18O$ = ratio of oxygen-18 to oxygen-16; measured relative to Vienna Standard Mean Ocean Water (VSMOW)

Tritium measured in tritium units (TU).

ATTACHMENTS

ATTACHMENT A
FIELD FORMS



Chain of Custody and Analytical Request

Page 1 of 1
 Project Number: 60271027.3
 Chain of Custody Number ⁽¹⁾: _____
 LIMS Number: _____

Project Name / Location: Pinewood Landfill, Pinewood SC

Client Name: AECOM / Pinewood Improvement Projects

Collected by: Randy Morgan *Jones/Tobon* Project Manager: John Haramut

Sample ID	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hh:mm)	See Comments			Sample Information	Alkalinity (SM2320B)	Carbonate Alk. (SM2320B)	Bicarbonate Alk. (SM2320B)	Chloride (300.0)	Sulfate (300.0)	Cations (Na, K, Mg, Ca: 6010B)							COMMENTS	Cooler ID	
			COMP	GRAB	Well																
WT030	09-Apr-2013	1648		X		Groundwater	X	X	X	X	X	X									
WT015	10-Apr-2013	0924		X		Groundwater	X	X	X	X	X	X									
WT027	10-Apr-2013	0852		X		Groundwater	X	X	X	X	X	X									
WT040	10-Apr-2013	1010		X		Groundwater	X	X	X	X	X	X									
WT038	10-Apr-2013	1125		X		Groundwater	X	X	X	X	X	X									
FD1	10-Apr-2013	1240		X		Groundwater	X	X	X	X	X	X									
Leachate I	10-Apr-2013	1338		X		Wastewater	X	X	X	X	X	X									
Leachate II Lab	10-Apr-2013	1345	X	X		Waste water	X	X	X	X	X	X									
SW1	10-Apr-2013	1500	X	X		Surface water	X	X	X	X	X	X									
WT033	10-Apr-2013	1535		X		Groundwater	X	X	X	X	X	X									

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. <i>Randy Morgan</i>	4-10-2013	1718	1. _____		
2. _____			2. <i>JCH</i>	4/10/13	1718
3. _____			3. _____		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: <u>XXX</u>	Shipped: _____
Method of Shipment: <u>AECOM</u>	Airbill #: _____
Analytical Lab: <u>Shealy Envir. Labs</u>	Location: <u>West Columbia SC</u>
Lab Recipient: _____	Date: _____ Time: _____

1.) Chain of Custody Number = date collected + custody number (e.g. 01-19-2004-01)



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 1308 Parkland Court
 Champaign, IL 61821
 Phone: 217-398-3490
 Fax: 217-398-3493
 www.isotechlabs.com
 mail@isotechlabs.com

Send Data and Invoice to

Name: John Haramut
 Company: AECOM
 Address: 10 Patwood Dr
Bldg VI Suite 500 Gille SC 29615
 Phone: 864-234-3569
 Fax: 864-234-3069
 Email: john.haramut@AECOM.COM

Project: Pinewood Landfill
 Location: Pinewood SC
 Sampled by: Randy Morgan

Sample Description

Container Number	Sample Identification	Time	Date Sampled	Analyses Requested			Comments
				Oxygen-18	Deuterium	Tritium	
1	WT015	0724	4/10/2013	X	X	X	
2	WT030	1648	4/9/2013	X	X	X	
3	Leachate I	1338	4-10-2013	X	X	X	
4	Leachate II ab	1345	4-10-2013	X	X	X	
5	WT027	0852	4-10-2013	X	X	X	
6	WT033	1535	4-10-2013	X	X	X	
7	WT038	1125	4-10-2013	X	X	X	
8	WT040	1010	4-10-2013	X	X	X	
9	SW1	1500	4-10-2013	X	X	X	
10	FD1	1240	4-10-2013	X	X	X	

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>Randy Morgan</u>	<u>AECOM</u>	<u>April 10 2013</u>	<u>1745</u>
Received by			
Relinquished by			
Received by			
Relinquished by			
Received by			

PROJECT NUMBER: 60271027.3 DATE: April 9, 2013 REPORT NUMBER: 1 of 2
 PROJECT & LOCATION: Pinewood Landfill, Pinewood SC
 CLIENT: _____ AECOM FIELD REPRESENTATIVE: Randy Morgan
 SUBCONTRACTOR: _____
 SUBCONTRACTOR PERSONNEL ON SITE: _____
 BRIEF SUMMARY OF WORK PERFORMED: groundwater sampling

START TIME	STOP TIME	DESCRIPTION OF ACTIVITIES: REMARKS
0900		John Haramit, Randy Morgan, Deri Culham conference call with Brian Burgess at AECOM - kick off meeting before leaving for site
0955		at progress park to pick up equipment
	1028	leave for Pinewood Landfill
1315		purchase ice Wedgefield
1328		arrive on site
1333		at visitor center to watch safety video
1400		waiting for Brian to get off phone load bottles
1413		Richard Jones w/ Simon Troncyatt takes me around to three locations to be sampled
1430		calibrate YSI 556 S/N 05H1116 AG DO% saturated air @ 31.89°C 7.35 Conductivity 1.413 @ 26.29 1.413 Ph 7.010 @ 26.64 7.01 Ph 4.00 4.00 Ph 10.01 9.96 ORP 231.0 231.0
1506		turbidity meter accepts all standards 1000, 10.0, 0.02 NTUS at WPT 15 begins to minor surge of precipitation pump-water level keeps dropping - turn pump down - water level still drops
	1551	dry at 1.75 gals will return to sample also has low Ph 3.23

FIELD REPRESENTATIVES SIGNATURE: Randy Morgan DATE: April 9, 2013

PROJECT NUMBER: 60271027.3 DATE: April 9, 2013 REPORT NUMBER: 2072
 Page #: _____

START TIME	STOP TIME	DESCRIPTION OF ACTIVITIES: REMARKS
		There is limited cell phone service will call John about low pH when I can get service
1601		Called John Haramit about low pH and let him know about cell phone service
1612		at WTD 30 begin to mirror purge w/ peristaltic pump tubing set in middle of water column
	1648	sampled WTD 30
1705		back at WTD 15 water level is 22.45 not enough to sample - will return first thing on 4-10-2013 to collect sample.
1714		at visitor center - crew leaves around 5-5:30 each day and I need to be ready to go at that time.
1720		off site - sampler stored on ice in secure location until April 10, 2013 then will deliver to Steady & Ship Fed Ex to ISO Tech Labs respectfully.
		Brian stated today that the French Drain FDI sample should come from the outfall going into pond it would be same as (the manhole) 4 location - this was OK'd by John Haramit.

FIELD REPRESENTATIVES SIGNATURE: Randy Morgan DATE: April 9, 2013

PROJECT NUMBER: 60271027.3 DATE: April 10, 2013 REPORT NUMBER: 1 of 3
 PROJECT & LOCATION: Pinewood Landfill Pinewood SC
 CLIENT: _____ AECOM FIELD REPRESENTATIVE: Randy Meyer
 SUBCONTRACTOR: _____
 SUBCONTRACTOR PERSONNEL ON SITE: _____
 BRIEF SUMMARY OF WORK PERFORMED: groundwater sampling

START TIME	STOP TIME	DESCRIPTION OF ACTIVITIES: REMARKS
0630		Calibrate YSI 556 S/N 05H1116 AG
		DO% saturated air @ 17.94 9.44
		Conductivity 1.278 @ 20.16 1.278
		Ph 7.02 @ 20.14 7.02
		Ph 4.00 @ 20.30 4.00
		Ph 10.05 10.02
		ORP 2375 2375
		Turbidity meter accepts all standards 1000, 10.0, 0.02 NTUS
0708		Sign in at visitor center
0715		at WTD15 water level 20.67 take 1-reading then
	0724	sampled WTD15 purged on 4-9-2013 (went dry)
0755		at WTD27 begin to micro purge w/ peristaltic pump - tubing set in middle of water column - floating bacteria / light yellow
	0852	sampled WTD27 - turbidity but sampling 13.87
0928		at WTD40 set up and begin to micro purge w/ peristaltic pump - tubing set middle of water column - water is clear no odor
	1010	sampled WTD40
1034		at WTD38 set up and begin to micro purge w/ peristaltic pump tubing set in middle of water column
	1125	sampled WTD38
1150		at WTD33 begin to boil w/ disposable boiler due to depth of water 34.39' BTOE, water starts out clear then very turbid orange

FIELD REPRESENTATIVES SIGNATURE: Randy Meyer DATE: April 10, 2013

PROJECT NUMBER: 60271027.3 DATE: April 10, 2013 REPORT NUMBER: 2 of 3

Page #: _____

START TIME	STOP TIME	DESCRIPTION OF ACTIVITIES: REMARKS
		very fine silt, settler out quickly
	1208	boiled out 5 volumes turbidity over 1000 NTU's will return later today to sample
1220		at visitor center spoke w/ Brian, He said his guys are out to lunch and it would be this afternoon before they could get the leachate sample + surface water sample I will go get the Fresh Brain sample (the location is at the pitfall going into pond "A")
1240		collect FDI out of 10" pipe discharge, took readings also, set wooden stake w/ pink flagging + FDI orbit
1300		Richard (Joner) Mr Tolson are collecting the Leachate samples Leachate I will be sampled at the header in the CTF Leachate II will be a composite of aliquots from each of the ramps in section 2 A+B These were collected in 1/2 gal containers 1-each then transferred into bottleware to be sent to labs
	1338	Leachate I put into sample bottleware to labs
	1345	Leachate II put into sample bottleware to labs
1405		Brian Biegen / Richard Joner / Randy Morgan - goes out of the boundary fence on west side of the landfill to locate seep to collect SW1 at surface discharge Brian showed me the creek from Pond A and the creek coming from Section 2 discharge located 2-USB wells and 2-PVC wells outside property fence - found swamp area with flowing water about 1/2 way between the 2-creeks Brian / Richard have to get back to other tasks / landfill I will get equipment - bottleware and go and locate SW1 - call John to see if the Swamp area was what they are looking for - He said yes - where water is flowing

FIELD REPRESENTATIVES SIGNATURE: Randy Morgan DATE: April 10, 2013

PROJECT NUMBER: 60271027.3 DATE: April 19, 2013 REPORT NUMBER: 313

groundwater sampling

Page #: _____

START TIME	STOP TIME	DESCRIPTION OF ACTIVITIES: REMARKS
		<i>located spot for SW1 flagged trees into the location then put wooden stakes at location and pink flagging on tree close to location.</i>
	<i>1500</i>	<i>collect SW1 and collect water quality readings secure gate</i>
	<i>1535</i>	<i>back at WTU 33 to collect sample - purged earlier today with ladder - very turbid - wanted to let silt settle out at visitors center no one there - have to locate someone to open gate to leave site</i>
<i>1543</i>		
	<i>1610</i>	<i>Brian opens gate and I am off site to deliver samples to Shealy in West Columbia and ship others to ISOtech via Fed Ex. Sumter Transport disposal of all purge water I collected on site.</i>
	<i>1635</i>	<i>purchase ice to complete packing sampler</i>
	<i>1718</i>	<i>relinquish sampler to Shealy in West Columbia</i>
	<i>1745</i>	<i>ship remaining sampler Fed Ex to ISOtech</i>
<i>1753</i>	<i>1910</i>	<i>return to Williams and return equipment</i>
	<i>1930</i>	<i>at AECOM office end of event</i>

FIELD REPRESENTATIVES SIGNATURE: Randy Morgan DATE: April 19, 2013

YSI 556 MPS / Water Quality Calibration Certificate



Cal Standard Temp, LAB, C : 21.80 Temp, FIELD, C :

Conductivity	Lot #	Expiration	Post-Cal, LAB	Post-Cal, FIELD	Acceptable Range
1413 UMHO/CM @25 ^c	1019NCA	11/13	1.278		(+/- .5%)

PH 4.00	Lot #	Expiration	Post-Cal, LAB	Post-Cal, FIELD	Acceptable Range
@25 ^c	1101NCA	11/14	4.00		(+/- 0.2 units)

PH 7.01	Lot #	Expiration	Post-Cal, LAB	Post-Cal, FIELD	Acceptable Range
@25 ^c	1024NCA	11/14	7.01		(+/- 0.2 units)

PH 10.01	Lot #	Expiration	Post-Cal, LAB	Post-Cal, FIELD	Acceptable Range
@25 ^c	1015NCA	11/14	10.01		(+/- 0.2 units)

ORP ZOBELLS	Lot #	Expiration	Post-Cal, LAB	Post-Cal, FIELD	Acceptable Range
231.0 MV @ 25 ^c	7303005	6/13	237.5		(+/- 20 MV)

Dissolved Oxygen (Saturated Air)	Post-Cal, LAB	Temp, C	% Saturation	mg/L	Acceptable Range
		22.18	97.5	8.49	
	Post-Cal, FIELD				

New DO Membrane

Yes No

Do Cap Color

Black Blue Yellow

Model 556 S/N 05H1116 Cable 12B06

Calibration referenced to the temperature of the calibration standards.

Turbidity	Lot #	Expiration	Post-Cal, LAB	Post-Cal, FIELD	Acceptable Range
.02 NTU	21107	NOV-14	0.02		(.0196 to .0204)
10 NTU	20932	SEP-14	10.03		(9.8 to 10.2)
1000 NTU	21174	NOV-14	996.9		(970 to 1031)

Model Micro TPW S/N 200711198

Calibrated By Eric Olson Date of Calibration 4-9-13

Project Name PILIC WOOD Project number 60271027.3

Signed : EO



FIELD DATA LOG FOR GROUNDWATER SAMPLING

Date (mo/day/yr) <u>April 9, 2013</u>	Casing Diameter <u>2.0</u> inches
Field Personnel <u>Randy Morgan</u>	Casing Material <u>Stainless/steel</u>
Site Name <u>Pinewood Landfill</u>	Measuring Point Elevation _____ 1/100 ft
Earth Tech Job # _____	Height of Riser (above land surface) _____ 1/100 ft
Well ID* <u>WTO15</u>	Land Surface Elevation _____ 1/100 ft
____ Upgradient ____ Downgradient ____ Sidegradient ____ Source	Screened Interval _____ 1/100 ft
Weather Conditions <u>mostly sunny</u>	Dedicated Pump or Bailor YES ____ NO <u>X</u> Type _____
Air Temperature <u>87</u> ° F	Steel Guard Pipe Around Casing YES <u>X</u> NO ____
Total Well Depth (TWD) = <u>21.31 23.09 TD</u> 1/100 ft	Locking Cap YES <u>X</u> NO ____
Depth to Ground Water (DGW) = <u>19.97</u> 1/100 ft	Protective Post/Abutment YES <u>X</u> NO ____
Length of Water Column (LWC) = TWD - DGW = <u>3.19</u> 1/100 ft	Well Integrity Satisfactory YES <u>X</u> NO ____
1 Casing Volume (OCV)* = LWC x <u>0.163</u> = <u>0.51</u> gal	Yield LOW <u>X</u> MODERATE ____ HIGH ____
3 Casing Volumes = _____ gal = Standard Evacuation Volume	Comments/Observations
Method of Sample Evacuation _____ peristaltic pump	Sample Time: <u>0724 on 4-10-2013</u>
Method of Sample Collection _____ peristaltic pump	<u>went dry on 4-9-2013 did not recover enough to sample</u>
Total Volume of Water Removed <u>1.75</u> gal	<u>Will sample on 4-10-2013 first A.M.</u>

* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.

Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

FIELD ANALYSES

VOLUME PURGED (gallons)	Initial	<u>.25</u>	<u>.50</u>	<u>.75</u>	<u>1.0</u>	<u>1.20</u>	<u>1.40</u>	<u>1.50</u>	<u>1.60</u>	<u>1.70</u>	<u>1.75</u>
TIME (Military)	<u>1506</u>	<u>1511</u>	<u>1516</u>	<u>1521</u>	<u>1526</u>	<u>1531</u>	<u>1536</u>	<u>1541</u>	<u>1546</u>	<u>1551</u>	<u>1553</u>
Water Level (ft BTOC)	<u>20.23</u>	<u>20.39</u>	<u>20.60</u>	<u>20.78</u>	<u>20.97</u>	<u>21.12</u>	<u>21.29</u>	<u>21.91</u>	<u>22.39</u>	<u>22.92</u>	
pH (S.U.)	<u>3.18</u>	<u>3.04</u>	<u>3.07</u>	<u>3.15</u>	<u>3.18</u>	<u>3.20</u>	<u>3.22</u>	<u>3.23</u>	<u>3.24</u>	<u>3.23</u>	
Sp. Cond. (mS/cm)	<u>2.906</u>	<u>2.870</u>	<u>2.867</u>	<u>2.868</u>	<u>2.873</u>	<u>2.865</u>	<u>2.863</u>	<u>2.863</u>	<u>2.879</u>	<u>2.877</u>	
Water Temp. (°C)	<u>20.63</u>	<u>19.97</u>	<u>20.14</u>	<u>20.31</u>	<u>20.30</u>	<u>20.87</u>	<u>21.20</u>	<u>21.57</u>	<u>21.42</u>	<u>21.14</u>	
Turbidity (NTUs)	<u>1.73</u>	<u>1.55</u>	<u>1.14</u>	<u>1.37</u>	<u>1.58</u>	<u>1.40</u>	<u>1.30</u>	<u>4.28</u>	<u>5.08</u>	<u>4.54</u>	
DO - (mg/L)	<u>6.17</u>	<u>2.75</u>	<u>2.80</u>	<u>2.85</u>	<u>2.94</u>	<u>2.80</u>	<u>2.57</u>	<u>1.91</u>	<u>1.94</u>	<u>1.90</u>	
Salinity (ppt)	<u>1.51</u>	<u>1.50</u>	<u>1.49</u>	<u>1.49</u>	<u>1.50</u>	<u>1.49</u>	<u>1.49</u>	<u>1.49</u>	<u>1.50</u>	<u>1.49</u>	
ORP (mV)	<u>492.5</u>	<u>511.6</u>	<u>521.8</u>	<u>513.9</u>	<u>519.3</u>	<u>515.8</u>	<u>518.6</u>	<u>520.2</u>	<u>517.5</u>	<u>518.9</u>	

DRY

Samp
4-10-1
0722
~~1553~~
3.31
2.49
17.26
9.22
2.38
1.30
444.1

COMMENTS/OBSERVATIONS 4-9-2013 1705 WL 22.45
0715 4-10-2013 WL 20.67 water was clear / no rust present / No odor



FIELD DATA LOG FOR GROUNDWATER SAMPLING

<p>Date (mo/day/yr) <u>April 10, 2013</u></p> <p>Field Personnel <u>Randy Morgan</u></p> <p>Site Name <u>Pinewood Landfill</u></p> <p>Earth Tech Job # <u>60271027, 3</u></p> <p>Well ID* <u>WTO27</u></p> <p style="text-align: center;"> <input type="checkbox"/> Upgradient <input type="checkbox"/> Downgradient <input type="checkbox"/> Sidegradient <input type="checkbox"/> Source </p> <p>Weather Conditions <u>clear / sunny</u></p> <p>Air Temperature <u>71</u> ° F</p> <p>Total Well Depth (TWD) = <u>15.64</u> <u>TOC</u> 1/100 ft</p> <p>Depth to Ground Water (DGW) = <u>12.65</u> 1/100 ft</p> <p>Length of Water Column (LWC) = TWD - DGW = _____ 1/100 ft</p> <p>1 Casing Volume (OCV)* = LWC x _____ = _____ gal</p> <p>3 Casing Volumes = _____ gal = Standard Evacuation Volume</p> <p>Method of Sample Evacuation _____ peristaltic pump</p> <p>Method of Sample Collection _____ peristaltic pump</p> <p>Total Volume of Water Removed <u>2.2</u> gal</p>	<p>Casing Diameter <u>4.0</u> inches</p> <p>Casing Material <u>PVC</u></p> <p>Measuring Point Elevation _____ 1/100 ft</p> <p>Height of Riser (above land surface) _____ 1/100 ft</p> <p>Land Surface Elevation _____ 1/100 ft</p> <p>Screened Interval <u>10.64 - 1.5.64</u> 1/100 ft</p> <p>Dedicated Pump or Bailer YES _____ NO <u>X</u> Type _____</p> <p>Steel Guard Pipe Around Casing YES <u>X</u> NO _____</p> <p>Locking Cap YES _____ NO _____</p> <p>Protective Post/Abutment YES _____ NO <u>X</u></p> <p>Well Integrity Satisfactory YES <u>X</u> NO _____</p> <p>Yield LOW _____ MODERATE _____ HIGH _____</p> <p>Comments/Observations <u>Sample Time: 0852</u></p>
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* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.

Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

FIELD ANALYSES

	Initial	.20	.40	.60	.80	1.0	1.20	1.40	1.60	1.80	2.0	
VOLUME PURGED (gallons)												2.2 2.2
TIME (Military)	0755	0800	0805	0810	0815	0820	0825	0830	0835	0840	0845	0850
Water Level (ft BTOC)	12.88	13.06	13.15	13.22	13.33	13.39	13.40	13.38	13.38	13.38	13.40	13.40
pH (S.U.)	6.15	6.08	6.26	6.29	6.39	6.27	6.26	6.24	6.21	6.19	6.17	6.16
Sp. Cond. (mS/cm)	0.286	0.285	0.289	0.299	0.323	0.333	0.347	0.361	0.383	0.407	0.422	0.430
Water Temp. (°C)	16.38	16.44	16.57	16.64	16.72	16.82	16.80	16.83	16.87	16.93	17.01	17.03
Turbidity (NTUs)	69.34	44.63	40.91	38.60	36.13	34.84	33.27	32.80	29.18	25.39	20.48	17.28
DO - (mg/L)	6.70	1.49	1.94	2.59	1.58	1.37	1.05	0.77	0.52	0.51	0.49	0.52
Salinity (ppt)	0.14	0.14	0.14	0.14	0.15	0.16	0.17	0.17	0.18	0.20	0.20	0.21
ORP (mV)	258.3	273.0	258.2	94.1	-12.1	-16.7	-13.0	-10.1	-13.7	-20.2	-23.5	-23.9

COMMENTS/OBSERVATIONS started out w/ floating bacteria - cleared up
very light yellow tint color turbidity sampling metals = 13.87 NTU'S
very slight color - organic



FIELD DATA LOG FOR GROUNDWATER SAMPLING

Date (mo/day/yr) <u>April 10, 2013</u>	Casing Diameter <u>2.0</u> inches
Field Personnel <u>Randy Morgan</u>	Casing Material _____
Site Name <u>Pinewood Landfill</u>	Measuring Point Elevation _____ 1/100 ft
Earth Tech Job # <u>60271027.3</u>	Height of Riser (above land surface) _____ 1/100 ft
Well ID* <u>WTO33</u>	Land Surface Elevation _____ 1/100 ft
____ Upgradient ____ Downgradient ____ Sidegradient ____ Source	Screened Interval <u>25 - 35</u> 1/100 ft
Weather Conditions <u>Clear / sunny</u>	Dedicated Pump or Bailor YES ____ NO <u>X</u> Type ____
Air Temperature <u>75</u> °F	Steel Guard Pipe Around Casing YES <u>X</u> NO ____
Total Well Depth (TWD) = <u>35.0 37.78 TOC</u> 1/100 ft	Locking Cap YES <u>X</u> NO ____
Depth to Ground Water (DGW) = <u>34.39</u> 1/100 ft	Protective Post/Abutment YES ____ NO <u>X</u>
Length of Water Column (LWC) = TWD - DGW = <u>3.39</u> 1/100 ft	Well Integrity Satisfactory YES <u>X</u> NO ____
1 Casing Volume (OCV)* = LWC x <u>.163</u> = <u>0.55</u> gal	Yield LOW ____ MODERATE <u>X</u> HIGH ____
3 Casing Volumes = <u>1.65</u> gal = Standard Evacuation Volume	Comments/Observations
Method of Sample Evacuation <u>disposable peristaltic pump bailer</u>	Sample Time: <u>1535</u>
Method of Sample Collection <u>disposable peristaltic pump bailer</u>	<u>Water today Allow to settle out (furbidity)</u>
Total Volume of Water Removed <u>2.75</u> gal	<u>very fine silt settles out quickly</u>

* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.

Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

(5 volumes)

	FIELD ANALYSES										
	Initial	.55	1.10	1.65	2.20	2.75					
VOLUME PURGED (gallons)											
TIME (Military)	<u>1150</u>	<u>1153</u>	<u>1156</u>	<u>1200</u>	<u>1204</u>	<u>1208</u>					
Water Level (ft BTOC)	<u>~</u>										
pH (S.U.)	<u>4.69</u>	<u>4.33</u>	<u>4.28</u>	<u>4.29</u>	<u>4.26</u>	<u>4.25</u>					
Sp. Cond. (mS/cm)	<u>0.088</u>	<u>0.088</u>	<u>0.086</u>	<u>0.083</u>	<u>0.084</u>	<u>0.085</u>					
Water Temp. (°C)	<u>19.63</u>	<u>19.19</u>	<u>19.15</u>	<u>19.11</u>	<u>18.96</u>	<u>19.04</u>					
Turbidity (NTUs) <u>Clear</u>	<u>13.85</u>	<u>85.9 orange</u>	<u>94.6 orange</u>	<u>100.8 orange</u>	<u>95.2 orange</u>	<u>71.00 o.r. orange</u>					
DO - (mg/L)	<u>7.42</u>	<u>6.45</u>	<u>7.04</u>	<u>6.45</u>	<u>6.72</u>	<u>6.61</u>					
Salinity (ppt)	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>					
ORP (mV)	<u>333.2</u>	<u>349.3</u>	<u>354.9</u>	<u>350.6</u>	<u>360.9</u>	<u>363.4</u>					

COMMENTS/OBSERVATIONS Water starts out clear to furbid orange / No odor metals furbidity 38.8 NTU
Will return to stable later today due to water being very furbid ISD Tech Sample 102.9 NTU's



FIELD DATA LOG FOR GROUNDWATER SAMPLING

<p>Date (mo/day/yr) <u>April 9, 2013</u></p> <p>Field Personnel <u>Randy Morgan</u></p> <p>Site Name <u>Pinewood Landfill</u></p> <p>Earth Tech Job # _____</p> <p>Well ID* <u>WTO30</u></p> <p style="text-align: center;"> <input type="checkbox"/> Upgradient <input type="checkbox"/> Downgradient <input type="checkbox"/> Sidegradient <input type="checkbox"/> Source </p> <p>Weather Conditions <u>mostly Sunny</u></p> <p>Air Temperature <u>87</u> ° F</p> <p>Total Well Depth (TWD) = <u>13.60</u> 1/100 ft</p> <p>Depth to Ground Water (DGW) = <u>6.27</u> 1/100 ft</p> <p>Length of Water Column (LWC) = TWD - DGW = _____ 1/100 ft</p> <p>1 Casing Volume (OCV)* = LWC x <u>.653</u> = _____ gal</p> <p>3 Casing Volumes = _____ gal = Standard Evacuation Volume</p> <p>Method of Sample Evacuation _____ peristaltic pump</p> <p>Method of Sample Collection _____ peristaltic pump</p> <p>Total Volume of Water Removed <u>1.40</u> gal</p>	<p>Casing Diameter <u>4"</u> inches</p> <p>Casing Material <u>PVC</u></p> <p>Measuring Point Elevation _____ 1/100 ft</p> <p>Height of Riser (above land surface) _____ 1/100 ft</p> <p>Land Surface Elevation _____ 1/100 ft</p> <p>Screened Interval <u>8.6 - 13.6</u> 1/100 ft</p> <p>Dedicated Pump or Bailor YES _____ NO <u>X</u> Type _____</p> <p>Steel Guard Pipe Around Casing YES <u>X</u> NO _____</p> <p>Locking Cap YES <u>X</u> NO _____</p> <p>Protective Post/Abutment YES _____ NO <u>X</u></p> <p>Well Integrity Satisfactory YES <u>X</u> NO _____</p> <p>Yield LOW _____ MODERATE _____ HIGH _____</p> <p>Comments/Observations <u>Sample Time: 1648</u></p>
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* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.

Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

FIELD ANALYSES

	Initial	.20	.40	.60	.80	1.0	1.20	1.40			
VOLUME PURGED (gallons)	1612	1612	1622	1627	1632	1637	1642	1647			
TIME (Military)	1612	1612	1622	1627	1632	1637	1642	1647			
Water Level (ft BTOC)	6.49	6.55	6.59	6.63	6.65	6.67	6.70	6.72			
pH (S.U.)	4.87	4.63	4.66	4.72	4.79	4.78	4.83	4.86			
Sp. Cond. (mS/cm)	1.177	1.185	1.190	1.197	1.202	1.203	1.206	1.220			
Water Temp. (°C)	17.52	17.01	16.63	16.67	16.51	16.55	16.51	16.33			
Turbidity (NTUs)	6.80	6.17	5.68	5.37	5.28	5.25	3.90	3.96			
DO - (mg/L)	6.80	4.84	5.65	5.60	4.64	5.19	5.32	5.20			
Salinity (ppt)	0.59	0.59	0.60	0.60	0.60	0.60	0.61	0.61			
ORP (mV)	35.3	40.3	39.0	40.2	35.4	41.1	46.3	44.7			

COMMENTS/OBSERVATIONS Water is clear / no odor



FIELD DATA LOG FOR GROUNDWATER SAMPLING

Date (mo/day/yr) <u>April-10-2013</u>	Casing Diameter <u>2.0</u> inches
Field Personnel <u>Randy Morgan</u>	Casing Material <u>PVC</u>
Site Name <u>Pinewood Landfill</u>	Measuring Point Elevation _____ 1/100 ft
Earth Tech Job # <u>60271027.3</u>	Height of Riser (above land surface) _____ 1/100 ft
Well ID* <u>WTO38</u>	Land Surface Elevation _____ 1/100 ft
____ Upgradient ____ Downgradient ____ Sidegradient ____ Source	Screened Interval <u>9.5 - 19.5</u> 1/100 ft
Weather Conditions <u>Clear / Sunny</u>	Dedicated Pump or Bailer YES ____ NO <u>X</u> Type _____
Air Temperature <u>72</u> °F	Steel Guard Pipe Around Casing YES <u>X</u> NO ____
Total Well Depth (TWD) = <u>19.5 22.61</u> 1/100 ft	Locking Cap YES <u>X</u> NO ____
Depth to Ground Water (DGW) = <u>12.24</u> 1/100 ft	Protective Post/Abutment YES ____ NO <u>X</u>
Length of Water Column (LWC) = TWD - DGW = _____ 1/100 ft	Well Integrity Satisfactory YES <u>X</u> NO ____
1 Casing Volume (OCV)* = LWC x _____ = _____ gal	Yield LOW ____ MODERATE ____ HIGH ____
3 Casing Volumes = _____ gal = Standard Evacuation Volume	Comments/Observations
Method of Sample Evacuation _____ peristaltic pump	Sample Time: <u>1125</u>
Method of Sample Collection _____ peristaltic pump	
Total Volume of Water Removed <u>1.60</u> gal	

* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.

Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

FIELD ANALYSES

VOLUME PURGED (gallons)	Initial	.20	.40	.55	.70	.85	1.0	1.15	1.30	1.45	1.60
TIME (Military)	1034	1039	1044	1049	1054	1059	1104	1109	1114	1119	1124
Water Level (ft BTOC)	12.81	13.10	13.49	13.74	13.94	14.12	14.24	14.38	14.47	14.54	14.63
pH (S.U.)	5.63	5.64	5.62	5.51	5.55	5.60	5.60	5.63	5.62	5.64	5.65
Sp. Cond. (mS/cm)	0.286	0.290	0.291	0.292	0.295	0.302	0.304	0.306	0.309	0.309	0.310
Water Temp. (°C)	17.98	17.61	17.37	17.57	17.81	17.56	17.62	17.85	17.82	18.01	18.28
Turbidity (NTUs) <u>clear</u>	4.57	3.65	5.16	7.25	8.07	7.98	8.12	7.17	8.14	6.98	6.60
DO - (mg/L)	8.09	7.46	7.16	6.89	6.54	6.88	6.60	5.91	5.88	5.75	5.69
Salinity (ppt)	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15
ORP (mV)	237.7	247.4	244.0	248.2	247.2	249.3	248.8	242.9	247.4	242.3	243.9

COMMENTS/OBSERVATIONS

Water is clear / No odor



FIELD DATA LOG FOR GROUNDWATER SAMPLING

Date (mo/day/yr) <u>April 10, 2013</u>	Casing Diameter <u>2.0</u> inches
Field Personnel <u>Randy Morgan</u>	Casing Material <u>PVC</u>
Site Name <u>Pinewood Landfill</u>	Measuring Point Elevation _____ 1/100 ft
Earth Tech Job # <u>60271027.3</u>	Height of Riser (above land surface) _____ 1/100 ft
Well ID* <u>WTO40</u>	Land Surface Elevation _____ 1/100 ft
____ Upgradient ____ Downgradient ____ Sidegradient ____ Source	Screened Interval <u>12 - 22</u> 1/100 ft
Weather Conditions <u>Clear/sunny</u>	Dedicated Pump or Bailor YES ____ NO <u>X</u> Type ____
Air Temperature _____ °F	Steel Guard Pipe Around Casing YES <u>X</u> NO ____
Total Well Depth (TWD) = <u>22.00</u> <u>2558 TC</u> 1/100 ft	Locking Cap YES <u>X</u> NO ____
Depth to Ground Water (DGW) = <u>16.03</u> 1/100 ft	Protective Post/Abutment YES ____ NO <u>X</u>
Length of Water Column (LWC) = TWD - DGW = _____ 1/100 ft	Well Integrity Satisfactory YES <u>X</u> NO ____
1 Casing Volume (OCV)* = LWC x _____ = _____ gal	Yield LOW ____ MODERATE <u>X</u> HIGH ____
3 Casing Volumes = _____ gal = Standard Evacuation Volume	Comments/Observations
Method of Sample Evacuation _____ peristaltic pump	Sample Time: <u>1010</u>
Method of Sample Collection _____ peristaltic pump	_____
Total Volume of Water Removed <u>1.60</u> gal	_____

* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.

Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

FIELD ANALYSES

	Initial	.20	.40	.60	.80	1.0	1.20	1.40	1.60		
VOLUME PURGED (gallons)											
TIME (Military)	<u>0928</u>	<u>0933</u>	<u>0938</u>	<u>0943</u>	<u>0948</u>	<u>0953</u>	<u>0958</u>	<u>1003</u>	<u>1008</u>		
Water Level (ft BTOC)	<u>16.39</u>	<u>16.44</u>	<u>16.54</u>	<u>16.54</u>	<u>16.54</u>	<u>16.56</u>	<u>16.57</u>	<u>16.57</u>	<u>16.58</u>		
pH (S.U.)	<u>5.23</u>	<u>4.75</u>	<u>4.65</u>	<u>4.62</u>	<u>4.60</u>	<u>4.51</u>	<u>4.51</u>	<u>4.51</u>	<u>4.51</u>		
Sp. Cond. (mS/cm)	<u>0.086</u>	<u>0.087</u>	<u>0.087</u>	<u>0.088</u>	<u>0.088</u>	<u>0.089</u>	<u>0.089</u>	<u>0.090</u>	<u>0.090</u>		
Water Temp. (°C)	<u>18.14</u>	<u>18.06</u>	<u>18.02</u>	<u>18.00</u>	<u>18.02</u>	<u>18.09</u>	<u>18.22</u>	<u>18.31</u>	<u>18.36</u>		
Turbidity (NTUs) <u>clear</u>	<u>2.93</u>	<u>2.09</u>	<u>3.59</u>	<u>3.09</u>	<u>3.34</u>	<u>3.26</u>	<u>3.31</u>	<u>2.37</u>	<u>2.88</u>		
DO - (mg/L)	<u>5.70</u>	<u>5.03</u>	<u>4.44</u>	<u>4.88</u>	<u>4.51</u>	<u>4.23</u>	<u>3.82</u>	<u>3.70</u>	<u>3.63</u>		
Salinity (ppt)	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>	<u>0.04</u>		
ORP (mV)	<u>246.6</u>	<u>268.7</u>	<u>284.0</u>	<u>291.6</u>	<u>300.2</u>	<u>306.8</u>	<u>314.0</u>	<u>314.9</u>	<u>321.7</u>		

COMMENTS/OBSERVATIONS water is clear / No odor



FIELD DATA LOG FOR GROUNDWATER SAMPLING

<p>Date (mo/day/yr) <u>April 10, 2013</u></p> <p>Field Personnel <u>Randy Morgan</u></p> <p>Site Name <u>Pinewood Landfill</u></p> <p>Earth Tech Job # _____</p> <p>Well ID* <u>FD1</u></p> <p>_____ Upgradient _____ Downgradient _____ Sidegradient _____ Source _____</p> <p>Weather Conditions _____</p> <p>Air Temperature _____ ° F</p> <p>Total Well Depth (TWD) = _____ 1/100 ft</p> <p>Depth to Ground Water (DGW) = _____ 1/100 ft</p> <p>Length of Water Column (LWC) = TWD - DGW = _____ 1/100 ft</p> <p>1 Casing Volume (OCV)* = LWC x _____ = _____ gal</p> <p>3 Casing Volumes = _____ gal = Standard Evacuation Volume</p> <p>Method of Sample Evacuation _____</p> <p>Method of Sample Collection _____</p> <p>Total Volume of Water Removed _____ gal</p>	<p>Casing Diameter _____ inches</p> <p>Casing Material _____</p> <p>Measuring Point Elevation _____ 1/100 ft</p> <p>Height of Riser (above land surface) _____ 1/100 ft</p> <p>Land Surface Elevation _____ 1/100 ft</p> <p>Screened Interval _____ 1/100 ft</p> <p>Dedicated Pump or Bailor YES _____ NO _____ Type _____</p> <p>Steel Guard Pipe Around Casing YES _____ NO _____</p> <p>Locking Cap YES _____ NO _____</p> <p>Protective Post/Abutment YES _____ NO _____</p> <p>Well Integrity Satisfactory YES _____ NO _____</p> <p>Yield LOW _____ MODERATE _____ HIGH _____</p> <p>Comments/Observations <u>Sample Time: 1240</u></p>
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* - One casing volume (gallons) for a 0.5 inch well is 0.0102XLWC; for a 2 inch well is 0.163 X LWC; for a 4 inch well is 0.652 X LWC and for a 6 inch well is 1.468 X LWC.
 Volume (in gallons) = $\pi r^2 h (7.48)$, where r is the radius (ft) and h is the height (ft).

FIELD ANALYSES

	Initial								
VOLUME PURGED (gallons)									
TIME (Military)	<u>1238</u>								
Water Level (ft BTOC)									
pH (S.U.)	<u>4.78</u>								
Sp. Cond. (mS/cm)	<u>0.620</u>								
Water Temp. (°C)	<u>17.36</u>								
Turbidity (NTUs)	<u>3.99</u>								
DO - (mg/L)	<u>8.86</u>								
Salinity (ppt)	<u>0.30</u>								
ORP (mV)	<u>2823</u>								

COMMENTS/OBSERVATIONS French Drain Discharge into Pond A
wooden stake w/ pink flagging to mark location ~ 1.5 GPM discharge
per Brian Burgess

FIELD DATA LOG FOR SURFACE WATER/SEDIMENT SAMPLING

Date (yr/mo/day) 2013-April-10

Field Personnel Randy Morgan

Site Name Pinewood Land All

Earth Tech Job No. 60271027.3

Sample Station ID SW1

Surface Water Sediment _____

Weather Conditions _____

Air Temperature (°C) _____

Surface Water	Sediment
Bailer _____	Stainless-Steel Scoop _____
Bottle <input checked="" type="checkbox"/> _____	Stainless-Steel Scoop _____
Other (Specify) _____	Other (Specify) _____

	Sample Container	
	Preservative (Y/N, Type)	
		Sediment

VOCs		
SVOCs		
Pest/PCBs		
Metals		
TPH		
Other (cyanide)		

(PPT) - Parts Per Thousand
 (NTU) - Nephelometric Turbidity Units
 (MV) - Millivolts
 (umhos/cm) - Micro mhos Per Centimeter

Field Analysis

	Surface Water	Sediment
Time (Military)	<u>1500</u>	_____
pH (S.U.)	<u>5.99</u>	_____
ORP (mV)	<u>50.4</u>	_____
Specific Conductivity (mS/cm)	<u>0.084</u>	_____
Water temperature (°C)	<u>22.59</u>	_____
Dissolved Oxygen (mg/L)	<u>6.41</u>	_____
Turbidity (NTU)	<u>10.67</u>	_____
Salinity (PPT)	<u>0.04</u>	_____
Ferrous Iron	_____	_____

*(1) Clear (2) Slight (3) Moderate (4) High

Comments/Observations:

in swamp area outside property boundary where flowing water occurs - staked location and pink flagged.

ATTACHMENT B
LABORATORY ANALYTICAL DATA

Report of Analysis

Earth Tech / AECOM
10 Patewood Drive
Building 6, Suite 500
Greenville, SC 29615
Attention: Doria Cullom

Project Name: **Pinewood**

Project Number: **60271027.3**

Lot Number: **OD10100**

Date Completed: **04/23/2013**



Nisreen Saikaly
Project Manager



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The following non-paginated documents are considered part of this report: Chain of Custody Record and Sample Receipt Checklist.

* OD10100 *

SHEALY ENVIRONMENTAL SERVICES, INC.

SC DHEC No: 32010

NELAC No: E87653

NC DENR No: 329

Case Narrative

Earth Tech / AECOM

Lot Number: OD10100

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. ("Shealy") Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies. Any exceptions to the NELAC standards, the QAMP, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Shealy Project Manager listed on the cover page.

Alkalinity

The MS/MSD recoveries in batch 18807 were outside acceptance criteria. All other QA/QC criteria for the batch were within acceptance criteria and method control limits. The MS/MSD recovery results are attributed to matrix interference. The associated sample results were reported and no corrective action was required.

SHEALY ENVIRONMENTAL SERVICES, INC.

Sample Summary Earth Tech / AECOM Lot Number: OD10100

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WT030	Aqueous	04/09/2013 1648	04/10/2013
002	WT015	Aqueous	04/10/2013 0724	04/10/2013
003	WT027	Aqueous	04/10/2013 0852	04/10/2013
004	WT040	Aqueous	04/10/2013 1010	04/10/2013
005	WT038	Aqueous	04/10/2013 1125	04/10/2013
006	FD1	Aqueous	04/10/2013 1240	04/10/2013
007	Leachate 1	Aqueous	04/10/2013 1338	04/10/2013
008	Leachate II ab	Aqueous	04/10/2013 1345	04/10/2013
009	SW1	Aqueous	04/10/2013 1500	04/10/2013
010	WT033	Aqueous	04/10/2013 1535	04/10/2013

(10 samples)

SHEALY ENVIRONMENTAL SERVICES, INC.

Executive Summary Earth Tech / AECOM Lot Number: OD10100

Sample ID	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	WT030	Aqueous	Alkalinity	SM 2320B-	8.4	J	mg/L	6
001	WT030	Aqueous	Bicarbonate Alkalinity	SM 2320B-	8.4	J	mg/L	6
001	WT030	Aqueous	Chloride	300.0	6.1		mg/L	6
001	WT030	Aqueous	Sulfate	300.0	680		mg/L	6
001	WT030	Aqueous	Calcium	6010C	210		mg/L	7
001	WT030	Aqueous	Magnesium	6010C	30		mg/L	7
001	WT030	Aqueous	Potassium	6010C	15		mg/L	7
001	WT030	Aqueous	Sodium	6010C	27		mg/L	7
002	WT015	Aqueous	Chloride	300.0	4.2		mg/L	8
002	WT015	Aqueous	Sulfate	300.0	2600		mg/L	8
002	WT015	Aqueous	Calcium	6010C	220		mg/L	9
002	WT015	Aqueous	Magnesium	6010C	54		mg/L	9
002	WT015	Aqueous	Potassium	6010C	4.5	J	mg/L	9
002	WT015	Aqueous	Sodium	6010C	6.4		mg/L	9
003	WT027	Aqueous	Alkalinity	SM 2320B-	170		mg/L	10
003	WT027	Aqueous	Bicarbonate Alkalinity	SM 2320B-	170		mg/L	10
003	WT027	Aqueous	Chloride	300.0	3.2		mg/L	10
003	WT027	Aqueous	Sulfate	300.0	14		mg/L	10
003	WT027	Aqueous	Calcium	6010C	34		mg/L	11
003	WT027	Aqueous	Magnesium	6010C	7.5		mg/L	11
003	WT027	Aqueous	Potassium	6010C	6.2		mg/L	11
003	WT027	Aqueous	Sodium	6010C	24		mg/L	11
004	WT040	Aqueous	Alkalinity	SM 2320B-	4.0	J	mg/L	12
004	WT040	Aqueous	Bicarbonate Alkalinity	SM 2320B-	4.0	J	mg/L	12
004	WT040	Aqueous	Chloride	300.0	8.8		mg/L	12
004	WT040	Aqueous	Sulfate	300.0	0.86	J	mg/L	12
004	WT040	Aqueous	Calcium	6010C	2.3	J	mg/L	13
004	WT040	Aqueous	Potassium	6010C	2.4	J	mg/L	13
004	WT040	Aqueous	Sodium	6010C	13		mg/L	13
005	WT038	Aqueous	Alkalinity	SM 2320B-	39		mg/L	14
005	WT038	Aqueous	Bicarbonate Alkalinity	SM 2320B-	39		mg/L	14
005	WT038	Aqueous	Chloride	300.0	3.3		mg/L	14
005	WT038	Aqueous	Sulfate	300.0	120		mg/L	14
005	WT038	Aqueous	Calcium	6010C	56		mg/L	15
005	WT038	Aqueous	Magnesium	6010C	5.6		mg/L	15
005	WT038	Aqueous	Potassium	6010C	1.9	J	mg/L	15
005	WT038	Aqueous	Sodium	6010C	3.7	J	mg/L	15
006	FD1	Aqueous	Alkalinity	SM 2320B-	9.2	J	mg/L	16
006	FD1	Aqueous	Bicarbonate Alkalinity	SM 2320B-	9.2	J	mg/L	16
006	FD1	Aqueous	Chloride	300.0	4.7		mg/L	16
006	FD1	Aqueous	Sulfate	300.0	340		mg/L	16
006	FD1	Aqueous	Calcium	6010C	110		mg/L	17
006	FD1	Aqueous	Magnesium	6010C	13		mg/L	17
006	FD1	Aqueous	Potassium	6010C	4.5	J	mg/L	17
006	FD1	Aqueous	Sodium	6010C	6.5		mg/L	17

Executive Summary (Continued)

Lot Number: OD10100

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
007	Leachate 1	Aqueous	Chloride	300.0	10000		mg/L	18
007	Leachate 1	Aqueous	Sulfate	300.0	2900		mg/L	18
007	Leachate 1	Aqueous	Calcium	6010C	1500		mg/L	19
007	Leachate 1	Aqueous	Magnesium	6010C	410		mg/L	19
007	Leachate 1	Aqueous	Potassium	6010C	820		mg/L	19
007	Leachate 1	Aqueous	Sodium	6010C	2200		mg/L	19
008	Leachate II ab	Aqueous	Alkalinity	SM 2320B-	4100		mg/L	20
008	Leachate II ab	Aqueous	Bicarbonate Alkalinity	SM 2320B-	4100		mg/L	20
008	Leachate II ab	Aqueous	Chloride	300.0	16000		mg/L	20
008	Leachate II ab	Aqueous	Sulfate	300.0	2800		mg/L	20
008	Leachate II ab	Aqueous	Calcium	6010C	980		mg/L	21
008	Leachate II ab	Aqueous	Magnesium	6010C	370		mg/L	21
008	Leachate II ab	Aqueous	Potassium	6010C	1400		mg/L	21
008	Leachate II ab	Aqueous	Sodium	6010C	7600		mg/L	21
009	SW1	Aqueous	Alkalinity	SM 2320B-	7.8	J	mg/L	22
009	SW1	Aqueous	Bicarbonate Alkalinity	SM 2320B-	7.8	J	mg/L	22
009	SW1	Aqueous	Chloride	300.0	8.2		mg/L	22
009	SW1	Aqueous	Sulfate	300.0	15		mg/L	22
009	SW1	Aqueous	Calcium	6010C	7.8		mg/L	23
009	SW1	Aqueous	Magnesium	6010C	2.7	J	mg/L	23
009	SW1	Aqueous	Potassium	6010C	2.9	J	mg/L	23
009	SW1	Aqueous	Sodium	6010C	9.1		mg/L	23
010	WT033	Aqueous	Chloride	300.0	4.6		mg/L	24
010	WT033	Aqueous	Sulfate	300.0	0.48	J	mg/L	24
010	WT033	Aqueous	Calcium	6010C	2.7	J	mg/L	25
010	WT033	Aqueous	Magnesium	6010C	3.2	J	mg/L	25
010	WT033	Aqueous	Potassium	6010C	2.2	J	mg/L	25
010	WT033	Aqueous	Sodium	6010C	6.2		mg/L	25

(73 detections)

Inorganic non-metals

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-001**

Description: **WT030**

Matrix: **Aqueous**

Date Sampled: **04/09/2013 1648**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 1901	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 1901	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 1901	KMB		
1		(Chloride) 300.0	1	04/20/2013 0417	SMH		18855
1		(Sulfate) 300.0	25	04/22/2013 2257	SMH		18940

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	8.4	J	10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	8.4	J	10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	6.1		1.0	0.11	mg/L	1
Sulfate		300.0	680		25	6.9	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-001**

Description: **WT030**

Matrix: **Aqueous**

Date Sampled: **04/09/2013 1648**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/17/2013 0207	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	210		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	30		5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	15		5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	27		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-002**

Description: **WT015**

Matrix: **Aqueous**

Date Sampled: **04/10/2013 0724**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 1904	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 1904	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 1904	KMB		
1		(Chloride) 300.0	1	04/20/2013 0441	SMH		18855
1		(Sulfate) 300.0	100	04/23/2013 0009	SMH		18940

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	ND	S	10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	4.2		1.0	0.11	mg/L	1
Sulfate		300.0	2600		100	28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: OD10100-002
Description: WT015	Matrix: Aqueous
Date Sampled: 04/10/2013 0724	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/17/2013 0230	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	220		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	54		5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	4.5	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	6.4		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: Earth Tech / AECOM	Laboratory ID: OD10100-003
Description: WT027	Matrix: Aqueous
Date Sampled: 04/10/2013 0852	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 1927	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 1927	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 1927	KMB		
1		(Chloride) 300.0	1	04/20/2013 0554	SMH		18855
1		(Sulfate) 300.0	1	04/20/2013 0554	SMH		18858

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	170		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	170		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	3.2		1.0	0.11	mg/L	1
Sulfate		300.0	14		1.0	0.28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: OD10100-003
Description: WT027	Matrix: Aqueous
Date Sampled: 04/10/2013 0852	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/15/2013 2123	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	34		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	7.5		5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	6.2		5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	24		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-004**

Description: **WT040**

Matrix: **Aqueous**

Date Sampled: **04/10/2013 1010**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 1937	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 1937	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 1937	KMB		
1		(Chloride) 300.0	1	04/20/2013 0618	SMH		18855
1		(Sulfate) 300.0	1	04/20/2013 0618	SMH		18858

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	4.0	J	10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	4.0	J	10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	8.8		1.0	0.11	mg/L	1
Sulfate		300.0	0.86	J	1.0	0.28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: OD10100-004
Description: WT040	Matrix: Aqueous
Date Sampled: 04/10/2013 1010	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/15/2013 2130	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	2.3	J	5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	ND		5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	2.4	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	13		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: Earth Tech / AECOM	Laboratory ID: OD10100-005
Description: WT038	Matrix: Aqueous
Date Sampled: 04/10/2013 1125	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 1942	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 1942	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 1942	KMB		
1		(Chloride) 300.0	1	04/20/2013 0730	SMH		18855
1		(Sulfate) 300.0	5	04/23/2013 0033	SMH		18940

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	39		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	39		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	3.3		1.0	0.11	mg/L	1
Sulfate		300.0	120		5.0	1.4	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-005**

Description: **WT038**

Matrix: **Aqueous**

Date Sampled: **04/10/2013 1125**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/15/2013 2134	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	56		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	5.6		5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	1.9	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	3.7	J	5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-006**

Description: **FD1**

Matrix: **Aqueous**

Date Sampled: **04/10/2013 1240**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 1948	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 1948	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 1948	KMB		
1		(Chloride) 300.0	1	04/20/2013 0931	SMH		18857
1		(Sulfate) 300.0	10	04/23/2013 0057	SMH		18940

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	9.2	J	10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	9.2	J	10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	4.7		1.0	0.11	mg/L	1
Sulfate		300.0	340		10	2.8	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-006**

Description: **FD1**

Matrix: **Aqueous**

Date Sampled: **04/10/2013 1240**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/15/2013 2138	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	110		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	13		5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	4.5	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	6.5		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: Earth Tech / AECOM	Laboratory ID: OD10100-007
Description: Leachate 1	Matrix: Aqueous
Date Sampled: 04/10/2013 1338	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 2006	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 2006	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 2006	KMB		
1		(Chloride) 300.0	500	04/22/2013 2208	SMH		18937
1		(Sulfate) 300.0	100	04/20/2013 1043	SMH		18859

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	10000		500	55	mg/L	1
Sulfate		300.0	2900		100	28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: OD10100-007
Description: Leachate 1	Matrix: Aqueous
Date Sampled: 04/10/2013 1338	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	25	04/17/2013 0234	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	1500		130	25	mg/L	1
Magnesium	7439-95-4	6010C	410		130	30	mg/L	1
Potassium	7440-09-7	6010C	820		130	27	mg/L	1
Sodium	7440-23-5	6010C	2200		130	29	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: Earth Tech / AECOM	Laboratory ID: OD10100-008
Description: Leachate II ab	Matrix: Aqueous
Date Sampled: 04/10/2013 1345	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/22/2013 1330	KMB		18889
1		(Bicarbonate) SM 2320B-	1	04/22/2013 1330	KMB		
1		(Carbonate Al) SM 2320B-	1	04/22/2013 1330	KMB		
1		(Chloride) 300.0	500	04/22/2013 2232	SMH		18937
1		(Sulfate) 300.0	100	04/20/2013 1107	SMH		18859

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	4100		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	4100		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	16000		500	55	mg/L	1
Sulfate		300.0	2800		100	28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: OD10100-008
Description: Leachate II ab	Matrix: Aqueous
Date Sampled: 04/10/2013 1345	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	25	04/17/2013 0238	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	980		130	25	mg/L	1
Magnesium	7439-95-4	6010C	370		130	30	mg/L	1
Potassium	7440-09-7	6010C	1400		130	27	mg/L	1
Sodium	7440-23-5	6010C	7600		130	29	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: Earth Tech / AECOM	Laboratory ID: OD10100-009
Description: SW1	Matrix: Aqueous
Date Sampled: 04/10/2013 1500	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 2042	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 2042	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 2042	KMB		
1		(Chloride) 300.0	1	04/20/2013 1131	SMH		18857
1		(Sulfate) 300.0	1	04/20/2013 1131	SMH		18859

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	7.8	J	10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	7.8	J	10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	8.2		1.0	0.11	mg/L	1
Sulfate		300.0	15		1.0	0.28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: **Earth Tech / AECOM**

Laboratory ID: **OD10100-009**

Description: **SW1**

Matrix: **Aqueous**

Date Sampled: **04/10/2013 1500**

Date Received: **04/10/2013**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/15/2013 2158	CDF	04/12/2013 1135	18070
2	3005A	6010C	1	04/17/2013 0241	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	7.8		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	2.7	J	5.0	1.2	mg/L	2
Potassium	7440-09-7	6010C	2.9	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	9.1		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

Inorganic non-metals

Client: Earth Tech / AECOM	Laboratory ID: OD10100-010
Description: WT033	Matrix: Aqueous
Date Sampled: 04/10/2013 1535	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B-2011	1	04/20/2013 2046	KMB		18807
1		(Bicarbonate) SM 2320B-	1	04/20/2013 2046	KMB		
1		(Carbonate Al) SM 2320B-	1	04/20/2013 2046	KMB		
1		(Chloride) 300.0	1	04/20/2013 1155	SMH		18857
1		(Sulfate) 300.0	1	04/20/2013 1155	SMH		18859

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B-20	ND		10	3.9	mg/L	1
Chloride		300.0	4.6		1.0	0.11	mg/L	1
Sulfate		300.0	0.48	J	1.0	0.28	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: OD10100-010
Description: WT033	Matrix: Aqueous
Date Sampled: 04/10/2013 1535	
Date Received: 04/10/2013	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	04/15/2013 2202	CDF	04/12/2013 1135	18070
2	3005A	6010C	1	04/17/2013 0245	CDF	04/12/2013 1135	18070

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	2.7	J	5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	3.2	J	5.0	1.2	mg/L	2
Potassium	7440-09-7	6010C	2.2	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	6.2		5.0	1.2	mg/L	1

PQL = Practical quantitation limit B = Detected in the method blank E = Quantitation of compound exceeded the calibration range H = Out of holding time Q = Surrogate failure
 ND = Not detected at or above the MDL J = Estimated result < PQL and ≥ MDL P = The RPD between two GC columns exceeds 40% N = Recovery is out of criteria L = LCS/LCSD failure
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" S = MS/MSD failure

QC Summary

Inorganic non-metals - MB

Sample ID: OQ18807-001

Matrix: Aqueous

Batch: 18807

Analytical Method: SM 2320B-2011

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Alkalinity	ND		1	10	3.9	mg/L	04/20/2013 2019

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCS

Sample ID: OQ18807-002

Matrix: Aqueous

Batch: 18807

Analytical Method: SM 2320B-2011

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	100	99		1	99	90-110	04/20/2013 2025

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18807-003

Matrix: Aqueous

Batch: 18807

Analytical Method: SM 2320B-2011

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	100	110		1	105	6.5	90-110	20	04/20/2013 2031

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MS

Sample ID: OD10100-002MS

Matrix: Aqueous

Batch: 18807

Analytical Method: SM 2320B-2011

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	ND	100	ND	N	1	0.00	70-130	04/20/2013 1906

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MSD

Sample ID: OD10100-002MD

Matrix: Aqueous

Batch: 18807

Analytical Method: SM 2320B-2011

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	ND	100	ND	N	1	0.00	0.00	70-130	20	04/20/2013 1909

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18855-001

Matrix: Aqueous

Batch: 18855

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Chloride	ND		1	1.0	0.11	mg/L	04/19/2013 1951

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCS

Sample ID: OQ18855-002

Matrix: Aqueous

Batch: 18855

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	20	20		1	98	90-110	04/19/2013 2015

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18855-003

Matrix: Aqueous

Batch: 18855

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	20	20		1	98	0.42	90-110	20	04/19/2013 2039

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MS

Sample ID: OD10100-004MS

Matrix: Aqueous

Batch: 18855

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	8.8	20	28		1	97	90-110	04/20/2013 0642

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MSD

Sample ID: OD10100-004MD

Matrix: Aqueous

Batch: 18855

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	8.8	20	28		1	97	0.078	90-110	20	04/20/2013 0706

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18857-001

Matrix: Aqueous

Batch: 18857

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Chloride	ND		1	1.0	0.11	mg/L	04/20/2013 0818

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCS

Sample ID: OQ18857-002

Matrix: Aqueous

Batch: 18857

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	20	20		1	98	90-110	04/20/2013 0843

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18857-003

Matrix: Aqueous

Batch: 18857

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	20	20		1	98	0.11	90-110	20	04/20/2013 0907

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MS

Sample ID: OD10100-006MS

Matrix: Aqueous

Batch: 18857

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	4.7	20	24		1	99	90-110	04/20/2013 0955

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MSD

Sample ID: OD10100-006MD

Matrix: Aqueous

Batch: 18857

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	4.7	20	24		1	97	1.6	90-110	20	04/20/2013 1019

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18858-001

Matrix: Aqueous

Batch: 18858

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Sulfate	ND		1	1.0	0.28	mg/L	04/19/2013 1951

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

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Page: 42 of 64
Level 1 Report v2.1

Inorganic non-metals - LCS

Sample ID: OQ18858-002

Matrix: Aqueous

Batch: 18858

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	20	20		1	100	90-110	04/19/2013 2015

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18858-003

Matrix: Aqueous

Batch: 18858

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	20	20		1	100	0.32	90-110	20	04/19/2013 2039

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MS

Sample ID: OD10100-004MS

Matrix: Aqueous

Batch: 18858

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	0.86	20	21		1	100	90-110	04/20/2013 0642

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MSD

Sample ID: OD10100-004MD

Matrix: Aqueous

Batch: 18858

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	0.86	20	21		1	99	1.4	90-110	20	04/20/2013 0706

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18859-001

Matrix: Aqueous

Batch: 18859

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Sulfate	ND		1	1.0	0.28	mg/L	04/20/2013 0818

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCS

Sample ID: OQ18859-002

Matrix: Aqueous

Batch: 18859

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	20	20		1	98	90-110	04/20/2013 0843

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18859-003

Matrix: Aqueous

Batch: 18859

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	20	20		1	98	0.44	90-110	20	04/20/2013 0907

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18889-001

Matrix: Aqueous

Batch: 18889

Analytical Method: SM 2320B-2011

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Alkalinity	ND		1	10	3.9	mg/L	04/22/2013 1330

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCS

Sample ID: OQ18889-002

Matrix: Aqueous

Batch: 18889

Analytical Method: SM 2320B-2011

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	1000	1000		1	100	90-110	04/22/2013 1330

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18889-003

Matrix: Aqueous

Batch: 18889

Analytical Method: SM 2320B-2011

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	1000	1100		1	109	8.3	90-110	20	04/22/2013 1330

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18937-001

Matrix: Aqueous

Batch: 18937

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Chloride	ND		1	1.0	0.11	mg/L	04/22/2013 1855

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCS

Sample ID: OQ18937-002

Matrix: Aqueous

Batch: 18937

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	20	20		1	101	90-110	04/22/2013 1920

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18937-003

Matrix: Aqueous

Batch: 18937

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	20	20		1	101	0.13	90-110	20	04/22/2013 1944

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - MB

Sample ID: OQ18940-001

Matrix: Aqueous

Batch: 18940

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Sulfate	ND		1	1.0	0.28	mg/L	04/22/2013 1855

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

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Page: 56 of 64
Level 1 Report v2.1

Inorganic non-metals - LCS

Sample ID: OQ18940-002

Matrix: Aqueous

Batch: 18940

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	20	21		1	103	90-110	04/22/2013 1920

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Inorganic non-metals - LCSD

Sample ID: OQ18940-003

Matrix: Aqueous

Batch: 18940

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	20	21		1	103	0.58	90-110	20	04/22/2013 1944

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MB

Sample ID: OQ18070-001

Batch: 18070

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 04/12/2013 1135

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Calcium	ND		1	5.0	1.0	mg/L	04/17/2013 0140
Magnesium	ND		1	5.0	1.2	mg/L	04/17/2013 0140
Potassium	ND		1	5.0	1.1	mg/L	04/15/2013 2224
Sodium	ND		1	5.0	1.2	mg/L	04/15/2013 2224

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

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Page: 59 of 64
Level 1 Report v2.1

ICP-AES - LCS

Sample ID: OQ18070-002

Matrix: Aqueous

Batch: 18070

Prep Method: 3005A

Analytical Method: 6010C

Prep Date: 04/12/2013 1135

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	40	41		1	103	80-120	04/17/2013 0144
Magnesium	40	42		1	104	80-120	04/17/2013 0144
Potassium	40	42		1	106	80-120	04/15/2013 2228
Sodium	40	39		1	97	80-120	04/15/2013 2228

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - LCSD

Sample ID: OQ18070-003

Matrix: Aqueous

Batch: 18070

Prep Method: 3005A

Analytical Method: 6010C

Prep Date: 04/12/2013 1135

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Calcium	40	41		1	101	1.3	80-120	20	04/17/2013 0148
Magnesium	40	41		1	102	2.0	80-120	20	04/17/2013 0148
Potassium	40	43		1	108	1.6	80-120	20	04/15/2013 2232
Sodium	40	39		1	96	0.41	80-120	20	04/15/2013 2232

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MS

Sample ID: OD10100-001MS

Matrix: Aqueous

Batch: 18070

Prep Method: 3005A

Analytical Method: 6010C

Prep Date: 04/12/2013 1135

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	210	40	240		1	87	75-125	04/17/2013 0211
Magnesium	30	40	70		1	99	75-125	04/17/2013 0211
Potassium	15	40	58		1	106	75-125	04/17/2013 0211
Sodium	27	40	68		1	103	75-125	04/17/2013 0211

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MSD

Sample ID: OD10100-001MD

Matrix: Aqueous

Batch: 18070

Prep Method: 3005A

Analytical Method: 6010C

Prep Date: 04/12/2013 1135

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Calcium	210	40	240		1	93	1.0	75-125	20	04/17/2013 0215
Magnesium	30	40	70		1	100	0.60	75-125	20	04/17/2013 0215
Potassium	15	40	56		1	102	2.5	75-125	20	04/17/2013 0215
Sodium	27	40	70		1	106	2.0	75-125	20	04/17/2013 0215

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

ICP-AES - MS

Sample ID: OD10100-003MS

Matrix: Aqueous

Batch: 18070

Prep Method: 3005A

Analytical Method: 6010C

Prep Date: 04/12/2013 1135

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	34	40	73		1	98	75-125	04/15/2013 2127
Magnesium	7.5	40	46		1	97	75-125	04/15/2013 2127
Potassium	6.2	40	50		1	109	75-125	04/15/2013 2127
Sodium	24	40	64		1	99	75-125	04/15/2013 2127

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and \geq MDL

+ = RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

AECOM		Chain of Custody and Analytical Request		Page <u>1</u> of <u>1</u>																														
				Project Number: <u>60271027.3</u>																														
				Chain of Custody Number (C): _____																														
				LIMS Number: _____																														
Project Name / Location: Pinewood Landfill, Pinewood SC																																		
Client Name: AECOM / Pinewood Improvement Projects																																		
collected by: Randy Morgan / John Haramut																																		
Project Manager: John Haramut																																		
Sample ID	Date Collected (dd-mm-yyyy)	Time Collected (Military) (hh:mm)	See Comments			Sample Information	Alkalinity (SM1230B)	Carbonate Alk. (SM1230B)	Bicarbonate Alk. (SM2320B)	Chloride (300.0)	Sulfate (300.0)	Cations (Na, K, Mg, Ca, 6010B)	Quality Assurance Samples	Cooler ID																				
			COMP	GRAB	WEL																													
WT030	09-Apr-2013	1648	X	X	X	Groundwater	X	X	X	X	X	X	to 4/12/13																					
WT015	10-Apr-2013	0924	X	X	X	Groundwater	X	X	X	X	X	X	OD 10100																					
WT027	10-Apr-2013	0852	X	X	X	Groundwater	X	X	X	X	X	X	COMMENTS																					
WT040	10-Apr-2013	1010	X	X	X	Groundwater	X	X	X	X	X	X																						
WT038	10-Apr-2013	1125	X	X	X	Groundwater	X	X	X	X	X	X																						
FD1	10-Apr-2013	1240	X	X	X	Groundwater	X	X	X	X	X	X																						
Leachate I	10-Apr-2013	1338	X	X	X	Wastewater	X	X	X	X	X	X																						
Leachate II	10-Apr-2013	1345	X	X	X	Waste water	X	X	X	X	X	X																						
SW1	10-Apr-2013	1500	X	X	X	Surface water	X	X	X	X	X	X																						
WT033	10-Apr-2013	1535	X	X	X	Groundwater	X	X	X	X	X	X																						
<table border="0" style="width:100%;"> <tr> <td style="width:30%;">Requested By (Signed) <i>Randy Morgan</i></td> <td style="width:20%;">Date <u>4-10-2013</u></td> <td style="width:20%;">Time <u>1118</u></td> <td style="width:30%;">Received by (signed) _____</td> <td style="width:10%;">Date _____</td> <td style="width:10%;">Time _____</td> </tr> <tr> <td colspan="3">Custody Transfers Prior to Receipt by Laboratory</td> <td colspan="3">Sample Delivery Details / Laboratory Receipt</td> </tr> <tr> <td colspan="3">Delivered Directly to Lab: _____</td> <td colspan="3">Shipped: _____</td> </tr> <tr> <td colspan="3">Method of Shipment: _____</td> <td colspan="3">Analytical Lab: <u>Shealy Envir. Labs</u></td> </tr> <tr> <td colspan="3">Lab Receipt#: _____</td> <td colspan="3">Date: _____</td> </tr> </table>					Requested By (Signed) <i>Randy Morgan</i>	Date <u>4-10-2013</u>	Time <u>1118</u>	Received by (signed) _____	Date _____	Time _____	Custody Transfers Prior to Receipt by Laboratory			Sample Delivery Details / Laboratory Receipt			Delivered Directly to Lab: _____			Shipped: _____			Method of Shipment: _____			Analytical Lab: <u>Shealy Envir. Labs</u>			Lab Receipt#: _____			Date: _____		
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Delivered Directly to Lab: _____			Shipped: _____																															
Method of Shipment: _____			Analytical Lab: <u>Shealy Envir. Labs</u>																															
Lab Receipt#: _____			Date: _____																															

Chain of Custody Number - date collected - custody number (e.g. 01-19-2004-01)

Temp 1.0

52745 labware project control project forms blank CDC

SHEALY ENVIRONMENTAL SERVICES, INC.

Shealy Environmental Services, Inc.
 Document Number: F-AD-016
 Revision Number: 10

Page 1 of 1
 Replaces Date: 10/11/11
 Effective Date: 01/28/13

Sample Receipt Checklist (SRC)

Client: ALCOM Cooler Inspected by/date: LD 4/10/13 Lot #: 0010160

Means of receipt: <input checked="" type="checkbox"/> SESI <input type="checkbox"/> Client <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Airborne Exp <input type="checkbox"/> Other			
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	1. Were custody seals present on the cooler?	
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	2. If custody seals were present, were they intact and unbroken?	
Cooler ID/temperature upon receipt: <u>1.1</u> °C / <u> </u> °C / <u> </u> °C / <u> </u> °C			
Method: <input type="checkbox"/> Temperature Blank <input checked="" type="checkbox"/> Against Bottles			
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Blue Ice <input type="checkbox"/> Dry Ice <input type="checkbox"/> None			
If response is No (or Yes for 14, 15, 16), an explanation/resolution must be provided.			
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	3. If temperature of any cooler exceeded 6.0°C, was Project Manager notified? PM notified by SRC, phone, note (circle one), other: <u> </u> . (For coolers received via commercial courier, PMs are to be notified immediately.)
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	4. Is the commercial courier's packing slip attached to this form?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		5. Were proper custody procedures (relinquished/received) followed?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	5a Were samples relinquished by client to commercial courier?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		6. Were sample IDs listed?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		7. Was collection date & time listed?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		8. Were tests to be performed listed on the COC?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		9. Did all samples arrive in the proper containers for each test?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		10. Did all container label information (ID, date, time) agree with COC?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		11. Did all containers arrive in good condition (unbroken, lids on, etc.)?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		12. Was adequate sample volume available?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		13. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		14. Were any samples containers missing?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		15. Were there any excess samples not listed on COC?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	16. Were bubbles present >"pea-size" (¼" or 6mm in diameter) in any VOA vials?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input type="checkbox"/>	17. Were all metals/O&G/HEM/nutrient samples received at a pH of <2?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	18. Were all cyanide and/or sulfide samples received at a pH >12?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	19. Were all applicable NH3/TKN/cyanide/phenol/BNA/pest/PCB/herb (<0.2mg/L) samples free of residual chlorine?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	20. Were collection temperatures documented on the COC for NC samples?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	21. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?
Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)			
Sample(s) <u>007 008</u> were received incorrectly preserved and were adjusted accordingly in sample receiving with <u>086</u> (H ₂ SO ₄ , HNO ₃ , HCl, NaOH) with the SR # (number) <u> </u>			
Sample(s) <u> </u> were received with bubbles >6 mm in diameter.			
Sample(s) <u> </u> were received with TRC >0.2 mg/L for NH3/TKN/cyanide/BNA/pest/PCB/herb.			
Sample labels verified by: <u>LD</u>		Date: <u>4/10/13</u>	

Corrective Action taken, if necessary:
 Was client notified: Yes No
 SESI employee: Did client respond: Yes No
 Comments: Date of response:

Nisreen Saikaly

From: Morgan, Randy <RANDY.MORGAN@aecom.com>
Sent: Thursday, April 11, 2013 8:13 AM
To: Nisreen Saikaly
Subject: Pinewood
Attachments: randy.pdf

OD10100

The ID for Leachate II needs to be Leachate II ab can you correct this on the chain so it will be in the system this way, attached is my corrected chain. The bottles need to be corrected also please. Thank you, Randy

AECOM

Project Name / Location: Pinewood Landfill, Pinewood SC

Client Name: AECOM / Pinewood Improvement Projects

Collected by: Randy Morgan *Randy Morgan* Project Manager: John Haramut

Page 1 of 1

Project Number: 60271027.3

Chain of Custody Number (C):

LIMS Number:

Chain of Custody and Analytical Request

Sample ID	Date Collected (dd-mm-yyyy)	Time Collected (Military) (hh:mm)	Site Comments			Sample Information	Sample Analysis Requested						Quality Assurance Samples	Comments	Cooler ID	
			Well	GRAB	COMF		Alkalinity (SM220B)	Carbonic A/c. (SM220B)	Chloride (3000)	Sulfate (3000)	Cations (Na, K, Mg, Ca, 6010B)					
WTD030	09-Apr-2013	1648		X		Groundwater	X	X	X	X	X	X	X			
WTD015	10-Apr-2013	0924		X		Groundwater	X	X	X	X	X	X	X			
WTD027	10-Apr-2013	0852		X		Groundwater	X	X	X	X	X	X	X			
WTD040	10-Apr-2013	1010		X		Groundwater	X	X	X	X	X	X	X			
WTD038	10-Apr-2013	1125		X		Groundwater	X	X	X	X	X	X	X			
FD1	10-Apr-2013	1240		X		Groundwater	X	X	X	X	X	X	X			
Leachate I	10-Apr-2013	1338		X		Wastewater	X	X	X	X	X	X	X			
Leachate II Lab	10-Apr-2013	1345		X		Wastewater	X	X	X	X	X	X	X			
SW1	10-Apr-2013	1500		X		Surface water	X	X	X	X	X	X	X			
WTD033	10-Apr-2013	1535		X		Groundwater	X	X	X	X	X	X	X			
Custody Transfers Prior to Receipt by Laboratory																
Requested By (Signed): <i>Randy Morgan</i>		Date: 4-10-2013	Received by (Signed): <i>[Signature]</i>		Date: 4/10/13	Time: 1718		Delivered Directly to Lab: XXX		Method of Shipment: AECOM		Sample Delivery Receipt: XXX		Shipper: XXX		
1. <i>Randy Morgan</i>		4-10-2013	2. <i>[Signature]</i>		4/10/13	3. <i>[Signature]</i>		Analytical Lab: Shealy Envir. Labs		Lab Receipt #: 1718		Locate: West Columbia SC		Date: Time:		

Water Analysis

Lab Number: 346546 Job Number: 21264 IS-63920

Submitter Sample Name: WT015

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

δ D of water ----- -25.8 ‰ relative to VSMOW

δ ¹⁸O of water ----- -4.48 ‰ relative to VSMOW

Tritium content of water ----- 6.38 ± 0.20 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346547 Job Number: 21264 IS-63920

Submitter Sample Name: WT030

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/09/2013 Results Reported: 5/16/2013

δ D of water ----- -20.3 ‰ relative to VSMOW

δ ¹⁸O of water ----- -3.97 ‰ relative to VSMOW

Tritium content of water ----- 7.80 ± 0.19 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346548 Job Number: 21264 IS-63920

Submitter Sample Name: Leachate I

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

δ D of water ----- -84.2 ‰ relative to VSMOW

δ ¹⁸O of water ----- -8.57 ‰ relative to VSMOW

Tritium content of water ----- 25.3 ± 3.6 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346549 Job Number: 21264 IS-63920

Submitter Sample Name: Leachate II ab

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

δ D of water ----- -81.9 ‰ relative to VSMOW

δ ¹⁸O of water ----- -7.75 ‰ relative to VSMOW

Tritium content of water ----- 363 ± 7 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346550 Job Number: 21264 IS-63920

Submitter Sample Name: WT027

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

δ D of water ----- -22.9 ‰ relative to VSMOW

δ ¹⁸O of water ----- -4.28 ‰ relative to VSMOW

Tritium content of water ----- 8.07 ± 0.22 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346551 Job Number: 21264 IS-63920

Submitter Sample Name: WT033

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

δ D of water ----- -25.6 ‰ relative to VSMOW

δ ¹⁸O of water ----- -4.58 ‰ relative to VSMOW

Tritium content of water ----- 5.07 ± 0.19 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346552 Job Number: 21264 IS-63920

Submitter Sample Name: WT038

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

 δD of water ----- -23.7 ‰ relative to VSMOW $\delta^{18}O$ of water ----- -4.38 ‰ relative to VSMOWTritium content of water ----- 7.12 \pm 0.21 TU $\delta^{13}C$ of DIC ----- na ^{14}C content of DIC ----- na $\delta^{15}N$ of nitrate ----- na $\delta^{18}O$ of nitrate ----- na $\delta^{34}S$ of sulfate ----- na $\delta^{18}O$ of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346553 Job Number: 21264 IS-63920

Submitter Sample Name: WT040

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

 δ D of water ----- -24.8 ‰ relative to VSMOW δ ¹⁸O of water ----- -4.43 ‰ relative to VSMOW

Tritium content of water ----- 4.78 ± 0.19 TU

 δ ¹³C of DIC ----- na¹⁴C content of DIC ----- na δ ¹⁵N of nitrate ----- na δ ¹⁸O of nitrate ----- na δ ³⁴S of sulfate ----- na δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346554 Job Number: 21264 IS-63920

Submitter Sample Name: SW1

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

 δ D of water ----- -18.1 ‰ relative to VSMOW δ ¹⁸O of water ----- -2.90 ‰ relative to VSMOW

Tritium content of water ----- 6.85 ± 0.20 TU

 δ ¹³C of DIC ----- na¹⁴C content of DIC ----- na δ ¹⁵N of nitrate ----- na δ ¹⁸O of nitrate ----- na δ ³⁴S of sulfate ----- na δ ¹⁸O of sulfate ----- na

Remarks:

Water Analysis

Lab Number: 346555 Job Number: 21264 IS-63920

Submitter Sample Name: FD1

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Landfill

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 4/10/2013 Results Reported: 5/16/2013

δ D of water ----- -22.8 ‰ relative to VSMOW

δ ¹⁸O of water ----- -4.32 ‰ relative to VSMOW

Tritium content of water ----- 6.58 ± 0.19 TU

δ ¹³C of DIC ----- na

¹⁴C content of DIC ----- na

δ ¹⁵N of nitrate ----- na

δ ¹⁸O of nitrate ----- na

δ ³⁴S of sulfate ----- na

δ ¹⁸O of sulfate ----- na

Remarks:

ATTACHMENT C
QUALITY ASSURANCE/QUALITY CONTROL

ATTACHMENT C

QUALITY ASSURANCE/QUALITY CONTROL

Major ion analysis was performed by Shealy Environmental Services, Inc., West Columbia, South Carolina. Sample receipt, sample analysis, and data review were performed by the laboratory “in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. (“Shealy”) Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies” (Shealy 2013; see Attachment B to the Technical Memorandum).

A Data Assessment Report (DAR) was prepared by AECOM and is included with this attachment. Results of alkalinity in sample WT015 were qualified “/M/m” (see Table C-1) due to high recovery in the associated matrix spike sample above the established criteria of 70-160% (0%). These qualifiers indicate the results should be considered biased low. However, since the pH of this sample was measured at 3.3 in the field, no alkalinity should be present.

The DAR concluded that QC excursions encountered during the validation of this data set did not result in the rejection of any data. Therefore, the analytical data associated with Shealy SDG OD10100 should be considered compliant and adequate for its intended use.

As another check on analytical results, charge balance was calculated using major ion analysis. Concentrations were converted to milliequivalents by dividing by the molecular weight and multiplying by the electron charge. Charge balance is calculated as the sum of cation milliequivalents minus the sum of anion milliequivalents, divided by the sum of major ion milliequivalents, and converted to relative percent difference (RPD). The calculated RPDs for the additional samples ranged were highly variable, as indicated by the table below.

Sample Identification	Total Dissolved Soils (mg/L)	RPD
WT015	2892	-55%
WT027	192	-3%
WT-030	973	0%
WT-033	22	68%
WT038	215	2%
WT040	32	36%
Leachate 1	17,833	-20%
Leachate II ab	31,650	-14%
FD1	484	-3%
SW1	51	22%

Negative RPD values indicate a deficit of cation concentrations compared to anion concentrations; positive RPD values indicate the reverse. When total dissolved solids (TDS) are low, poor charge balance can result because the concentrations are within or close to the expected error for the method. This may be the case for samples such as WT033, WT040, and SW1. In samples with elevated TDS,

such as the leachate samples, precipitating salts may interfere with analytical instrumentation, resulting in charge imbalance. This may also be an explanation for the charge imbalance for sample WT015.

Isotope analysis was performed by Isotech Laboratories, Inc., Champaign, Illinois. Cavity ring-down spectroscopy was used for analysis of $\delta^{18}\text{O}/^{16}\text{O}$ and $\delta\text{D}/\text{H}$, and tritium was analyzed by radiometric measurement. For $\delta\text{D}/\text{H}$ and $\delta^{18}\text{O}/^{16}\text{O}$ isotope analyses, the one standard deviation general analytical measurement uncertainty was reported by the laboratory based on their experience because duplicate analyses were not conducted. The laboratory assigned $\delta\text{D}/\text{H}$ an uncertainty of +/- 2 and $\delta^{18}\text{O}/^{16}\text{O}$ an uncertainty of +/- 0.2. Uncertainties assigned for tritium measurements are reported in Table 3 of the addendum and range from 0.19 to 7.0 tritium units. Uncertainties are mainly 2% to 4% of the tritium measurement, except for the Leachate I sample, which has an uncertainty of 14%.

DATA ASSESSMENT REPORT

Data assessment is a systematic process for reviewing a body of data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and sample collection and handling procedures affect the usability of the analytical data. If specific DQOs are not met, the data are qualified (i.e., data flags are assigned to sample results) in accordance with guidelines established by the U.S. Environmental Protection Agency (EPA). Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The assessment of data quality and usability involves five components, as described below.

- 1) **Field Sampling Check** - is a process to ensure that all samples were collected, handled, and submitted for laboratory analyses in accordance with project work plans. Inspection of sample preservation procedures, sample handling, analysis requested, sample description and ID, cooler receipt forms, holding time evaluation, and Chain of Custody procedures are all evaluated to insure that the evidentiary nature of the samples and the resulting analytical data have not been compromised.
- 2) **Data Verification** - is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 3) **Data Review** - is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance/quality control (QA/QC) samples, such as field, trip, equipment or ambient blanks and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 4) **Data Evaluation** - is a process to determine if the data meets project-specific DQOs and contract requirements. This evaluation may involve a review of field sampling and sample management procedures, laboratory audits, Performance Evaluation (PE) sample results, and any other data quality indicators that are available.
- 5) **Data Validation** - is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with EPA regional or national functional guidelines, project-specific guidelines, and compliance with the requirements of each analytical method. Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each

analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are qualified with data flags according to referenced guidelines.

Data Validation Procedures

AECOM performed independent QC review and assessment of field and laboratory procedures that were used in collecting and analyzing the data. The QC review and assessment is conducted to verify the data collected are of appropriate quality for the intended use and meets site-specific DQOs. The steps and guidelines followed during the data validation process were modeled on the EPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. In addition, method-specific criteria set fourth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste, Third Edition, Update III* are also evaluated during the validation process. This validation process has been adapted to meet the DQO requirements for generation of definitive critical data.

Data Validation Results

The analytical data consist of groundwater samples analyzed by Shealy Environmental Services, Inc. (Shealy) located in West Columbia, South Carolina. Sample Delivery Group (SDG) OD10100 was validated according to the procedures outlined above.

Where data flags have been applied to this data set, they are separated by a slash "/" and presented in the following format:

Laboratory Flag / AECOM Result Flags / AECOM Analysis Flags

- **Laboratory Flag:** Is the flag preceding the first slash and is added by the laboratory as a result of QC excursions from the analytical method. These flags are laboratory-specific and are described in the associated laboratory report.
- **AECOM Result Flags:** These are presented after the first slash and are added based on data validation procedures and guidelines. They tell how the data should be used.
- **AECOM Analysis Flags:** These flags are presented after the second slash and inform the data user of the specific QA/QC problem that was encountered.

Data flags for each of the three categories described above are listed and defined in Data Flags List. The following describes analytical QA/QC excursions where appropriate by analytical fraction.

Alkalinity by Method SM2320B

Results of alkalinity in sample WT-015 were qualified “/M/m” due to high recovery in the associated matrix spike sample above the established criteria of 70-160% (0%). These qualifiers indicate the results should be considered biased low.

Anions by Method E300.0

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

Cations by Method 6010C

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

Data Summary and Usability

The QC excursions encountered during the validation of this data set did not result in the rejection of any data. Therefore, the analytical data associated with Shealy SDG OD10100 should be considered compliant and adequate for its intended use.

References

Environmental Protection Agency, June 1997. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update III.

Environmental Protection Agency, October 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review* EPA-540/R-99-008, (PB99-963506).

Environmental Protection Agency, October 2004. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540-R-04-004, (OSWER 9240.1-45).

**Table C-1
Summary of Added Data Qualifiers
Pinewood Landfill
Pinewood, South Carolina**

<u>Modifier</u>	<u>Description</u>
<	Indicates not detected at the reporting limit indicated.
"/"	Separates the laboratory added data qualifiers from the validation data qualifiers. The laboratory added data qualifiers precede the first "/". The result qualifiers follow the first "/", and the analysis qualifiers follow the second "/". The result qualifiers are a product of the data validation process, and the analysis qualifier defines the type of QC excursion.

Laboratory Data Qualifiers

<u>Qualifier</u>	<u>Description</u>
J	Estimated result < PQL and ≥ MDL
S	MS/MSD failure

Result Data Qualifiers

<u>Qualifier</u>	<u>Description</u>
M	A matrix effect was present.

Analysis Data Qualifiers

<u>Qualifier</u>	<u>Description</u>
m	Matrix spike recovery below established criteria.