

DENR USE ONLY:

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Doc/Event #:

NC DENR
Division of Waste Management - Solid Waste

Environmental Monitoring Reporting Form

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Instructions:

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

Solid Waste Monitoring Data Submittal Information

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

Jett Environmental Consulting, PLLC

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

Name: Steve Jett Phone: (314) 496-4654

E-mail: steve.jett@jettenviro.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Lake Norman C&D Landfill	7099 Quarry Lane Stanley, NC 28164	55-04	.0500	N/A

Environmental Status: (Check all that apply)

- Initial/Background Monitoring Detection Monitoring Assessment Monitoring Corrective Action

Type of data submitted: (Check all that apply)

- Groundwater monitoring data from monitoring wells Methane gas monitoring data
 Groundwater monitoring data from private water supply wells Corrective action data (specify) _____
 Leachate monitoring data Other(specify) Groundwater Assessment Monitoring Work Plan
 Surface water monitoring data

Notification attached?

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

Certification

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

Steve Jett Owner (314) 496-4654
 Facility Representative Name (Print) Title (Area Code) Telephone Number
 Signature [Signature] Date 3/9/15 Affix NC Licensed/ Professional Geologist Seal

Jett Environmental Consulting, PLLC, 10 Quiet Brook Court, St. Charles, MO 63303

Facility Representative Address

NC PE Firm License Number (if applicable effective May 1, 2009)





March 9, 2015

Submitted via Electronic Mail

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

Dear Ms. Drummond:

**Re: Groundwater Assessment Monitoring Work Plan
Lake Norman Construction & Demolition Landfill
North Carolina, Permit # 55-04**

On behalf of BFI Lake Norman Landfill, Inc., Jett Environmental Consulting is submitting this Groundwater Assessment Monitoring Work Plan to the North Carolina Department of Environment and Natural Resources (DENR). The Work Plan was compiled in accordance with 15A NCAC 13B .0545, due to confirmed methylene chloride detections at MW-4 above the North Carolina 15A NCAC 2L Water Quality Standard. The confirmed exceedance of the methylene chloride NC 2L Standard was documented in the "Submittal of Groundwater and Surface Water Monitoring Results, Second Semi-Annual 2014 Event" submitted to DENR by Jett Environmental Consulting on February 12, 2015.

Background

Attached as **Figure 1** is a potentiometric surface map for the Second Semi-Annual (November) 2014 event, which displays the site layout, groundwater well locations, and groundwater flow direction. The Second Semi-Annual 2014 exhibited detections of methylene chloride (6.4 ug/L), tetrahydrofuran (14 ug/L), and trichlorofluoromethane (4.5 ug/L) at MW-4 above their respective detection limits specified in the SWSLs. Trichlorofluoromethane was below the 2L Standard (2,000 ug/L). Methylene chloride was above the 2L Standard (5 ug/L). Tetrahydrofuran does not have an established 2L Standard.

Well MW-4 was resampled on January 19, 2015 to confirm the first time 2L Standard exceedance for methylene chloride and the first time detection of tetrahydrofuran. During the January 2015 event, methylene chloride was detected at 6.4 ug/L, which confirmed the November 2014 concentration above the 2L Standard (5 ug/L).

Tetrahydrofuran was also confirmed detected during the January 2015 event at MW-4 (12 ug/L). As stated above, tetrahydrofuran does not have an established 2L Standard.

According to the site's Water Quality Monitoring Plan and review of sampling field forms, well MW-4 has a total depth of approximately 19 feet below ground surface (fbgs), indicating a screened interval from 4 to 19 fbgs (total depth). Review of the historical water level data for MW-4 indicates water levels ranging from approximately 11.5 to 16.5 fbgs. This shallow well, with a long screen exhibiting a partially unsaturated interval (ranging from 7.5 to 12.5 feet), could be providing a conduit for landfill gas (gaseous phase) VOCs to partition into the dissolved phase in groundwater. Therefore, the well construction for MW-4 may be not functioning optimally, which may be contributing to impacts to groundwater.

A boring log for MW-4 was not available, however a boring log was located for OW-8, which was an observation well previously installed in the vicinity of MW-4 during 1997 as part of the Construction Plan Application. The boring log for OW-8 indicates that subsurface geology consists of:

- 0 to 6 fbs: red-brown, micaceous, sandy and clayey SILT, with manganese from 2.5 to 6 feet;
- 6 to 18.5 fbs: red-brown to brown, micaceous, sandy SILT, with manganese from 13.5 to 18.5 feet;
- 18.5 to 30 fbs: brown-white, micaceous, silty, medium to fine-grained SAND, with manganese, and a quartz vein at 28.5 feet (water level at 23 feet).

DENR Assessment Regulations or C&D Landfills

According to 15A NCAC 13B .0545:

(a) Assessment Program. Assessment is required if one or more constituents, as listed in Part (b)(1)(D) of Rule .0544 of this Section are detected above the current ground-water quality standards in accordance with 15A NCAC 02L .0202, in any sampling event. The owner and operator must also immediately:

(1) Install at least one additional groundwater monitoring well or methane gas monitoring well at the facility boundary or the compliance boundary, as defined in 15A NCAC 02L .0100, in the direction of contaminant migration. The new sampling point must be installed at the facility boundary or compliance boundary at the location most likely to show impact based on the known geology and hydrogeology;

(2) Notify all persons who own land or reside on land that directly overlies any part of the plume of contamination if contaminants have migrated off-site or are thought to have migrated off site;

(3) Within 30 days of triggering an assessment monitoring program, the owner and operator must submit an assessment monitoring work plan for Division review. The Division shall date and stamp the assessment monitoring program "approved" if the conditions in Paragraph (b) of this Rule are met. The owner and operator must place the approved program in the operation record, and notify all appropriate local government officials.

(b) Assessment Monitoring Work Plan. The assessment monitoring work plan must be in accordance with the following:

(1) Install additional monitoring wells to characterize the nature and extent of the release by determining the following:

- (A) Lithology of the aquifer and unsaturated zone;*
- (B) Hydraulic conductivity of the aquifer and unsaturated zone;*
- (C) Ground-water flow rates;*
- (D) Minimum distance of travel;*
- (E) Resource value of the aquifer; and*
- (F) Nature, fate, and transport of any detected constituents.*

(2) Analyze for additional parameters, which may include constituents on the Appendix II of 40 CFR Part 258 as directed by the Division. For any constituent detected in the downgradient wells as the result of analyzing of additional parameters, a minimum of four independent samples from each well (background and downgradient) must be collected and analyzed to establish background for the new constituents.

Extent of Methylene Chloride Near MW-4

In order to delineate the extent of methylene chloride in the vicinity of MW-4, one additional well (MW-5) is proposed downgradient of MW-4. **Figure 1** displays the general proposed location of MW-5. Delineation well MW-5 will allow collection of a groundwater sample in the direction of any potential migration. The distance from MW-4 to the facility property boundary (Forney Creek) is approximately 185 feet. Very saturated surface conditions exist between MW-4 and Forney Creek. An attempt will be made to install MW-5 as close to the creek as accessible conditions allow, but no closer than 50 feet to the creek (i.e. compliance boundary).

A hollow-stem auger rig will likely be utilized to drill the boring for MW-5. The boring will be continuously logged under the direction of a North Carolina licensed Geologist in order to determine the lithology of the aquifer and unsaturated zone. Subsurface soil samples will also be collected to determine the hydraulic conductivity of the aquifer and unsaturated zone. Drilling will continue down to approximately 15 feet below the depth of water encountered, to allow a full saturated screen to be installed. Depth to water at MW-4 has typically ranged from 11.5 to 16.5 fbs. Therefore, the total depth of MW-5 is anticipated to be in the 26.5 to 31.5 feet range, dependent on actual materials encountered in the field, in order to be installed with a fully-saturated screen interval within the subsurface sand unit.

New well MW-5 will be constructed of 2-inch diameter Schedule 40 PVC pipe. A 10-foot length of well screen (0.01-inch slots) will be installed at the base of the monitoring well, with solid PVC riser installed on top of the screen and extending approximately 30 inches above the ground surface. Casing joints will be fitted with rubber O-rings. An expandable plug will be fitted on the well riser, then a primary filter sand pack will be placed in the annulus between the well casing and the inner wall of the auger string from the base of the well to a depth to at least 2 feet above the top of the screen. A minimum 2-foot layer of granular or chipped bentonite will be installed on top of the sand pack as a primary seal. The remaining annular space will be filled with cement-bentonite slurry tremmied into place. Completion of the new well will consist of installing a 5-foot long (3 feet above ground, 2 feet below ground) protective steel or aluminum casing with a lockable hinged lid over the PVC riser, encased in a concrete pad approximately 4 feet square and 6 inches thick. The concrete pad will be constructed such that it slopes away from the well. A weep hole will be installed in the protective casing. Well MW-5 will be developed and surveyed (top of PVC casing elevation, ground elevation, and coordinates).

Nature (Source) of Methylene Chloride at MW-4

The only organic compounds that have been confirmed detected above SWSLs at MW-4 are methylene chloride, tetrahydrofuran, and trichlorofluoromethane. Methylene chloride and trichlorofluoromethane are commonly found in landfill gas (LFG). C&D landfills are not required to have a leachate collection system. Therefore, a representative leachate sample cannot be collected for comparison of the groundwater to leachate quality. However, constituents that are typically elevated in landfill leachate (i.e. heavy metals, BTEX, acetone, ketones) are non-detect at well MW-4.

The following work is proposed to assist in confirming the source of the organic detections are LFG.

- (1) Methane, oxygen, and carbon dioxide will be measured within the well casing headspaces of MW-1, MW-2, MW-3, and MW-4. Tubing, attached to a GEM 2000 portable gas analyzer (or equivalent), will be inserted into the well to a depth of approximately 5 feet above the groundwater level. Measurements will also be conducted during drilling and in the headspace of the new well to be installed (i.e. MW-5). The presence of methane and/or carbon dioxide would be an indicator of LFG. LFG is a common source of organics in groundwater adjacent to landfills.
- (2) It is proposed to collect geochemical indicator parameter data from MW-1, MW-2, MW-3, MW-4, and new well MW-5. The geochemical data will include alkalinity, bicarbonate, calcium, carbonate, chloride, magnesium, potassium, sodium, and sulfate. The additional parameters will allow the facility to compare (i.e. piper and stiff diagrams) upgradient data (MW-1) to downgradient well data to determine if any geochemical differences exist across the site.

As noted in 15A NCAC 13B .0545, it is proposed to also sample the list of constituents in Appendix II of 40 CFR Part 258 at well MW-4 and new well MW-5. If any Appendix II parameters are detected which lack sufficient information on background, additional sampling will be conducted to satisfy the assessment objectives.

If new downgradient well MW-5 indicates no VOCs above applicable 2L Standards, then the extent of VOC impact will be considered defined on the landfill property by MW-5. If VOCs above applicable 2L Standards are confirmed at new well MW-5, then the extent of VOC impact will not be considered defined, and the site will submit an additional plan to evaluate potential actions.

As stated above, well MW-4 is a shallow well, with a long screen exhibiting a partially unsaturated interval, which could be providing a conduit for landfill gas (gaseous phase) VOCs to partition into the dissolved phase in groundwater. Therefore, the well construction for MW-4 may be contributing to impacts to groundwater. Upon installation and sampling of MW-5, if the groundwater results indicate water quality not affected by the landfill, then the facility may propose abandoning MW-4 and utilizing MW-5 as a replacement well in the Detection Monitoring program.

Upon receipt of DENR approval of this Work Plan, the site will schedule the proposed actions. The site respectfully requests a DENR response prior to the upcoming April 2015 semi-annual groundwater sampling event in order to allow time to coordinate the proposed sampling activities in conjunction with the April 2015 event.

Should you have any questions or concerns, please contact Mr. Mike Gurley at (704) 262-6019 or Steve Jett at (314) 496-4654.

Sincerely,



Steve Jett, LG #1825
Owner, Jett Environmental Consulting, PLLC (C-517)

Attachment: Figure 1 – Potentiometric Surface & Proposed Delineation Well Map

*cc: Mike Gurley, Republic Services, Inc. (1 Hardcopy and PDF via Email)
Lake Norman Landfill (1 Hardcopy)*

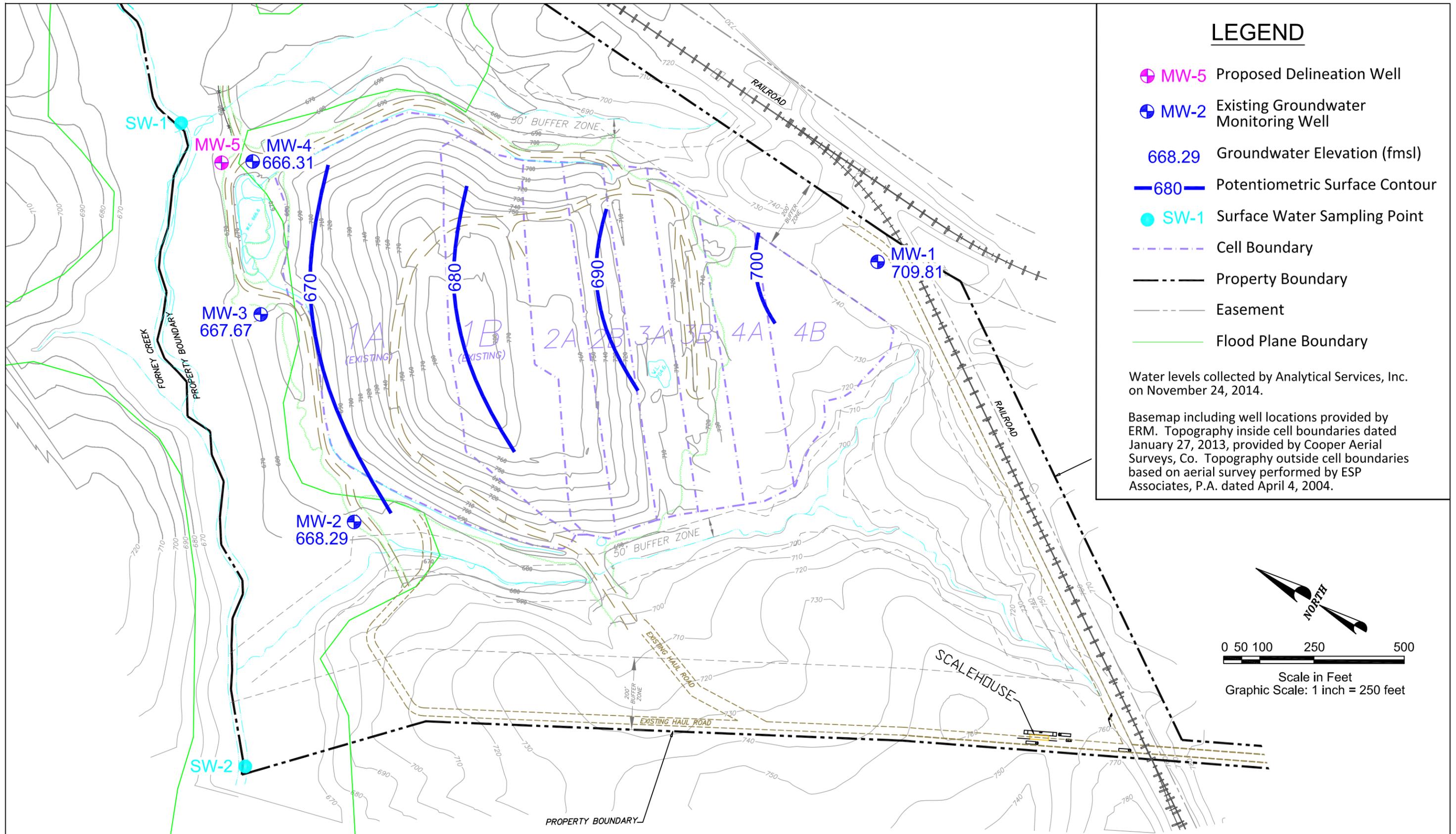


Figure 1
Potentiometric Surface & Proposed Delineation Well Location Map
Lake Norman C&D Landfill, Lincoln County, North Carolina