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May 21, 2015

Mr. John E. Murray, P.E.
Professional Engineer - Solid Waste Section
North Carolina Dept. of Env. & Natural Resources
Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115

Re: City of Albemarle Landfill
Facility Permit No. 84-01
Stanly County, North Carolina
Permit to Operate for 5-yr Permit Renewal
Response to Comments
HHNT Project No. 1011-010-01

Dear Mr. Murray:

The purpose of this letter is to summarize the steps that have been completed to date with regard to the 5-year permit renewal for the subject facility. In addition, we are providing a formal response to additional technical comments received from the Section regarding this permit renewal request.

A summary of correspondence related to this permit renewal is provided below:

1. Original request to renew the 5-year Permit to Operate submitted in a letter dated, December 13, 2013.
2. Request from Sarah Rice for a Compliance History Review provided in a letter dated March 11, 2014. This questionnaire was completed by the City of Albemarle and returned on March 27, 2014.
3. The $15,000 permit renewal fee has been invoiced by NCDENR and paid by the City of Albemarle based on information provided by the City.
4. Additional documentation including an updated Operation Plan and select plan sheets submitted to the Section in a letter dated, June 19, 2014.
5. A completeness letter was issued by the Section on July 22, 2014
6. Technical comments regarding the Operation Plan were received via email on August 19, 2014 and August 22, 2014.

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7. A response to those comments was submitted on November 18, 2014 and included a revised Operation Plan which adequately addresses both MSW and C&D Operations at the facility.

8. Additional technical comments received from the Section via telephone conversation on January 29, 2015. These comments are summarized below and responses have been provided.

9. Additional technical comments received from the Section's Hydrogeological Review via email correspondence on February 9, 2015. These comments are summarized below and responses have been provided.

On January 29, 2015 additional technical comments were received via telephone conversation with Mr. John Murray. These comments have been summarized below in *italics* and responses have been provided in **bold**.

1. *Comment: Revise the Operation Plan to remove the Posi-Shell Usage Guideline data located in the Appendix.*

   Response: The Operation Plan has been revised to remove the Posi-Shell Usage Guidelines from the Appendix and all references to this guideline throughout the Operation Plan. A copy of this plan, dated May, 2015 has been enclosed for your review and approval.

2. *Comment: Ms. Teresa Bradford of the Compliance Section expressed concerns that the Operation Plan did not adequately address all aspects of the facility's permitted operations, specifically with regard to C&D disposal activities.*

   Response: Based on a conversation between Matt Cheek, PE and Ms. Bradford, it was discovered that she did not have a copy of the most current Operation Plan, revised November, 2014. During the call, the latest copy was discovered, and Mr. Cheek walked Ms. Bradford through the changes that had been incorporated to specifically address C&D operations at the facility. It is our understanding that Ms. Bradford has no further comments on the Operation Plan. The only change to the enclosed May, 2015 Operation Plan was to remove the Posi-shell Usage Guidelines, as directed.

3. *Comment: Mr. John Murray requested an Engineering Drawing be added to the revised plan set to show the waste filling activities that will be done in the C&D area over the next 5 years.*

   Response: A plan sheet has entitled, C&D Landfill Area – 5 Year Sequence Grading Plan has been included in the Permit Renewal Plans. A complete set of revised plans has been enclosed for your review and approval.

4. *Comment: A request was made to identify the location of the proposed leachate force main being considered by the City of Albemarle on the Permit Renewal Plans.*

Response: Plan sheets have been added to the Permit Renewal Plans to indicate the proposed leachate force main location within the landfill facility boundary. Once installed, this leachate force main will provide a direct discharge connection from the existing leachate lagoon at the landfill to a connection point with the City of Albemarle's sanitary sewer system located approximately 3.5 miles from the landfill site. This project is more specifically described as the construction of approximately 20,000 linear feet of leachate force main from the City of Albemarle's Landfill site on Stony Gap Road East towards Highway 52, then North on Highway 52 to the termination point of the existing City sanitary sewer system near Ross Drive. A new duplex pump station and HDPE wet well will be constructed on the Landfill site to pump the leachate from the Landfill to the existing sanitary sewer system.

On February 9, 2015 additional technical comments were received via email correspondence. These comments were summarized in a Memorandum to John Murray, PE from Perry Sugg, PG and dated January 12, 2015. These comments were further discussed with Mr. Sugg on February 20, 2015 by Matt Cheek, PE of HHHT, Inc. These comments have been summarized below in *italics* and responses have been provided in **bold**.

1. *Comment: Subtitle D MSWLF (Phases 1 and 2)*

   Groundwater Levels and Wells

   a. *A review of the Design Hydro plans submitted for Phase 2 in 2007 and recent water quality monitoring reports indicate that seasonal high groundwater levels have not been greater than estimated and there are no concerns with meeting the minimum four-foot vertical separation requirement between design base grade and groundwater levels.*

      Response: No response required.

   b. *Also, groundwater levels collected during semi-annual monitoring has demonstrated a consistent flow direction across Phase 1 and 2 areas toward two tributaries to the southwest and to the southeast. The current monitoring well network is adequately located for monitoring groundwater quality for Phase 1 and Phase 2. However, due to the expansion of Phase 2 there is a data gap for water level measurements on the west and north sides of Phase 2 area. Water level data in these areas would provide a better indication of groundwater direction in this area, which now appears to be inferred. I would recommend either installing temporary piezometers or, if still existing, collect water levels from any unused piezometers left from the design site study. There were numerous piezometers installed for the 2006 Design Hydro study (see Plate 2, MESCO report) that may serve this purpose if they still exist.*

      Response: It was confirmed during a telephone conversation that the area in question is actually to the "east" and "northern" sides of

Phase 2 which can more generally be described as the future Phase 3 area. As requested, field evaluations were conducted to determine the existing condition of any remaining piezometers located within the future Phase 3 area. It was determined that PZ-60, PZ-61, and PZ-62 were still in place. It was further confirmed that the intent of this comment was to better identify groundwater flow direction and not a request for additional groundwater quality monitoring—hence the request to monitor water levels. Groundwater levels were obtained from these three piezometers on February 24th, 2015 by Shield Engineering, Inc. (Shield). Shield subsequently developed a groundwater contour map from these piezometers and other monitoring wells. The groundwater contour map is provided in the revised Gas Monitoring Plan prepared by Shield and included with this submittal.

2. *Comment: CDLF Unit*

Landfill Gas Monitoring

a. *For the last 2 years, two landfill gas monitoring wells (MP9 and MP12) near the western property boundary have consistently recorded methane levels in excess of 100% LEL and UEL for methane. In early 2014, the City acquired the adjacent property immediately to the west. I'm not sure how this affects the compliance boundary, but regardless, it appears that additional LFG monitoring wells are needed between MP-9 and MP-12 and the compliance boundary (new property line?) to demonstrate acceptable methane levels at the compliance boundary.*

Response: **Gas monitoring, reporting and compliance at the City of Albemarle Landfill is handled by Shield Engineering, Inc. (Shield). Shield performed quarterly gas monitoring in April of 2015 and discussed landfill gas compliance in the Report of Gas Monitoring dated May 19, 2015. A copy of this report has been provided for your review.**

b. *LFG monitoring in the vicinity of the CDLF needs to be amended to add hydrogen sulfide gas (H2S) monitoring as well as methane. C&D landfills are a source of this gas due to the nature of material disposed in them. Please add H2S monitoring for the following wells and buildings: MP-3, MP-4, MP-5, MP-7R, MP-9, MP-10, MP-11, Recycle Shop, and Maintenance Shop; and any additional wells installed around the CDLF for compliance monitoring. Also, update LFG monitoring plans as appropriate to reflect H2S monitoring.*

Response: **The Gas Monitoring Plan has been updated to reflect H_2S monitoring. Actual monitoring for H_2S by Shields Engineering, Inc. began in Fall, 2014 and monitoring has continued to the present.**

3. *Comment: Facility Groundwater and Surface Water Monitoring*
Semi-annual monitoring of groundwater and surface water is conducted at the facility for the active CDLF, the closed MSWLF, and the Subtitle D MSWLF (phase 1 and 2). Groundwater and surface water monitoring is designed to detect early release of constituents to the uppermost aquifer. Other than the recommendation for additional water level monitoring for the Subtitle D MSWLF, the current plan and existing well network is sufficient to effectively monitor the permitted and closed units at this facility for releases without any additions or changes.

Response: No response required.

4. *Comment: Updated Operations Plan*
Finally, it appears that the updated Operations Plan only addresses the Subtitle D MSWLF. The 2012 PTO does have a subsection in the permit itself that includes CDLF specific conditions, but not operations. If the CDLF unit is to be incorporated into this permit, would the updated Ops Plan also need to include the CDLF? I'm not sure how to reflect updates to the CDLF gas monitoring in this process.

Response: The Operation Plan was revised in November, 2014 to appropriately address all items specific to C&D operations in accordance with the Rules. We believe the current Operation Plan appropriately addresses all permitted activities at this facility.

5. *Comment: Permit Renewal Plan Sheets*
Plan Sheet 4: include groundwater monitoring wells and LFG wells on the facility plan sheet.
Plan Sheet 6 Cross-Section: do we want to show groundwater levels on the cross section?

Response: Plan Sheet No. 4 has been revised to include all groundwater monitoring wells and landfill gas monitoring wells on the facility plan sheet. Plan sheet No. 6 has not been revised to show groundwater levels. It would be inaccurate to show current groundwater monitoring levels on this cross-section. That data would have been included in the original Permit to Construct application to demonstrate adequate separation and would have incorporated seasonal high groundwater data associated with piezometers located within the existing waste footprint. This information was approved by the Section prior to constructing Phases 1 & 2. A digital copy of this plan could not be located. Therefore, we have not added these groundwater contours to the updated cross section

with this permit renewal request since this could introduce inconsistencies with the Permit to Construct Application.

In addition to the technical comments listed below, work to address these comments revealed that the Groundwater Monitoring Plan for the C&D landfill area was currently out of date due to work that was completed last year through the Compliance Section to install some additional wells within the newly acquired property. To simplify the Groundwater Monitoring Plan for the entire facility, the Plan was updated to combine the MSW and C&D Monitoring plans and address the changes in the C&D landfill area.

At this time, we believe that the information provided in the responses above, along with the attached documents, appropriately address all technical comments that have been received. The following documents have been enclosed as part of this response:

- Revised Operation Plan, prepared by HHNT, Inc. and dated May, 2015;
- Revised Permit Renewal Plans, prepared by HHNT, Inc. and dated May, 2015;
- Updated Water Quality Monitoring Plan, prepared by Shield Engineering, Inc. and dated May, 2015;
- Updated Gas Monitoring Plan, prepared by Shield Engineering, Inc. and dated May, 2015;
- Report of Gas Monitoring, Second Quarter 2015, prepared by Shield Engineering, Inc. and dated May 19, 2015.

We trust that these revised documents will satisfy the Section's concerns so that the Permit to Operate and Permit to Construct can be renewed for an additional 5 year period.

Should you have any questions, please call.

Sincerely,

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

R. Brant Lane, P.E.
Principal

RBL/lc

Enclosure

cc: Teresa Bradford (w/ electronic enclosure only)
Nina Underwood (w/ electronic enclosure only)
Darren Preslar (w/ enclosure)
Laura Vanhoy (w/ enclosure)

OPERATION PLAN

CITY OF ALBEMARLE LANDFILL
FACILITY PERMIT NO. 84-01
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

MAY 2015

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHEEK 5/21/15

NC. Corp. License No. C-0813

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TABLE OF CONTENTS

1. INTRODUCTION 1
- A. Ownership and Operation 2
- B. Objectives 2
- C. Regulatory Authority 2
- D. Landfill Restrictions 2
- E. Landfill Operator Responsibilities 4
- F. Training 5

2. SITE OPERATION & MAINTENANCE 8
- A. Typical Landfill Equipment 8
- B. Facilities Maintenance 8

3. ANTICIPATED LAND USE DURING POST-CLOSURE 10

4. METHOD OF OPERATION 11
- A. Landfilling/Operations 11
- B. Daily Operations 11
- C. Cell Filling/Stormwater Management 14
- D. Leachate Management 15
- E. Leachate Recirculation 18
- F. Random Inspection Program 21
- G. Waste Solidification 26
- H. Storm Drainage 26
- I. Monitoring 26
- J. Final Grades 27
- K. Seeding 28
- L. Maintenance 28
- M. Fire Hazard 28
- N. Open Burning 29
- O. Fire Prevention 29
- P. Odor Control 29
- Q. Vector Control 29
- R. Insect Control 29
- S. Litter Control 30
- T. Dust Control 30
- U. Landfill Gas Management 30
- V. Access Roads 30
- W. Equipment 30
- X Buildings and Structures 30
- Y. Security 31
- Z. Signs 31
- AA. Phasing and Sequence of Fill 31
- BB. Site Inspections 31

CC. Record Keeping Requirements 31

5. COMPLIANCE WITH THE SEDIMENTATION POLLUTION CONTROL ACT OF 1973 33

6. COMPLIANCE WITH DESIGN REQUIREMENTS 34
A. Compliance with Explosive Gas Requirements 34
B. Compliance with Surface Water Requirements 36
C. Compliance with Ground Water Requirements 36
D. Compliance with Permit Requirements 36

7. OTHER ISSUES 37
A. Borrows Areas 37
B. Storm Debris Storage 37

8. POSI-SHELL COVER SYSTEM AS ALTERNATE DAILY COVER 38
A. Material Description 38
B. Requirements for Alternate Daily Cover 39
C. ADC Material Handling Procedures and Application Process 39
D. Waste Latex Paint Additive 41
E. Staffing Requirements and Training Program 42
F. Contingency Plans 42

9. APPENDIX 43
A. Random Waste Inspection Form
B. Plan of Operation for Fighting Fires
C. Leachate Recirculation Log Form
D. Monthly Leachate Hauling Log Form
E. Site Inspection Form
F. Tire Collection Plan
G. Land Clearing and Yard Waste Debris Plan
H. Residential Leaf Collection Plan
I. White Goods Management Plan
J. Asbestos Waste Shipment Record
K. Posi-Shell Usage Approval Letter
L. Typical Storm Water Diversion Berm Detail
M. Operational Drawings

1. INTRODUCTION

The City of Albemarle Landfills' are located at 40592-B Stony Gap Road (NC State Road 1720) approximately 3.5 miles southeast of the City of Albemarle in Stanly County, North Carolina. This facility includes an active MSW Landfill Facility, an active C&D Landfill Facility, which has been permitted on top of a closed, unlined MSW landfill and an Active Type 1 Compost Facility. In addition, there is a closed, unlined MSW facility currently under post-closure care requirements located at this address. These facilities are owned and operated by the City of Albemarle under Facility Permit No. 84-01. This document serves as the updated Operation Plan for this facility and describes how the facility will be operated on a daily basis.

The Landfill Operation Plan is a document to guide the facility operators in their daily activities. As such, it should be as comprehensive and as up-to-date as possible. The document should be updated during the construction period, Permit renewals, and throughout the facility's operating life. As the Section rules change, revisions should be reflected in the updated document.

This Operation Plan describes how the Facility, Engineering, and Closure Plans prepared for the City of Albemarle Landfill will be implemented during the life of the facility. The plan has been prepared in compliance with Rules .0542, .1625, and .1626 of the North Carolina Solid Waste Management Regulations.

City of Albemarle Landfill will only accept solid wastes from Stanly County. Approximately 31.6 acres of waste footprint consisting of Phase 1 & 2 has been constructed according to Subtitle D requirements. The facility design for Phase 1 consisted of 24 inches of cohesive soil (permeability of 1.0×10^{-7} cm/sec), A 60 mil High Density Polyethylene (HDPE) Liner, A Double Bonded HDPE Drainage Net, 36 inches of Protective Cover over the liner and a leachate collection system which flows to the existing leachate lagoon. The facility design for Phase 2 consisted of 18 inches of cohesive soil (permeability of 1.0×10^{-5} cm/sec) with reinforced geosynthetic clay liner (GCL), a 60 mil High Density Polyethylene (HDPE) liner, a Double Bonded HDPE Drainage Net, 36 inches of protective cover over the liner and a leachate collection system which flows to the existing leachate lagoon.

The perimeter of the lined areas has been marked off by marker posts at approximately 100' intervals to identify the existing edge of liner. Alternative and more visible markers may be used by the Operator at his or her discretion. Solid waste will not be placed within four (4) feet of this boundary to assure that it is being placed directly above the liner system and prevent leachate from flowing outside of the lined area.

Leachate will be treated at the City of Albemarle Wastewater Treatment Plant (WWTP). The leachate will have to be tested according to the Solid Waste Rules and the requirements of the Public Utilities – Water/Sewer Plants Division. Currently, tanker trucks transport the leachate from the lagoon to the treatment plant. In the future there may be a direct force main constructed to pump the leachate to the City of Albemarle sewer system.

The leachate will be pumped out of the leachate lagoon into either tanker trucks or re-circulated into an approved area of the landfill. Approved areas include any area constructed with a regulatory composite liner and leachate collection system as described in Rule .1624. The pumping of leachate will be on an

as needed basis. During wet weather, the pump and hauling may be very intensive until the leachate lagoon levels have been reduced. On the other hand, during dry weather, leachate may not have to be hauled for several days at a time.

Leachate may be re-circulated in the MSW Phase 1 Area only, as outlined in Section 4.E.

A. OWNERSHIP AND OPERATION

Ownership of the facility will be in the name of the City of Albemarle. Operational responsibilities will be handled by the City of Albemarle with address: 144 North Second Street, Albemarle NC 28001, phone (704) 984-9665 and fax (704) 986-6127. Landfill Management will be directed by the City Public Works Director.

The landfill is open to private and public waste haulers and the general public from 7:15 a.m. to 4:30 p.m. Monday through Friday. On Saturday the landfill tipping areas are closed, but the recycling center and convenience area are open from 7:30 a.m. to 12:00 p.m. Holidays are observed surrounding; Thanksgiving, Christmas and New Year's Day and may vary from year to year. These hours may be adjusted to meet unusual circumstances, operational needs, or emergencies.

B. OBJECTIVES

The objectives of the Landfill Operation Plan are to:

1. Protect the environment.
2. Provide the Operator with the intended methodology for operating the
3. Landfill efficiently.
4. Provide information about the site.
5. Provide operational parameters for State review.
6. Appropriately manage leachate at the facility.

C. REGULATORY AUTHORITY

The Division of Waste Management - Solid Waste Section (Section) is the principal permitting and regulatory authority in North Carolina for solid waste management and disposal.

D. LANDFILL RESTRICTIONS

The City of Albemarle Landfill can only accept those solid wastes which it is permitted to receive. The landfill owner or operator shall notify the Section within 24 hours of attempted disposal of any waste the landfill is not permitted to receive, including waste from outside the area the landfill is permitted to serve. A description of wastes which may be disposed of at this facility is included in this document. Also included in this document is a description of the Waste Screening Program for the site and a description of prohibited wastes.

The facility is permitted to receive municipal solid waste and construction and demolition waste from Stanly County, North Carolina. No radioactive waste, hazardous

waste, yard waste, white goods, regulated PCB contaminated waste, regulated medical waste, lead acid batteries, or liquid waste material shall be disposed of in the MSW or C&D landfill sites. Materials which contain free liquid are not allowed in the landfill. Any waste suspected of containing free liquids must be subjected to the "Paint Filter Liquids Test", and any material with free liquids shall not be disposed of in this facility. Any liquid containers five gallons or larger shall be empty, flattened, perforated, or rendered unable to contain liquids before they are accepted at the landfill for disposal.

Asbestos waste that is packaged in accordance with 40 CFR 61, which is adopted by reference in accordance with G.S. 150B-14(c), may be disposed at the facility. In accordance with Section .1626(1),(d), the asbestos waste shall be covered immediately with soil in a manner that will not cause airborne conditions and must be disposed of separate and apart from the other solid waste at the bottom of the working face or in an area not contiguous with other disposal areas. Separate areas shall be clearly designated so that asbestos is not exposed by future land disturbing activities. Copies of 40 CFR Part 61 Subpart M – National Emission Standards for Asbestos will be utilized for guidance.

Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste delivered to the facility should be covered immediately at the MSW Landfill site. This immediate attention will reduce odors and the potential for vector feeding.

Wastewater treatment sludges (or biosolids) may only be accepted for disposal in accordance with the following conditions:

1. Utilized as a soil conditioner and incorporated into or applied onto the vegetative growth layer of the final or intermediate cover, in no case greater than 6" in depth. Installation may require pre-processing or mixing into soil prior to placement as cover. This pre-processing or mixing may be performed over the lined areas of the site.
2. Co-disposed with Municipal Solid Waste since the facility meets the requirements of Rule .1624.

Industrial solid waste means solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of RCRA. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/ foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste, or oil and gas waste.

The operator should utilize the Special Waste Acceptance Protocol for non-MSW type waste acceptance which is located in Section 4 (F) of this Operation Plan.

The City of Albemarle will maintain a Random Inspection Program which has been developed in accordance with North Carolina's Solid Waste Management Regulations, Rule .1626(1)(f). This rule states that Owners/Operators of MSWLFs must implement a program at the facility for detecting and preventing the disposal of hazardous and liquid wastes, except as specifically authorized by the facility permit or by the Section. This program includes:

1. Random inspections of incoming loads unless the owner or operator takes other steps to ensure that incoming loads do not contain regulated hazardous or liquid wastes, or regulated PCB wastes;
2. Records of any inspections;
3. Training of facility personnel to recognize regulated hazardous waste, liquid waste, and PCB wastes; and
4. Development of a contingency plan to properly manage any identified hazardous and/or liquid wastes.

The Random Inspection Program is detailed in Section 4. (F) of this Operation Plan.

E. LANDFILL OPERATOR RESPONSIBILITIES

The landfill operator has the authority and responsibility to accept or reject wastes as he or she deems necessary to comply with requirements of the permit and Section rules. The operator also has the authority to control waste received to ensure that unauthorized, difficult to manage, or prohibited waste will not be disposed of in the landfill. Responsibilities of the Operator are to:

1. Determine whether waste brought to the landfill is to be placed in the landfill,
2. Provide proper maintenance,
3. Provide for satisfactory monitoring
4. Inform the Section within 24 hours of operational problems or violations, and maintain records in accordance with permit requirements and Section rules.

In accordance with NCGS 130A-309.09D, on or before August 1 of each year, the City of Albemarle will report to the Solid Waste Section the amount of waste received in tons at this facility and disposed in the landfill units. Data will be transmitted on forms prescribed by the Section. The report will include the following:

- The reporting period shall be for the previous year beginning July 1 and ending on June 30.
- The amount of waste received and landfilled in tons, compiled on a monthly basis by county or transfer station of origin and by specific waste type if diverted to a specific unit within the permitted facility; and
- The completed report shall be forwarded to the Regional Waste Management Specialist for the facility.

F. TRAINING PROGRAM

INTRODUCTION

The City Of Albemarle owns and operates the City of Albemarle Landfill in Stanly County, North Carolina. The facility includes a closed unlined Municipal Solid Waste (MSW) landfill, an operating Subtitle D MSW Landfill, and an operating Construction and Demolition (C&D) Landfill. This program will provide a guideline for employee training for the operating C&D and MSW landfills. As stated in the facility's Permit to Operate, a responsible individual certified in landfill operations must be on-site during all operating hours of the facility at all times while open for public use to ensure compliance with operational requirements. These individuals must complete an approved operator training course approved by the North Carolina Department of Environment and Natural Resources (NCDENR). The landfill shall comply with this permit requirement at all times.

In addition to the training of the facility operator, other employees at the landfill must receive training to ensure complete facility compliance with NCDENR solid waste rules and statutes. This program will provide a plan and schedule for the training and education of landfill employees. This program will not apply to laborers or daily help assigned to specific tasks on the landfill for a temporary basis. The program will be administered to all equipment operators and assistant managers responsible for the day to day operations of the landfill.

LANDFILL OPERATIONS TRAINING

Employee training will be conducted by a Certified Landfill Manager and/or Certified Landfill Operations Specialist. Specific training on issues such as erosion control or alternate daily cover may be conducted by an outside specialist upon approval by the landfill manager.

The training of all new employees will be conducted within the two months of the employee's hire date. Additionally, each employee shall be required to read or familiarize themselves with the facility operation plan and section 15A NCAC 13B.1626 of the solid waste rules. This requirement will be a condition of employment and a signed statement by each employee will be maintained in the facility operating record.

CONTENT OF TRAINING

At a minimum, landfill operations training will include the items in this program. Training will include a combination of classroom instruction and field demonstrations. A summary of suggested training topics and general content is described below:

1. Landfill Design – Provide a discussion of basic landfill design principles including groundwater separation, landfill composite liner system, leachate collection and treatment, and landfill cap requirements and closure. The facility design plans will be reviewed and discussed.

2. Access Roads – Discuss requirements for safe all weather access to the working face of the landfill.

3. Storm Water Management – Discuss the procedures for proper storm water management and separation of storm water and leachate. Training shall include direction on storm water run-on, run-off, and minimizing leachate generation. Review the storm water management features of the landfill such as diversion berms, roadside ditches and sediment basins. Review details of these structures in the facility design plans.

4. Working Face Operations – Review the proper techniques for spreading and compaction of waste. This training, which will be conducted in the field, shall also include instruction on maintaining a small working face and daily or weekly covering of waste. Discuss the function of disease control, vector control, insect control, and odor control.

5. Alternate Daily Cover – Provide specific training for each alternate daily cover. This training may be supplemented with instruction from a supplier of the alternate daily cover material.

6. Litter Control – Discuss controls and procedures for management of litter on site.

7. Unacceptable Waste – Provide instruction and training on the types of waste allowed at the facility and the identification of unacceptable and prohibited waste. Give direction on the management of unacceptable waste discovered on site.

8. Random Inspection – Provide training on the random inspection program and waste screening plan.

9. Leachate Management – Provide training on the leachate collection system design and operation. Include instruction on leachate level measurements, leachate pipe inspections, measures to prevent clogging and damage to the collection system, and measures to prevent leachate releases.

10. Leachate Outbreaks – Provide instruction on the identification of leachate outbreaks and the leachate outbreak inspection procedures. Discuss the management techniques used on leachate outbreaks and provide procedures to follow if a leachate outbreak is expected or discovered.

11. Landfill Gas Control – Provide instruction on monitoring of subsurface gas migration. Specific instruction on management of landfill gas extraction systems shall be provided if necessary. Provide direction on the maintenance of methane gas monitoring locations.

12. Groundwater Monitoring System – Provide instruction on the access maintenance to groundwater monitoring wells.

13. Intermediate Cover – Discuss the schedule and procedures for installation of intermediate cover.

14. Special Waste – Identify special wastes that are accepted at landfill and procedures for characterization, handling, recordkeeping, and disposal. The discussion shall include asbestos, spoiled foods, animal carcasses, hatchery waste, abattoir waste, sludge, and industrial waste.

15. Filling Sequence – Provide direction on the proper filling of landfill cells and the management of storm water to minimize leachate generation.

16. Erosion Control – Provide training on installation of best management practices on site.

17. Dust Control – Provide instruction on the proper dust control procedures.

18. Fire Prevention – Discuss operational procedures to control fires.

19. Equipment – Provide specific instruction on the operation, maintenance and safe operation of all pieces of equipment the employee will be operating. As job responsibilities change, the employee shall receive training on new equipment. Training shall include direction on the daily equipment inspections and checklists.

20. Security and Traffic – Instruct the employee on site security, access control and traffic flow within the facility. Identify the proper location for signage to maintain safe and efficient waste unloading and operations.

Additional training topics may be added as new landfill equipment or procedures are added.

ANNUAL REFRESHER TRAINING

- As a requirement of continued employment, all landfill employees must participate annually in a review of the landfill Operation Plan and receive refresher training on the content of this training program.

RECORDKEEPING

- A record of all training events will be documented and filed in the landfill operating record.

2. SITE OPERATION & MAINTENANCE

A. TYPICAL LANDFILL EQUIPMENT

Operation and maintenance of the site will be the responsibility of the landfill Manager. Typical heavy equipment available is as follows:

1. An Excavator with an off-road haul truck
2. Water Truck or Water Wagon
3. Farm Tractor and Mower
4. Steel Wheel Compactors
5. Dozers
6. Pick-up Trucks
7. Posi-Shell Application Equipment (optional)

Alternate equivalent equipment will be allowed to conduct landfill operations. Other equipment will be purchased or rented as required for the facility operations.

B. FACILITIES MAINTENANCE

The following is a list of maintenance duties of the operator:

1. Maintain paved, graveled, and temporary roads in and to landfill operations to ensure safe and unencumbered movement of traffic.

2. Maintain condition, visibility, and integrity of informational signs.

3. Maintain physical barriers to discourage unauthorized entry onto landfill property by unauthorized vehicles.

4. Maintain slopes by filling and (re)establishing vegetative cover to prevent erosion and/or exposure of refuse.

5. Maintain grassed areas.

6. Maintain drainage features such as swales, stormwater conveyance channels, and slope drains to ensure efficient management of stormwater.

7. Maintain site in a sanitary condition.

8. Maintain windscreens and keep blown litter from leaving site by frequent policing efforts within the landfill and on adjacent property.

9. Maintain effective rodent and vector control measures.

10. Maintain communication with fire department personnel and establish a plan of operations for fighting fires.

11. Maintain and protect landfill cells and embankments against erosion and damage.

12. Maintain (regrade subsided) or settlement fill areas.

13. Maintain sediment storage volume of sediment basins.

14. Maintain the landfill scales.

15. Maintain and operate the leachate management system.

16. Maintain appropriate records and operations demonstrations.

17. Use temporary control measures to prevent stormwater from contacting the waste and becoming leachate.

18. Maintain support facilities.

19. Maintain the landfill gas system (if implemented).

20. Maintain wetland boundaries and stream buffers.

3. ANTICIPATED LAND USE DURING POST-CLOSURE

After completion of the landfill, the projected land use will be to return the land to greenway and to woodlands, grasslands, or wetlands elsewhere on the property. The final closure will be completed to reduce maintenance during the post-closure care period. All areas of the closed site will be vegetated to reduce the long term potential of erosion. Any post-closure uses of the property must be approved by the Section.

4. METHOD OF OPERATION - MSW LANDFILL

A. LANDFILLING/OPERATIONS

The landfilling operation will be comprised of solid waste being deposited on the working face of the landfill. Steel wheel compactors or equivalent machinery will be used to obtain maximum compaction of the waste by compacting at 2 - 6' depths of waste at a time, and by confining the area to be compacted daily. The exception to this is the first lift which will be installed approximately 6' deep with limited steel wheel compaction. This initial 6' lift (known as a fluff lift) will generally be placed with dozers since this greatly reduces the risk of damage to the liner system. Once fill reaches approximately 6', steel wheel compactors will be used to place and compact the waste. If the working face is confined to a minimum area on a daily basis, this will economize the amount of daily cover or alternative daily cover (ADC) required.

Per North Carolina State Regulations for MSW Landfills, a daily cover of 6" of compacted soil or an approved alternative daily cover must be placed on top of the daily landfill operation to protect the landfilled garbage from exposure to rain and becoming windborne, and to prevent rodent and insect propagation or infestation. Once an area of the landfill is complete, that is, achieves final grades, a cover system (cap) will be placed as final cover and this will be seeded and stabilized.

Per NC State Regulations for C&D Landfills, a cover of 6” of compacted soil or an approved alternate cover material must be placed when the waste disposal area exceeds ½ acre and at least weekly. A notation of the date and time of cover placement must be recorded in the operating record. Areas which will not have additional waste placed on them for 3 months or more, but where final termination of disposal operations has not occurred must be covered and stabilized with vegetative ground cover or other stabilizing material. A sequence or phasing of the filling operations and final cover (cap) cross-sections are indicated in the Engineering Plans.

The sequence of waste filling may be adjusted as needed to comply with the storm water diversion berm (rain flap) locations. In general, the areas below the rain flaps will be filled until positive drainage above the landfill perimeter berm is achieved. This procedure will minimize leachate production within the landfill.

B. DAILY OPERATIONS

1. Placement of solid waste will begin in the initial fill area of the landfill.

2. Wastes should be kept to the minimum surface area possible and compacted via numerous passes of the steel-wheel compactor. Surface area (active landfill area) should be kept to a minimum for two reasons: (1) to minimize the amount of daily cover soils or ADC needed and, (2) to maximize the amount of waste (not soils) being placed; thereby, increasing the life of the landfill.

Waste placed along the permanent outer edge of the cell shall be no closer than 4' to this edge of liner. By stopping at the inside edge of the perimeter berm, the operator will be placing waste no closer than 4' from the permanent edge of liner.

After the first lift is in place, compaction berms may be installed at the outer edge. Trucks will unload their waste at the working face. The waste will be compacted against the compaction berm and up the working face. These outside compaction berms will serve several purposes:

a. The small berms give the operator guidance on where to place waste to ensure that the outside slope can be constructed quickly and accurately and,
b. The small berms give the operator a structure to compact against, keeping him from pushing waste out and over the outer slope of the landfill.

It is the intent (to the extent that safe operations on a sloped surface allow) that an area be brought to the maximum elevation possible before moving landfilling operations into an adjacent area. Further, it is intended that final contours be achieved as early as possible so as to direct run-off of storm water away from the working area.

Sequencing of areas in the proper order is necessary to manage the storm water.

3. It is important to remember that decaying wastes will generate both leachate and methane (landfill gas). Methane is an explosive gas which is lighter than air and thus can be trapped underneath structures and equipment. The operator should have the landfill boundaries and structures tested for methane gas concentrations at least quarterly and instruct all personnel in its dangers. Methane is a component of landfill gas that is odorless and thus cannot be detected except by proper equipment.

   Gas Monitoring procedures and probe locations are discussed in detail in Section 6 of this plan.

   Equipment: A portable combustible gas monitor, measuring the concentration of combustible gases in units of percent of lower explosive limit, shall be used to conduct gas monitoring. Lower explosive limit (LEL) means the lowest percent by volume of a mixture of combustible gas in air that will propagate a flame at 25 degrees Celsius and atmospheric pressure. The gas monitor shall be calibrated to methane using the manufacturer's calibration kit and procedure before the monitoring activities begin.

Response to Landfill Gas Exceedances

The regulatory maximum levels for explosive gas are the LEL at the facility boundary and 25% LEL in on-site structures. At a minimum, the following actions will be taken if methane gas levels exceed those standards:

1. The Section will be notified immediately;
2. Immediate steps necessary to protect human health will be identified and implemented. If the limit in structures is exceeded, these will include:
   - Elimination of smoking materials and all ignition sources
   - Evacuation of all personnel
   - Ventilation of the structure
   - Personnel will not be allowed to re-enter the building except to perform gas monitoring until the results of additional monitoring indicate that methane concentrations are stabilized below 25% LEL
   - Assessing the origin and pathways of the gas migration

Within seven days of detection, the monitoring results will be placed in the facility operating record, and the City of Albemarle will indicate actions taken and actions proposed to resolve the problem. Within 60 days of detection, the City of Albemarle will develop and implement a landfill gas remediation plan for the combustible gas releases, place a copy of the plan in the facility operating record, and notify the Section that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

4. Daily cover soil for operations will be obtained from the future cell areas or other approved borrow areas.

The operator may also choose to use alternative daily cover (ADC) for either MSW or C&D landfill areas. Alternative cover will not be allowed in place of intermediate or final cover. Use of alternative daily cover will be specified in the permit and may be subject to the Section's approval. Currently at this facility, tarps and Posi-Shell are approved for use as alternate daily cover (ADC). The site may use additional alternative daily covers such as, petroleum contaminated soil (PCS), yard waste type compost/mulch, automotive shredder residue (ASR), foam, shredded wood, crushed gypsum, C&D fines, foundry sand, paper pulp sludge, and alum sludge, in the future. Prior to incorporating any of these additional ADC's, proper notification will be provided to the Section in accordance with the Rules and NC DENR's Approved ADC Material Guidance Document.

ADC is intended to reduce the facility's reliance on soil cover and to reduce the air space consumption by daily soil cover. However, should the ADC prove

unsuccessful, the daily cover consisting of a minimum of 6" of soil must be utilized.

Alternative covers may be approved by the Section if the owner or operator demonstrates that the alternative material and thickness control disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment or if the Owner implements the proposed ADC material in accordance with the NC DENR guidance document.

City of Albemarle may utilize tarps as described below.

- If a tarp ADC is used, the cover shall be deployed over the deposited solid waste at the end of each day by pulling the cover into position by the available heavy equipment and anchoring in place. The tarp is approximately 100 feet by 100 feet in size and is equipped with a chain and plate system that anchors the tarp in place once it is in position. It can be easily placed by the available personnel and equipment. Additional smaller tarps may also be used in conjunction with larger tarp. Smaller tarps will be anchored in place by placing soil over the corners of the fabric. Prior to depositing solid waste the next working day, the tarps will be pulled from the waste with the available heavy equipment and stored in accordance with the manufacturer's recommendation.
- When Posi-shell ADC is used, the Posi-shell cover shall be placed in accordance with prior approved demonstration as stated in the approved Permit and summarized in Section 8 of this Plan. In addition, in accordance with the Section's approval and based on observations of the SWS Staff, the manner in which the facility applies Posi-shell does not meet the protocol of needing to apply soil cover every five days due to the fact that the facility covers waste with more waste, additional Posi-shell material, or a tarping system.

When weather and soil conditions so dictate, daily cover soils are available from the stockpiles. The operator should replenish depleted stockpiles by excavating from the future cell areas or permitted borrow areas to the limits indicated.

5. It will be necessary for operators to grade, repair and smooth the landfill surface as needed and to capture and replace soils that may have migrated to the surface drainage features or sediment basins and traps. These materials may be stockpiled, allowed to drain and utilized for daily cover.

C. CELL FILLING/STORM WATER MANAGEMENT

The landfill cells will be typically filled from the lower elevations toward the upper elevations in initial lifts of approximately 6'. No steel wheel compaction equipment shall be placed in the landfill cell until there is an 6' (plus or minus) mat of waste in that portion of the cell. Care shall be used to assure that the material placed in this initial lift will not be capable of penetrating the 36" of protective cover over the liner.

Penetration of waste through this protective cover could damage the FML liner component.

The operator must use extreme care in managing the initial cell filling. In the area of the cell above the waste being placed in an initial lift, the operator has installed storm water rain flaps to prevent storm water from flowing onto the cell area being filled.

Storm water above each of these rain flaps shall either be diverted, or pumped from the cell. Once this initial lift of waste is in place with an intermediate layer of soil, gravity drainage on top of the intermediate cover will be used.

The storm water rain flaps will be removed as the waste filling progresses to their location. Removal of all storm water rain flaps will be documented by a certified landfill manager and included in the facility operating record. In addition to their removal, the leachate collection pipe shall be connected to drain the leachate from that next portion of the cell.

As a rule, any water that directly contacts waste will be defined as leachate. Any water that is diverted away from the waste, and does not contact any waste, is defined as storm water. Leachate will be managed in the leachate management system and storm water shall be directed to the storm water management system.

In addition, temporary geotextiles used to cover the gravel column surrounding the perforated leachate collection lines must be removed as waste filling progresses. Removal of all temporary fabric will be documented by a certified landfill manager and included in the facility operating record.

D. LEACHATE MANAGEMENT

Leachate is the liquid waste generated as storm water passes through the landfill waste mass. In the landfill, this leachate is collected by a system of perforated pipes and sand, gravel, geonet drainage media, or other permeable media on top of the base liner system. Leachate will flow by gravity to a leachate sump where it will gravity drain in a solid pipe through the composite liner system and into the leachate storage lagoon. Leachate will be stored in the lagoon until it is periodically transported to an acceptable treatment facility, or is re-circulated in accordance with this Plan onto the approved Phase 1 lined areas.

The chemical composition of untreated leachate generated will be analyzed, at a minimum, semi-annually. The leachate samples will be collected from the leachate storage lagoon and shall be analyzed for the Detection Monitoring constituents (EPA Appendix I list for Detection Monitoring as incorporated by reference in Rule.1633), as well as pH, specific conductance, BOD, COD, phosphate, nitrate, sulfate. Test results will be submitted to the Section. Any Additional testing as may be required by the City's Public Utilities – Water/Sewer Plants Division will also be conducted.

All future leachate collection lines after Phase 2 shall be designed and constructed to permanently allow cleaning and remote camera inspection. Remote camera inspections of the leachate collection lines shall occur upon completion of the construction and at

least once every 5 years thereafter until such time as may be determined by the Section that camera inspections are no longer necessary. Cleaning and periodic maintenance of all readily accessible leachate collection lines will be conducted as necessary for proper functioning and to address buildup of leachate over the liner.

The leachate lagoon will be inspected after each cleaning to evaluate the amount of debris flushed from the leachate pipes. The lagoon will be cleaned as needed. Unnecessary cleaning of the leachate lagoon is discouraged to prevent potential damage to the liner system. The dislodged material and associated cleaning water shall be disposed of properly.

The operations of the leachate storage lagoon shall include the following:

1. Removal of leachate from the storage lagoon shall be a continuous activity and shall begin as soon as a pumpable quantity is present in the lagoon.

2. Should the leachate volume in the lagoon exceed 50% of the capacity of the lagoon during normal operations, the operator should utilize additional measures to expedite removal of the leachate.

3. Unless other provisions are made, all leachate shall be transported to an approved wastewater treatment facility, or it shall be recirculated (as allowable) into the waste mass.

4. The leachate lagoon will be inspected on a monthly basis and a report generated and placed in the landfill operating record. The report will include the date the liner was inspected, the inspector, general observations since the last inspection, visible abrasions, possible stress cracks, or obvious punctures. Stress cracks can occur in wrinkles that are generated from heat expansion or contraction due to freezing. Also, the HDPE liner may deteriorate due to ultra violet light and this can appear as an abrasion where material can be scrapped away with a hard object. If any damage or possible weak spots due to ultra violet exposure has been detected, a qualified HDPE installation company shall be notified immediately so that a repair patch can be installed. The leachate level shall not be allowed to exceed the depth of the damaged liner until it has been repaired and tested by the liner installation company. Once this has been accomplished all testing documentation shall be placed in the operating record.

5. Records shall be maintained by the landfill operator of the following:

    a. Daily volume of leachate pumped from the lagoon
    b. Daily volume of leachate re-circulated (as allowable) into the waste mass
    c. Analytical records of leachate quality
    d. Monthly inspections of the leachate lagoon liner
    e. Leachate level in the lagoon
    f. Records of any equipment breakdowns

g. Maintenance records

6. Daily records shall be maintained on the Monthly Leachate Hauling Log Form included in the Appendix of this Plan.

Special attention should be given to managing rainfall events to reduce, as much as possible, the surge volumes caused by these events.

The current open area of Phase II is approximately 7.5 acres. The facility has incorporated HDPE storm water diversion berms (rain flaps) to completely divert and segregate storm water from leachate. A detail of the existing storm water diversion berms (rain flaps) is included in the appendix of this document. The storm water diversion berms (rain flaps) divide Phase II into maximum three (3) acre subcells. However, the exact subcell size may vary based on existing field conditions.

In addition, the City of Albemarle will utilize commercial handlers of industrial wastewater for the treatment of any surge volumes, if the need arises.

Areas of special attention by the landfill operator include:

1. Maintain the cell internal storm water rain flaps to assure segregation of storm water from the leachate. The operator should use reasonable measures to minimize leachate generation throughout the landfill operating life.

2. Maintain cross slope and surface drainage on the landfill top to promote run-off of storm water. Any storm water that can be drained from the daily/intermediate cover surface above the waste will not contribute to the leachate generation.

3. Pump off storm water in the cell that is segregated from contact with the waste fill area.

4. Inspect the leachate storage lagoon. Continually remove leachate from the lagoon

5. Remove all or portions of daily and intermediate soil cover in between vertical lifts of waste to discourage horizontal migration of leachate between waste lifts. This will minimize the likelihood of leachate outbreaks from the waste mass.

In the event a leachate outbreak is discovered in any MSW or C&D waste disposal areas, the landfill manager will be notified and **immediate containment measures shall be implemented**. The containment measures may include excavating the outbreak area to allow downward migration of leachate and remove barriers causing the lateral leachate flow, sealing the outbreak area with cohesive soil, or containing the leachate in a temporary soil berm and pumping into a leachate hauling truck for proper disposal. The landfill manager will observe the outbreak area and determine the appropriate response to correct the outbreak. The facilities response may include a combination of

the measures discussed above or any other action needed to contain the leachate and protect the environment.

With aggressive leachate management activities by the operations personnel, storm water surges caused by rainfall events as great as the 25 year rainfall event can be handled by the system. Contingency for events that potentially exceed this event include establishing a relationship with a commercial wastewater handler for potential surge volumes of leachate.

Should this contingency plan ever be activated, records should be kept documenting all activities related to the event. These should be maintained in the facility operating record of the site.

E. LEACHATE RECIRCULATION

1. The following conditions will be met and followed by the City of Albemarle prior to and during the leachate recirculation. **It should be noted that recirculation may only be utilized over Phase 1 which was constructed with a regulatory composite liner and leachate collection system as described in Rule .1624.**

    a. Rain gauge and thermometer:

    A rain gauge and thermometer will be installed near the landfill office. These instruments will be read daily at the start of business. The amount of rainfall and temperature will be recorded on daily logs for the operating record.

    b. Base line sampling of leachate:

    The base line sampling of the leachate has been performed. This sampling and testing will continue on a semi-annual basis. The reports will be kept on file at the landfill office in the Facility Operating Record.

    c. Operational procedures:

    Recirculation will be accomplished by pump and haul with a tanker truck equipped with a distributor bar and hose with spray nozzle or pumped via force main to the top of the landfill. The tanker truck will load at the leachate storage lagoon, haul the leachate to the designated areas and distribute the leachate in a series of passes with the truck or sweeps with the nozzle.

    Leachate will only be recirculated over composite liner systems having a 2' thick clay liner with permeability $< 1x10^{-7}$ cm/sec, a minimum of 60 mil FML liner. Leachate recirculation will not be allowed over alternate liner systems unless specifically approved by the Section.

i. The procedures to be used are as follows:

a. Determine if conditions are suitable for recirculation by inspecting the designated areas. They should have compacted waste a minimum of 15' deep. In addition, leachate shall not be recirculated if appreciable rainfall has occurred during the previous 24 hours or if the temperature is below freezing.

b. Calculate the volume of leachate that the waste mass can accept. Based on the area of waste available, calculate the leachate volume at five gallons per square foot of waste available. Check the operation of all pumps and valves on the truck prior to filling.

c. Record the volume and method of leachate being recirculated into the landfill on the Leachate Recirculation Log Form. A copy of this form may be found in the Appendix of this Operation Plan.

d. Distribute the leachate in uniform passes with the truck across the designated areas or use the hose and nozzle to distribute the leachate in uniform sweeps across the surface. Concentrated applications shall be avoided and no runoff will be allowed. Discharge outside the cell will not be allowed under any circumstances.

ii. Complete the Leachate Recirculation Log Form and make notes of problems or corrections needed. (Copies of these logs will also be maintained on-site for review by the Section.)

iii. The recirculation system and the area in which leachate is being recirculated will be inspected daily during recirculation operations to check for excess leachate concentrations, leachate run-off, or blow-outs. Results of these inspections will be recorded and maintained in the Facility Operating Record and the Leachate Recirculation Log Form.

iv. Should run-off or side seepage be noticed, leachate recirculation will be ceased. Discharge of leachate outside the cell will not be allowed in any circumstances. If any seepage is observed, one option for remediating will be covering and compacting with 12" of soil. All remedial activities will be recorded and placed in the Facility Operating Record.

Recirculation will primarily be accomplished by direct application using the procedures described above. Additional recirculation

methods including irrigation, spray application on the working face, and injection via subsurface infiltration trenches may be conducted upon the Section's approval.

Recirculation rates shall vary based on season and recent precipitation rates. Leachate will only be recirculated over cells with the composite liner systems having a 2' thick compacted clay liner with a maximum permeability of $1x10^{-7}$ cm/sec and a minimum of 60 mil FML. Leachate recirculation will not be allowed over alternate liner systems unless specifically approved by the Section.

d. Equipment Required:

The facility will use a combination of towable tanks and truck mounted units equipped with holding tanks, centrifugal pumps, hoses, and nozzles to conduct leachate recirculation activities.

e. Recordkeeping Forms:

Logs will be maintained for leachate production and leachate recirculation. These logs will be kept in the Facility Operating Record for review by the Section.

i. Daily/weekly record of leachate generated.

Daily, the volume of leachate in the leachate storage lagoon will be recorded on the leachate log. The leachate log will be made part of the Facility Operating Record.

ii. Daily/weekly record of leachate recirculated.

Daily, the volume of leachate recirculated will be recorded on the leachate log. The leachate log will be made part of the Facility Operating Record.

iii. Weather conditions and other pertinent daily information.

Daily, the weather conditions along with any other data pertinent to leachate recirculation will be recorded on the leachate log.

f. Log for reporting operating or other unusual problems:

A log will be kept for reporting operating or any other unusual problems for leachate recirculation. All actions taken to remediate any problems due to leachate recirculation will be documented and recorded in the Facility Operating Record. A trained landfill

operator will be responsible for overseeing the leachate recirculation operation.

g. Other forms or procedures, etc. that owner/operators will use:

Any additional forms or procedures (as required) not found in this plan will be maintained in the Facility Operating Record.

2. The City of Albemarle will follow these additional operational conditions during leachate recirculation:

a. Records will be kept on a daily/weekly basis and will be maintained in the Facility Operating Record.

b. No leachate will be recirculated when it is raining, or when the waste is too wet.

c. Odors will be controlled. Should odors be present at levels determined undesirable by the facility Operator, leachate recirculation will cease.

d. Leachate will be recirculated during daylight hours only.

e. The application system will be properly maintained and documented. All records dealing with the application system will be maintained in the Facility Operating Record.

F. RANDOM INSPECTION PROGRAM

The landfill facility has permitted municipal solid waste and construction and demolition landfills and as such must not receive regulated hazardous or nuclear wastes. It is important that such wastes not enter the facility because of the potential damage and liability these wastes could cause should they enter the environment.

Random inspection of vehicles will be conducted on a regular basis. The selection must be at a frequency of at least one percent of the weekly traffic. The frequency of random inspections may be increased at the Landfill Manager's discretion. The personnel conducting the inspection will randomly select the load at the working face of the landfill and the inspection will be completed in a designated area near the working face. A random truck and time will be selected (for example, the second load after 8:00 a.m.). In addition, any suspicious load shall be inspected.

Results of random inspections shall be recorded; report forms are included in the Appendix. One form shall be completed for each inspection. All reports and resulting correspondence are to be maintained in the City of Albemarle facility operating record

for the life of the landfill and during the post-closure period. The presence of any regulated hazardous, liquid or regulated PCB wastes or otherwise prohibited wastes identified during random inspections shall be reported to the Section. Inspections shall include truck identification, driver's name, source of material(s) if possible, or route and what, if any, prohibited material(s) were included. If none were observed, or only normal quantities of household hazardous waste, this too should be logged.

The following wastes are prohibited from disposal at the MSWLF:

1. Hazardous waste as defined within 15A NCAC 13A, to also include hazardous waste from conditionally exempt small quantity generators.

2. Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761.
3. Bulk or non-containerized liquid waste will not be placed in the landfill unless:

    - The waste is household waste other than septic waste and waste oil
    - The waste is leachate or gas condensate derived from the landfill.

4. White Goods, Yard Waste, Tires.

5. Containers holding liquid wastes will not be placed in the landfill unless:

    - The container is a small container similar in size to that normally found in household waste
    - The container is designed to hold liquids for use other than storage
    - The waste is household waste

6. For the purpose of this paragraph:

    - Liquid waste means any waste material that is determined to contain "free liquids" as defined by Method 9095 (Paint Filter Liquids Test), S. W. 846.

The following wastes are prohibited from disposal at the C&D landfill:

1. Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure that no liquid, hazardous or municipal solid waste is contained therein,

2. Garbage as defined in G.S. 130A-290(a)(7),

3. Hazardous waste as defined in 130A-290(a)(8), to also include hazardous waste from conditionally exempt small quantity generators,

4. Industrial solid waste unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A),

5. Liquid wastes,

6. Medical waste as defined in G.S. 130A-290(a)(18),

7. Municipal solid waste as defined in G.S. 130A-290(a)(18a)

8. Polychlorinated biphenyls (PCB) waste as defined in 40 CFR 761,

9. Radioactive waste as defined in G.S. 104E-5(14),

10. Septage as defined in G.S. 130A-290(a)(32),

11. Sludge as defined in G.S. 130A-290(a)(34),

12. Special waste as defined in G.S. 130A-290(a)(40),

13. White goods as defined in G.S. 130A-290(a)(44), and

14. Yard trash as defined in G.S. 130A-290(a)(45),

15. The following wastes cannot be received if separate from C&D landfill waste: lamps or bulbs including but not limited to halogen, incandescent, neon, or fluorescent; lighting ballast or fixtures; thermostats and light switches; batteries including but not limited to those from exit and emergency lights and smoke detectors lead pipes, lead roof flashing; transformers; capacitors; and copper chrome arsenate (CCA) and creosote treated woods.

16. Waste accepted for disposal in a C&D landfill unit must be readily identifiable as C&D waste and must not have been shredded, pulverized, or processed to such an extent that the composition of the original waste cannot be readily ascertained except as specified in Subparagraph (17) of this Paragraph.

17. C&D waste that has been shredded, pulverized or otherwise processed may be accepted for disposal from a facility that has received a permit from an authorized regulatory authority which specifies such activities are inspected by authority, and whose primary purpose is recycling and reuse of the C&D material. A waste screening plan and waste acceptance plan must be made available to the Division upon request.

18. The owner or operator of a C&D LF must not knowingly dispose any type or form of C&D waste that is generated within the boundaries of a unit of local government that by ordinance:

    A. Prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste

    B. Requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

Hazardous wastes are those materials with characteristics, either physical or chemical, that could cause harm to health or the environment. A waste is hazardous if it is:

- Ignitable

- Corrosive
- Reactive
- Toxic (As defined by the TCLP test procedure)
- Is a listed hazardous waste

A waste material is ignitable if it has a flash point of 140 degrees F or less, causes fire by friction under normal conditions, or is an oxidizer. Examples of ignitable waste include solvents, bottom material from solvent recovery, and peroxide. This waste is typically generated by automobile repair shops, machine shops, dry cleaners, and industry. A waste is corrosive if the pH is 2 or less, or 12.5 or greater. An example of corrosive waste is spent pickle liquor from a metal plating operation or battery acid. A waste is reactive if it is unstable under normal conditions, reacts violently with water, forms an explosive mixture with water, contains any quantity of cyanide, contains sulfur which could be released to the atmosphere, or can be easily detonated or exploded. Waste from certain chemical operations, munitions works, or fertilizer plants can be reactive. A waste is toxic if it so tests by the TCLP procedure. The TCLP test stands for the Toxic Characteristics Leaching Procedure. For this test, a leachate is removed from the waste and this leachate is analyzed for specific constituents as listed in the Code of Federal Regulations, Chapter 40. If a waste checks toxic, then the waste is hazardous based on the TCLP test. Toxic materials can cause cancer, birth defects, or illness if released to the environment. Examples of toxic waste include solvents, industrial process sludges, emission control wastes. A waste is characterized as a listed waste if it is listed in the Code of Federal Regulations, Chapter 40 or any amendments of this document. A typical listed waste is one in which the known characteristics of that material will likely endanger the health or environment. The exhaustive list of hazardous waste is in the Part 261, of Chapter 40 of the Code of Federal Regulations.

Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste delivered to the disposal site will be covered immediately.

Asbestos waste will be accepted. The waste will be put in a hole dug out of the existing waste and buried immediately. A 24 hour notice will be given to the Landfill before any asbestos arrives, records will be kept as to whom and type of asbestos buried.

Wastewater treatment sludges may be accepted either as a soil conditioner incorporated into, or applied onto the vegetative growth layer of MSW, C&D, or closed landfill sideslopes to promote vegetative growth. In no case shall it be applied greater than six inches in depth. Waste water treatment sludges may also be co-disposed in the lined landfill areas.

Inspections will be carried out and supervised by landfill staff trained to identify and manage hazardous and liquid waste. Landfill operators responsible for screening waste are trained in waste screening.

The following action plan required by Rule .1626(1)(f)(iv) addresses identification, removal, storage, and final disposition of wastes, and details the procedure for conducting random waste inspections.

1. Stop the selected vehicle prior to the working face of the landfill.

2. Notify the driver of the inspection. Direct the vehicle to the inspection area. The inspection area may be either a permanently designated location or a temporary location adjacent to the working face.

3. If possible, perform a visual observation of the waste prior to unloading. If unauthorized waste is observed, or suspected, the vehicle shall be prohibited from unloading, and shall be directed out of the facility.

4. If no unauthorized waste is observed or suspected from the visual observation, or if a visual observation is not possible, the vehicle shall discharge the load at the inspection area. The driver shall remain at the inspection area while the inspection is performed, unless a safety concern requires evacuation of the area. Equipment shall spread and turn the waste to facilitate a visual observation of the load contents. If no unauthorized waste is identified, the waste shall be transferred to the working face for disposal.

5. If unauthorized waste is identified in the load, and the unauthorized waste is not a regulated hazardous waste, a regulated medical waste, a regulated nuclear waste, or a waste which requires special handling, the waste shall be loaded back into the vehicle and removed from the facility.

6. If acceptability of the waste cannot be determined by visual observation, the waste can either be rejected and loaded back into the vehicle and removed from the facility, or samples of the waste can be taken to determine acceptability. Testing shall be selected based on the reason for the suspicion of unacceptability.

7. Unauthorized wastes suspected of being a regulated hazardous waste, a regulated medical waste, or a regulated nuclear waste shall be managed in accordance with all applicable federal, state and local regulations. The City of Albemarle will contact the proper authorities if any of the above prohibited wastes are received at the facility. This includes the Section, County Emergency Personnel and the local HAZMAT by calling 911. In addition, responsible parties will be notified of all rejected loads, if possible.

<u>Special Waste Acceptance Protocol</u>

For those generators or haulers with waste which they are unsure of, the facility will use a protocol for testing those wastes. This particular protocol is to be used for all industrial waste and contaminated soil. The protocol includes:

1. Perform the hazardous characteristics tests for ignitability, reactivity, corrosivity, and toxicity.
2. Test the material for PCB, TPH, and pH.

3. Report all testing to the Operator in original form signed by the Laboratory Principal.
4. Provide a certification by a North Carolina Professional Engineer or a CHMM that the test results represent the waste mass.
5. Identify the waste generator and provide a complete description of the waste.
6. Provide a certification from the generator, and a North Carolina Professional Engineer stating the waste is Non-Hazardous.
7. Provide estimates of waste volumes.

The Operator will review this data and either approve or disapprove prior to waste being transported to the landfill.

G. WASTE SOLIDIFICATION

The Operator may choose to implement a Waste Solidification process at this facility at some time in the future. This operation will be specified in the Permit to Operate and is subject to the Sections approval.

H. STORM DRAINAGE

The landfill is surrounded by an earthen berm, stormwater conveyance channels, and other diversions that prohibit storm water run-on into the landfill area. Storm water diversion berms and downdrain pipes will be installed to manage storm water that falls within the landfill footprint and direct storm water flow to a sediment basin (storm water management basin). The sediment basins are used for final trapping and settlement of sediment. As an area's operations progress, the back surfaces should be sloped away from the active (working) face of the landfill to minimize the amount of storm water flowing into the active cell and thus minimize the potential for leachate generation.

Care should always be used to assure that storm water and leachate do not mix. In cases where they mix, the entire volume of mixed water must be treated as leachate. The operator may use temporary devices such as berms, storm water conveyance channels, etc. to divert surface water away from the working face to avoid leachate generation.

I. MONITORING

1. Groundwater and Surface Water Monitoring

   Ground and surface water will be sampled and analyzed according to Subtitle D Appendix I detection monitoring requirements. The monitoring frequency for all Appendix I detection monitoring constituents will be at least semiannual during the life of the facility including the closure and the post-closure period. A minimum of four independent samples from each well (background and downgradient) will be collected and analyzed for the Appendix I constituents during the first semiannual sampling event. At least one sample from each well (background and downgradient) will be collected and analyzed during subsequent semiannual sampling events.

If the City of Albemarle determines that there is a statistically significant increase over background for one or more of the constituents listed in Appendix I at any monitoring well at the relevant point of compliance, the City will, within 14 days of the finding, report to the Division of Solid Waste and place a notice in the facility operating record indicating which constituents have shown statistically significant changes from background levels. The City will establish an assessment monitoring program within 90 days. The City may demonstrate that a source other than the landfill caused the contamination or that the statistically significant increase resulted from an error in sampling, analysis, statistical evaluation, or natural variation in ground-water quality. A report documenting these demonstrations will be certified by a Licensed Geologist or Professional Engineer and approved by the Division of Solid Waste. A copy of this report will be placed in the facility operating record. If a successful demonstration is made, documented, and approved by the Division, the City may continue detection monitoring. If after 90 days, a successful demonstration is not made, the City will initiate an assessment monitoring program.

2. Leachate Monitoring

Leachate Monitoring is part of the facility Operation Plan. Leachate management will continue at the facility during the post-closure period as long as leachate continues to be generated or until the owner or operator demonstrates that the leachate no longer poses a threat to human health and the environment. The City of Albemarle will sample their leachate bi-annually, at a minimum, for Appendix I constituents, pH, BOD, COD, specific conductance, phosphate, nitrate, and sulfate. The sample will be obtained from the lagoon and sampled the same time as the monitoring wells. The leachate is being treated by the City of Albemarle Wastewater Treatment Plant (WWTP).

3. Landfill Gas Monitoring

Landfill Gas Monitoring and Compliance with explosive gas requirements is discussed in Section 4 of this plan.

J. FINAL GRADES

It is important that the final grades indicated on the revised Engineering Plans for the landfill are achieved as early as practicable throughout the filling operations so that storm water run-off can be controlled. Stable compost and soils in conjunction with an FML will comprise the final cover cap. If the final grades on the cap are too steep, then erosion problems may occur. If the final grades on the cap are too flat, then ponding may occur and the amount of storm water penetrating the landfill could increase; thereby, increasing the potential for generating leachate. The operator should also realize that subsidence (or settlement) of the landfill surface will likely occur, which may affect drainage patterns. The final grades as shown in the revised Operation Plan Drawings indicate a 4H:1V slope on the surface of the landfill. Post-closure maintenance of the landfill must include surveillance of drainage capability on the crown and slopes. As intermediate final grades are achieved, the operator may construct side slope

drainage berms with sideslope drain pipes at intervals of approximately 20-40 feet vertical. The drainage berms would be routed to side slope drain pipes. Maintaining adequate vegetative cover is critical.

K. SEEDING

The specifications for seeding of disturbed areas must be followed to minimize erosion. Solid waste will have a completed elevation below final cover surface elevations on the top of the facility. This will allow the operator to install a soil infiltration layer (where required), an FML top liner, a drainage layer, an 18" thick root zone/protective media, and a 6" thick vegetative growth media. The 6" thick growth media shall be placed to final grade and the area seeded. Seeding specifications are included in the Engineering Plans.

L. MAINTENANCE

Maintenance of the erosion control measures will be required throughout the life of the project and during the Post-Closure care period. After rain events, and when slope conditions allow, it will be necessary for the landfill operator to check silt fences and sediment basins for silt buildup, or any type of damage or loss of functions that may have occurred. The operator shall inspect the cover after rainfall and on a monthly basis during operations. Repairs must be made in a timely manner. Restoration of eroded areas on the surface is important to minimize the amount of water entering the landfill. Slopes providing drainage off the cap or crown surface must be maintained as well as vegetated to prevent cracks or fissures in the surface cap or crown due to erosion.

M. FIRE HAZARD

By keeping the landfill clean and the waste covered daily, the potential for fire can be lessened. Also, fires within the waste may be controlled by digging out the burning material, spreading and then recovering it with soil if conditions allow. Fire extinguishers should also be readily available. Arrangements should be made with local fire departments to establish procedures for extinguishing landfill fires. The City of Albemarle Fire Department would serve the landfill site should there be a fire.

Incoming waste loads shall be observed by site personnel for evidence of fire, such as flames, smoke, or the odor of burning material. Burning loads will be extinguished before dumping if possible. If there is evidence of fire in the landfill itself, the Landfill Manager will be notified immediately. If possible, the waste will be removed or segregated from other waste in the disposal area. The landfill general manager will evaluate the situation to determine whether the fire can be extinguished using fire extinguishers or equipment present at the site, or if off-site equipment will be needed. If necessary, the local fire department (The City of Albemarle Fire Department) will be called to render assistance in extinguishing the fire.

If there is a fire at the landfill, the operator must notify the Section and report if the fire has been controlled and what (if any) environmental damage may have occurred. The Section Rule .1626(5)(d) requires that any fires that may occur at the landfill be reported

verbally to the Section within 24 hours and in writing within 15 days. A copy of the NCDENR Fire Occurrence Notification Form can be found in the Appendix.

Fire extinguishers shall be located on each piece of equipment on site as required by Rule 1626(5)(c). Equipment operators shall be trained in the use of these extinguishers. Fire extinguishers will be used for small, localized fires. A stockpile of soil shall be maintained near the working face to be used for extinguishing small surface fires that may be too large to control with the fire extinguishers carried on the landfill equipment.

Emergency equipment will be called in the case of fires too large to be extinguished with fire extinguishers or soil as described above. Water contained in the sedimentation basins or inactive borrow areas can be used in an emergency to aid local firefighters in extinguishing large fires.

N. OPEN BURNING

Open burning of solid waste including yard waste and brush is prohibited at the landfill. Infrequent burning of land clearing debris generated on-site including brush and/or stumps or debris from emergency clean-up operations would only be requested on an infrequent basis in conjunction with clearing or construction events. Any such burning shall be approved by the Section and local permits shall be obtained prior to commencing burning activities.

O. FIRE PREVENTION

The landfill operator will be responsible for prohibiting acceptance of burning materials in the landfill. Cigarettes, lighters or any type of burning shall be prohibited in the active areas.

P. ODOR CONTROL

Odors are best controlled within the MSW areas by daily cover, as well as by adequate compaction. Diligent and effective daily covering of the compacted wastes should prevent odors. Weekly cover should be sufficient for controlling odors within the C&D areas.

Q. VECTOR CONTROL

Solid waste shall be covered daily with a minimum of 6" of soil or an approved alternative cover material within the MSW area and with a minimum of 6” of soil or an approved alternate cover material when the C&D area exceeds ½ acre and at least weekly within the C&D area to ensure that all food sources and potential habitats are buried.

R. INSECT CONTROL

Keeping the landfill clean and the solid waste covered daily (or weekly in C&D area), along with surveillance for and the elimination of any standing water in the waste filling areas, should prevent insect problems.

S. LITTER CONTROL

Use of movable screens or fences to capture windborne litter, followed by routine manual cleaning of the litter fence is strongly recommended. Fences should be cleaned on a regular basis. Frequent soil coverings during particularly windy days, and immediately covering and/or compacting and mixing light debris, should be performed to lessen the chances of blowing litter. At the conclusion of each day of operation, all wind blown material resulting from the operation shall be collected and returned to the area by the Operator.

T. DUST CONTROL

Dust should be controlled by wetting down or applying calcium chloride, or polymer based solutions or adding stone to problem areas to mitigate dust problems. Calcium chloride absorbs moisture from the air. Oil cannot be used for dust control.

U. LANDFILL GAS MANAGEMENT

A landfill gas management system will be implemented when necessary to comply with the New Source Performance Standards and the Operation Plan drawings for the facility.

V. ACCESS ROADS

The access roads are to provide smooth hauling operations from the entrance of the site through the weigh station to the landfill cell. It will be the responsibility of the landfill operator to maintain the paved, temporary dirt, and graveled access roads within the site. Keeping haul routes open for safe and efficient traffic movement is a key factor in achieving smooth landfilling operations. As landfilling operations achieve higher elevations, the operator will need to adjust road locations in such a manner that temporary access roads are run up the slopes gradually in ramp fashion.

Access in the operations area may pose problems during wet weather. Therefore, it is suggested that temporary roads be constructed using stone and sloped to shed water away from the landfill operations area. Shredded tires or other inert material may also be used for temporary road construction. Reuse of stone and replenishment of stone should be practiced when constructing new access roads.

W. EQUIPMENT

The equipment listed under Site Operation & Maintenance should be adequate for efficient operation of the landfill. Regular and preventative maintenance of the equipment will reduce repair problems, downtime and unnecessary costs.

X. BUILDINGS AND STRUCTURES

No modifications to existing buildings and structures on site are proposed.

Y. SECURITY

Fencing and natural barriers are provided to discourage vandalism, scavenging or trespassing from occurring when the landfill is not open. Screening by trees located along the property line should discourage 4-wheelers and other unauthorized vehicles from entering the site. Site boundaries should be checked regularly for evidence of unauthorized personnel and vehicle entry. The front gate should be locked when the landfill is closed to operations. Scavenging must be prohibited and enforced by the operator. Lines of communication should be established with the Albemarle Police Department to perform routine surveillance of the facility.

Z. SIGNS

Posting of "No Trespassing" signs around the periphery of the landfill will help to discourage scavengers and unauthorized entry. A sign containing information required in Rule .1626(6)(e) (i.e., dumping procedures, hours, permit number, etc.) and .0542(j)(6) is posted at the landfill entrance. Traffic signs and markers are posted to promote orderly traffic patterns to and from the disposal area and to maintain efficient operating conditions. Signs are posted stating that no hazardous or liquid waste can be accepted.

AA. PHASING AND SEQUENCE OF FILL

The City of Albemarle Landfill will be developed in a series of phases, each designed to handle waste disposal for periods of five years.

BB. SITE INSPECTIONS

The City of Albemarle will conduct daily inspections of the facility to ensure compliance with the solid waste rules and identify potential problems before they develop. The inspections will be conducted by the landfill manager or a specific designee of the landfill manager who has been trained to conduct the inspections. The landfill manager or their designee shall conduct the inspection or accompany the inspector at least bi-weekly. The form to be used to conduct the daily inspections is included in the Appendix of this plan. Special attention will be given to the inspection of leachate outbreaks at the facility. The intent of these daily inspections will be to identify moist areas or potential drainage problems that may be corrected before an outbreak develops. These daily inspections shall include C&D landfill operations, C&D waste areas, closed MSW waste areas and the current MSW landfill area.

CC. RECORD KEEPING REQUIREMENTS

1. The City of Albemarle will record and retain at the facility, or an alternative location near the facility approved by the Division of Solid Waste Management, in a facility operating record the following information as it becomes available.

    a. Records of random waste inspections, monitoring results, certification of training, inspection records, waste determination records, and training procedures

b. Amounts by weight of solid waste received at the landfill to include source of generation
c. Waste determination, Leachate sampling data, leachate levels, meteorological data;
d. Gas monitoring results and any remediation plans
e. Any demonstration, certification, findings, monitoring, testing or analytical data required for surface and groundwater monitoring;
f. Any monitoring, testing or analytical data required for closure or post-closure
g. Any cost estimates and financial assurance documentation
h. The date and time of weekly cover placement within the C&D area
i. All audit records, compliance records, and inspection reports

2. Any information contained in the facility operating record will be furnished upon request to the Solid Waste Section or be made available at all reasonable times for inspection by the Section.

3. A copy of the approved Operation Plan and Engineering Plans as required by the Rules.

4. A copy of the current Permit to Construct and Permit to Operate; and

5. A copy of the current Monitoring Plan.

5. COMPLIANCE WITH THE SEDIMENTATION POLLUTION CONTROL ACT OF 1973

Erosion and sediment will be controlled on the site to prevent the discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act. This includes, but is not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements, Section 402. In addition, the site shall not cause the discharge of nonpoint sources of pollution to waters of the United States, including wetlands, that violates any requirement of an area-wide or State-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended. Surface water shall be diverted from the operational area and shall not be impounded over or in waste.

6. COMPLIANCE WITH DESIGN REQUIREMENTS

A. COMPLIANCE WITH EXPLOSIVE GAS REQUIREMENTS

The proposed landfill operations will involve various amounts of municipal solid wastes on a daily basis. The composite liner system of the MSW landfill should not allow gases to develop in explosive concentrations outside the landfill. Routine monitoring for gas concentration should be performed. The explosive gas monitoring probe design and locations previously prepared by Municipal Engineering Services Company, P.A. are included below:

> *Quarterly, the City of Albemarle landfill will monitor the explosive gas at the landfill structures and at or near the landfill boundary. The permanent probes will consist of a plastic stand pipe similar to a piezometer used for groundwater detection. A typical permanent methane probe is detailed in the operation drawings. The permanent probe will be constructed at a depth of six (6) feet. A 6" diameter hole will contain a one(1) inch slotted PVC pipe. The bottom two (2) feet will be backfilled with non-carbonate pea gravel with a bentonite seal one (1) foot thick above it. The remaining three (3) feet will be backfilled with insitu soils. The one (1) inch PVC pipe will be approximately three (3) feet above the existing grade. The PVC pipe will be capped with a one (1) inch PVC cap, one quarter (1/4) inch NPT hose barb, and 1" tubing, plugged or capped.*
>
> *The location and spacing of the methane monitoring probes is somewhat arbitrary. The locations were determined by the relationship of solid waste with property lines and landfill structures. The spacing of the monitoring probes is between 200 and 400 feet. The migration of methane gas is induced by pressure gradients. The methane will move from areas of high pressure to those of low pressure following the path of least resistance. The methane will migrate vertically until it reaches the landfill cap, where it will begin to flow horizontally. This occurs until it finds a pathway out, either by the installed methane collection trenches or migration through the permeable in situ soils. Since methane is lighter than air, it wants to escape into the atmosphere. It has been our experience that whenever gas is migrating no matter what the spacing or depth of the monitoring probes, the gas will fill the void created by the monitoring point and an explosive meter will monitor the level. The six foot depth of the monitoring probes is to ensure a stable monitoring point. The only time a shallow monitoring point has not worked is in a very heavy, impermeable clay layer that acts as a seal to the migration of the gas. If a clay layer is encountered during the construction of the monitoring points, it will either be moved beyond the clay or excavated to a depth that is in the conductive zone below the clay.*
>
> *The permanent probes will surround Phase 2. City of Albemarle's landfill is designed with a base liner system and cap system, there should be no migration of methane in the permeable in situ soils.*

The gas can be detected by use of an instrument that reports the percent of lower explosive limit. The instrument being used is the Land Tech GEM-2000 or similar instrument accepted by the Division.

Quarterly, a City employee or the City's representative will visit each monitoring point either the temporary or permanent. The monitoring points consist of all methane probes and leachate collection system cleanouts. Using the detection instrument, he will determine if methane gas has filled the probes. If the probes is near the property line and methane gas is detected at or beyond the lower explosive limit (100%LEL), it must then be determined if the gas is migrating across the landfill boundary. If the probe is on the boundary or methane gas has migrated beyond the boundary, a remediation plan must be completed by the City of Albemarle.

Other points of monitoring will be the landfill structures. Each structure will be monitored for methane using the following methods:

1. *All crawl spaces will be monitored*
2. *All corners in the structures will be monitored*
3. *Any holes, cracks and pipes through the foundation will be monitored*

If methane gas is detected beyond 25% of its lower explosive limit in any structure, check the calibration of the monitor and resample. If the reading is still above 25%, evacuate the building and try to find the source of gas. If the source is found try to remove the source. If this fails a remediation plan is stated in the operational requirements.

If methane gas is found to exceed the acceptable limits at either the property boundary or landfill structures, it is the City's responsibility to do the following:

1. *Immediately take all necessary steps to ensure protection of human health, i.e. no smoking, temporarily abandon the structure and notify the Division of Solid Waste Management.*
2. *Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and*
3. *Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the Division of Solid Waste management that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.*

The methane gas venting system on top of the landfill will be constructed after all phases of filling have been completed.

B. COMPLIANCE WITH SURFACE WATER REQUIREMENTS

Sedimentation basins have been designed to prevent migration of sediment off-site. Preventing migration of contaminants from a landfill is a continuous concern. Design features and proper operational procedures should prevent surface waters from becoming contaminated. Surface water monitoring points have been established to monitor water quality upstream and downstream to determine the effects from the landfill.

Surface water samples are collected on a semi-annual basis as part of the monitoring program. In addition, discharges from outfall structures shall also be sampled as part of the NPDES Monitoring Program. All inspections of surface water and sediment control structures shall be documented, and copies of these reports shall be placed in the operating record.

C. COMPLIANCE WITH GROUND WATER REQUIREMENTS

Ground water protection has been considered in the siting and design of the landfill. Ground water monitoring wells will ascertain compliance with the ground water quality standards. Ground water is monitored on a semi-annual basis during operations and will continue into Post-Closure.

D. COMPLIANCE WITH PERMIT REQUIREMENTS

The landfill Engineering Plans and Permit to Operate from the North Carolina Division of Waste Management - Solid Waste Section shall be kept in the landfill office. The operator is responsible for being familiar with the permit requirements and ensuring compliance therewith.

7. OTHER ISSUES

A. BORROW AREAS

The City of Albemarle Landfill facility includes areas which are available for soil borrow. As additional phases are developed, new borrow sources will be permitted. Approval to expand the existing Borrow Area was granted by the NC DENR's Land Quality Section on June 29, 2011.

B. STORM DEBRIS STORAGE

Areas of the site may be utilized for temporary storm debris staging in the event of an emergency or disaster. Multiple Areas within the approved landfill facility boundary have been identified for this purpose. The actual location(s) used will be based on the severity of the event, the anticipated volume of storm debris, and other site logistical factors. The areas identified at this facility include areas such as:

1. Future MSW Phase III footprint
2. Existing Borrow Area
3. The Existing Closed MSW Area located northeast of the Recycling Area
4. The area located west of the Active C&D Area
5. The Existing C&D Over MSW Area located east of the Active C&D Area.

Prior to being activated, the Section will be notified. If any additional areas are deemed necessary for temporary storm debris staging, approval from the Section will be obtained prior to being utilized.

8. POSI-SHELL COVER SYSTEM ALTERNATE DAILY COVER

The City of Albemarle Landfill has completed the trial demonstration period for the use of Posi-Shell Cover System (PSCS) as an Alternate Daily Cover (ADC) Material. The trial period demonstrated PSCS's ability to meet the daily cover performance standards, specifically to control disease vectors, fires, scavenging, odors and blowing litter. In accordance with the NCDENR Draft Guidance for the Application and Use of Alternative Materials for Daily Cover, this Operations Plan incorporates the use of Posi-Shell as an ADC.

A. MATERIAL DESCRIPTION

PSCS is an alternative to traditional landfill daily cover materials. The coating is a spray applied slurry composed of water, mineral binder and polyester fibers that form a durable coating on landfill working faces. The PSCS contains 10%-20% solids and is designed for use by a landfill operator at the close of each operating day for compliance with daily cover regulations. The material meets and exceeds regulatory requirements for the control of disease vectors, fires, odors, blowing litter, and scavenging.

Components of the Posi-Shell Mixture:

1. Water:

   Potable water and non-potable water can be used as the water fraction of the PSCS. Up to 1,700 gallons of water are used per 2000 gallons of PSCS mixture.

2. Posi-Paks®:

   Posi-Paks are an important constituent of PSCS coating and give the cover its fiber reinforced rigidity and weather resistance. Posi-Pak Type P-100 is a short cut, polyester fiber with a proprietary finish that allows each individual fiber to remain separate and distinct in a liquid medium. A total of two Posi-Paks® are used for each 1000-gallon PSCS load.

3. Mineral Binder:

   Portland Cement and PSM-200 Setting Agent are commonly used as the mineral binder components of the PSCS. Approximately 500 pounds of PSM-200 Setting Agent are used for each 1,000 gallon PSCS load. Portland Cement is an optional additive to the PSCS mixture which is generally used to extend the useful life of the Posi-Shell Cover. None of the components exceed the regulatory maximum contaminant levels.

B. REQUIREMENTS FOR ALTERNATE DAILY COVER

An alternative daily cover must control disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment. PSCS will accomplish these requirements as follows:

1. PSCS will be spray applied daily to form a hardened, non-flammable shell over waste. The hardened shell will control disease vectors, odors, blowing litter, scavenging, and fire in a manner similar to soil and consistent with the NCDENR Solid Waste Rules.
2. A complete soil intermediate cover will be applied at the completion of each lift. This soil cover will help to control disease vectors, odors, blowing litter, scavenging, and fire. Final covers required by this plan will also help control spread of fire. In addition, stockpiled soil will be available for fighting fires. Taken together, these measures plus on-going quality site management will assure fire control is adequate.
3. Use of PSCS Alternate Daily Cover is not expected to cause excess dust. Normal site operations will be utilized to control dust.

C. ADC MATERIAL HANDLING PROCEDURES AND APPLICATION PROCESS

1. Material Delivery and Storage:

   Materials are delivered to the landfill site by the Landfill Service Corporation. The Posi-Pak P-100 fibers are stored inside the landfill maintenance shop and/or staging area. The PSM-200 Setting Agent bags are delivered on a pallet and stored adjacent to the maintenance shop. The bags are covered to prevent damage from weather. Alternate storage arrangements may be developed closer to the landfill working face in the future.

2. Application Process:

   Equipment utilized for PSCS application includes the following:

   a. Posi-Shell Applicator (2,000 Gallon size)

   The equipment listed above is the currently used PSCS application equipment. Alternate equipment, recommended by the manufacturer, for PSCS application may be utilized in the future. This may include a larger PSCS applicator or an applicator mounted on a truck bed in lieu of trailer mounted. An alternate towing unit may also be used. Equipment is generally parked adjacent to the landfill working face for daily use.

   The City of Albemarle landfill staff received training from the Posi-Shell representatives at the initiation of the trial period. Proper mixing and application of the PSCS were discussed. The process for application of the PSCS typically consists of the steps listed below:

a. The PSCS application unit will be hauled to the back of storm water management ponds at the MSW landfill.

b. Water will be pumped from the pond into the application unit.

c. The desired PSCS mixture will be added to the application unit. This mixture typically consists of ten 50 lb. bags of PSM-200 Setting Agent and two 15 lb. bags of Posi-Pak fibers per 1,000 gallons of PSCS Mixture.

d. The PSCS mixture is thoroughly agitated/mixed and hauled to the working face of the landfill.

e. After evaluating wind direction and speed, the application unit will be hauled across the working face typically on one edge. PSCS is applied to the entire working face as the unit is hauled by the truck. While only one person is required to apply PSCS, the application process may include two landfill personnel. One person drives the truck and one person rides on the application unit to apply the PSCS.

f. The application unit is then pulled along the working face from the opposite side of the first application to cover all waste from two directions.

g. After completely covering the working face, or the area intended to be covered by the PSCS if other cover methods were also being utilized, the application unit will be cleaned in accordance with the manufacturer's recommendations.

In addition to the typical base PSCS mixture described above, varying amounts of Portland Cement may also be utilized depending on anticipated weather and time of PSCS exposure. The base PSCS mixture has been observed to be effective and met the performance standards for daily cover when utilized for one to two day periods. For more extended periods, the base PSCS with Portland Cement additive has shown to be most effective.

The PSCS will be applied in accordance with manufacturer's guidance. For basic short term daily cover the application rate will be 8-10 ft^2 / gal of PSCS slurry. The PSCS will generally be 1/8" to 3/16" thick. For medium term cover use, the rate and thickness will be adjusted in accordance with manufacturer's recommendations. The maximum area to be covered by PSCS at any point in time will be two (2) acres.

3. High Wind Operations:

   The PSCS coating can be applied in high winds provided that the operators observe the wind direction and allow the spraying operation to be performed in a downwind or crosswind direction. Obviously, attempts to spray directly upwind during high wind operations are inadvisable.

4. Wet Weather Operations:

   If rain is expected, one of several alternate cover methods will be used depending on site conditions. The wet weather cover methods to be utilized include:

   1. PSCS with Extreme Rain Shield may be used, which will be applied in accordance with the manufacturer's recommendation. Alternatively, waste latex paint may be used during wet weather.
   2. PSCS mixture with at least 10 bags of 94 lb. Portland Cement per 1,000 gallons of mixture
   3. Soil daily cover
   4. Alternate daily cover tarps

D. WASTE LATEX PAINT ADDITIVE

On August 2, 2011, the City of Albemarle received approval from NCDENR to use Waste Latex Paint (WLP) as an enhancement to the PSCS mixture. Subsequent to this approval, the City of Albemarle utilized WLP at varying concentrations to evaluate the performance during the trial period. At all times during the demonstration period, the PSCS with WLP additive performed equal to or superior to daily soil cover. The PSCS with WLP met all performance standards of daily cover including vector control, fire control, odor control, litter control and scavenging prevention.

The WLP mixture will be utilized with the PSCS base mix and the PSCS base mix with Portland Cement. The concentration of WLP used in each PSCS application may vary depending on the amount of WLP available and anticipated site conditions. The amount of WLP added to each 1,000 gallon PSCS mixture will range between 5 gallons and 40 gallons. The WLP may be utilized in conjunction with Portland Cement additive or as the sole additive to enhance the viscid properties of PSCS. The WLP will be added to the PSCS slurry after all other mixture ingredients have been mixed.

The majority of WLP that is collected and processed at the City of Albemarle Recycling Center is generated through the Stanly County & City of Albemarle, annual Household Hazardous Waste Event. During the collection event all paints are inspected by hazardous waste collection personnel and separated accordingly. All latex paints are palletized and transported to the City of Albemarle Recycling Center, located at the City of Albemarle Landfill.

All landfill customers that bring paint to the landfill are notified by a Scale Attendant that the Recycling Center only accepts water-based, latex paints. Customers with non

water-based paints and or stains are directed to utilize the Stanly County & City of Albemarle, annual Household Hazardous Waste Event. If the customer states water based paints, then they are directed to the Recycling Center. Upon arrival at the Recycling Center, each customer is greeted by an attendant who reads the container label and verifies if the paint is water-based. Any paints and or other paint like liquids that aren't clearly identifiable are placed in a separate area and collected for the Stanly County & City of Albemarle, annual Household Hazardous Waste Event. Once verification is complete the attendant places the acceptable paints on the appropriate shelves located within the Paint Recycling Building. Typically the Recycling Center collects an average of 12,000 pounds of latex paint per year.

E. STAFFING REQUIREMENTS AND TRAINING PROGRAM

Landfill personnel required for operation and application of PSCS shall include two trained PSCS applicators.

Employees of the landfill have been trained by a PSCS manufacturer's representative on the safe and effective application of PSCS and on equipment maintenance. Future landfill employees who will apply PSCS will first be trained by a Certified Landfill Manager or Landfill Operations Specialist who is experienced in PSCS application. Records of PSCS training will be maintained by the Landfill.

F. CONTINGENCY PLANS

The Contingency Plan for use of PSCS during emergency weather conditions, disaster, equipment failure or staff shortages will be to utilize soil daily cover or a separate approved alternate daily cover such as tarps.

9. APPENDIX

A. RANDOM WASTE INSPECTION FORM

#5

WASTE SCREENING FORM

Date/Time of Inspection _____

Inspected by _____

Source of Waste _____

Name of Hauler _____

Type of Waste _____

Net Weight of Load _____

Other Information _____

Excluded Waste	Yes	No	If Yes, How was waste handled/disposed
Hazardous Waste			
Liquid Waste			
PCB Waste			
Tires			
White Goods			
Yard Waste			
Used Motor Oil			
Anti-Freeze			
Batteries			
Aluminum Cans (Bulk)			
Other (specify):			
Wastes Requiring Special Attention			
Medical Waste			
Other (specify):			
ADDITIONAL COMMENTS:			

B. PLAN OF OPERATION FOR FIGHTING FIRES

PLAN OF OPERATION FOR FIGHTING FIRES

In the event of a fire at the landfill, the following plan of operation for fighting fires may be used.

- Notify the general manager or operations manager immediately.
- If possible, move all equipment and personnel clear of the burning material.
- Mobilize on-site equipment including fire extinguishers, compacters or dozers to try and extinguish the fire. All on-site personnel who attempts to extinguish the fire using on-site equipment shall be trained in its proper use. The use of soil is often the best method for extinguishing landfill fires.
- If necessary, contact the City of Albemarle Fire Department for assistance.
- Once the fire has been extinguished, notify the Section verbally within 24 hours and in writing within 15 days. A copy of the Fire Occurrence Notification Form has been included in this Appendix.

SOLID WASTE MANAGEMENT FACILITY
FIRE OCCURRENCE NOTIFICATION
NC DENR Division of Waste Management
Solid Waste Section

Notify the Section verbally within 24 hours and submit written notification within 15 days of the occurrence.
(If additional space is needed, use back of this form.)

NAME OF FACILITY: _____ PERMIT # _____

DATE AND TIME OF FIRE: _____ @ _____

HOW WAS THE FIRE REPORTED AND BY WHOM:

LIST ACTIONS TAKEN:

WHAT WAS THE CAUSE OF THE FIRE:

DESCRIBE AREA, TYPE, AND AMOUNT OF WASTE INVOLVED:

WHAT COULD HAVE BEEN DONE TO PREVENT THIS FIRE:

DESCRIBE PLAN OF ACTIONS TO PREVENT FUTURE INCIDENTS:

NAME: _____ TITLE: _____ DATE: _____

****

THIS SECTION TO BE COMPLETED BY SOLID WASTE SECTION REGIONAL STAFF

DATE RECEIVED _____

List any factors not listed that might have contributed to the fire or that might prevent occurrence of future fires:

_____

FOLLOW-UP REQUIRED:

☐ NO ☐ PHONE CALL ☐ SUBMITTAL ☐ MEETING ☐ RETURN VISIT BY:_____ (DATE)

ACTIONS TAKEN OR REQUIRED:

Revised 6/8/09

C. LEACHATE RECIRCULATION LOG FORM

CITY OF ALBEMARLE MSW LANDFILL OPERATING RECORD
LEACHATE RECIRCULATION LOG

DAY: _____ DATE: _____ SITE MANAGER: _____

WEATHER CONDITIONS

Wind Speed:_____ Temperature:_____ Other: _____ 24 Hour Rainfall:_____ 24 Hour Snowfall: _____

ACCIDENTS/INCIDENTS:	LEACHATE RECIRCULATION
	Gallons of leachate added to waste: _____
	Location of leachate application: Cell No. _____
	Problem Areas:
	Seeps: Yes No Other _____
	Corrective action: _____
	Comments: _____
Accident Report Filed: Yes No	

Site Operator Notes: _____

Location of Active Fill Area: _____

This form may be updated or revised periodically at the Operator's discretion.

D. MONTHLY LEACHATE HAULING LOG

CITY OF ALBEMARLE LANDFILL

MONTHLY LEACHATE HAULING LOG

MONTH: _____

DAY	LEACHATE AMOUNT HAULED:	HAULER NAME:
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
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22		
23		
24		
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28		
29		
30		
31		

* This form may be updated or revised periodically at the Operator's discretion.

E. SITE INSPECTION FORM

City of Albemarle Solid Waste Facility

Permit 84-1

Comprehensive Daily Inspection Form (For Internal Use Only)

Please check (✓) and or write comments for each Task. If corrective action must be taken please notify landfill management immediately.
Note: For internal facility use per a required regulatory form.

***(Site Inspection for Potential Leachate Outbreaks)** if you suspect that you have identified a potential leachate outbreak please list its location and notify land fill management immediately!*

Task No.	***Task***	***M***	***T***	***W***	***Th***	***F***
1	Random Inspections – Have all necessary random inspections been performed for MSW and C&D Areas (min 1% weekly)					
2	Record Rainfall Measurement					
3	Are paved access roads free of sediment					
4	Apply water to access roads as needed for dust control					
5	Inspect best management practices (silt fence, check dams, etc.) (Once per week and after rainfall events)					
6	Inspect all sediment traps and ponds for sediment accumulation (weekly and after rainfall events – clean when 1/3 full)					
7	Are access roads to the working face acceptable for all-weather access					
8	Grass areas where land disturbing activities have ceased					
9	Place daily cover as required in MSW and C&D Areas					
10	Have areas ready for intermediate cover been properly covered					
11	Stockpile soil near working face for fighting fires					
12	Collect all litter					
13	Do conditions warrant additional measures to control litter					
14	Perform equipment maintenance					
15	* Inspect C&D area for leachate outbreaks					
16	*Inspect closed MSW landfill area for leachate outbreaks					
17	*Inspect Phase 1 and Phase 2 MSW areas for leachate outbreaks					
18	Record leachate levels in C&D leachate sump pump riser					
20	Exercise Valves in leachate lines from Phase 1 and Phase 2					
21	Record leachate levels in the leachate lagoon					
22	Check operation of storm water pumps behind rain flaps					
23	Is all waste within permitted limits					
24	Is waste being landfilled in accordance with the approved plans (Visual Inspection of grades)					
25	Area appropriate compaction efforts being performed					
26	Maintain access to all monitoring locations (Inspect Monthly)					
27	Inspect fueling areas for spills					

*This form may be updated or revised periodically at the Operator's discretion

Comments/Corrective Action

Item No.	***Date***	***Comment***

F. TIRE COLLECTION PLAN

TIRE COLLECTION PLAN

The City of Albemarle Landfill will accept any tires generated within the limits of Stanly County. No out of county tires are accepted. No tires still on rims will be accepted.

A disposer bringing five (5) or more tires must complete a NC scrap tire certification form. All disposers will cross the scales at the Scale house and a ticket will be generated and recorded noting the number of tires in their load. There is no charge for disposal.

Homeowners/tire dealers will be directed to the tire collection area located behind the maintenance shop and to the right of the White Goods Recycling area. At the site there are three (3) trailers placed against a retaining wall. Disposers are required to “lace” the tires into the trailers to maximize air space.

An approved vendor provides delivery of trailers and pickup of tires under our current written agreement.

NORTH CAROLINA SCRAP TIRE CERTIFICATION

REQUIRED FOR FREE DISPOSAL AT PUBLIC COLLECTION FACILITIES

Parts I and II must be completed to qualify for free disposal. Used tires and casings obtained from out-of-state by retreaders or used tire dealers are not eligible for free disposal. County may require proof that tires originated in NC. Used tire dealers, wholesalers, brokers, retreaders, and others who sort, grade, or cull loads of tires which were removed from vehicles by another NC dealer must provide the original certification from the individual who first removed the tire from a vehicle. Tires stockpiled before January 1, 1994 are not eligible for free disposal.

PROVIDING FALSE OR INCOMPLETE INFORMATION ON THIS FORM IS SUBJECT TO A CIVIL PENALTY OF UP TO $15,000 PER VIOLATION PURSUANT TO N.C.G.S. 130A-22. FALSIFYING THIS REPORT IS A CLASS 2 MISDEMEANOR AND SUBJECT TO A FINE OF UP TO $10,000 PURSUANT TO N.C.G.S. 130A-26.2

PART I: CERTIFICATION BY RETAILER OR OTHER PERSON DISPOSING OF SCRAP TIRES

This section is to be completed by the generator of the tires.

Must have ORIGINAL signature.

Name of retailer or other person disposing of scrap tires: _____

Address: _____ Phone Number: _____

City: _____ State: _____ Zip Code: _____

CERTIFICATION: I hereby certify that these _____ (total number) tires were collected for disposal as indicated below, and these tires originated in _____ County, _____ State, during the time period _____ / _____ to _____ / _____, 20 _____.

_____ NUMBER OF TIRES REMOVED FROM VEHICLES WHEN REPLACEMENT TIRES WERE SOLD IN NC
(*Provide copies of documentation, IF required by county*).

_____ NUMBER OF TIRES REMOVED WHEN VEHICLES WERE REPAIRED OR JUNKED IN NC
(*Provide proof of eligibility for free disposal, IF required by county*).

_____ NUMBER OF TIRES REMOVED FROM FLEET VEHICLES IN N.C. (e.g. School bus shop, trucking company garage)
(*Provide proof tires were purchased in NC and proof of payment of disposal tax, IF required by county*).

_____ NUMBER OF TIRES COLLECTED BY MEANS OTHER THAN THE NORMAL COURSE OF BUSINESS
(e.g. Cleanup projects, pre-1994 stockpiles from businesses and junkyards) ☐ *Disposal fees paid* ☐ *Fees waived by county*
(check one)

_____ NUMBER OF TIRES THAT ORIGINATED OUT OF STATE ☐ *Disposal fees paid* ☐ *Fees waived by county*

Signature _____ Date _____

PART II: CERTIFICATION BY SCRAP TIRE HAULER

This section is to be completed by the hauler of the tires.

Must have ORIGINAL signature.

Name of scrap tire hauler: _____

Scrap tire hauler identification #: _____ or Merchant identification #: _____ (sales tax #)

Address: _____ Phone Number: _____

City: _____ State: _____ Zip Code: _____

CERTIFICATION: I hereby certify that this load contains _____ (number) of the same tires that were received from the person disposing of scrap tires in Part I of this form AND NO OTHERS.

Signature _____ Date _____

PART III: CERTIFICATION BY COLLECTOR, PROCESSOR, OR DISPOSER

This section is to be completed by the collector of the tires.

Facility Name: _____ Number of tires received: _____

Received by: **Signature** _____ Date _____

THIS FORM IS TO BE RETAINED BY THE COLLECTOR, PROCESSOR OR DISPOSER FOR THREE YEARS.

INSTRUCTIONS & REQUIREMENTS FOR SCRAP TIRE HAULERS COMPLETING THE N.C. SCRAP TIRE CERTIFICATION

These instructions are to help haulers in correctly completing your portion of the Scrap Tire Certification. Part II is the section to be filled in by the hauler.

1. When you pick up a load of scrap tires from a retailer or other person disposing of scrap tires (the generator), they will give you a Scrap Tire Certification form with Part I completed and signed by them. If you are hauling scrap tires generated by you or the company you work for, Part I should be fully completed and signed by you or another representative of your company.

*****IMPORTANT***** - Only the generator may fill in the information requested in Part I.

2. Check Part I to be sure all the information has been included. The landfill or other collector can refuse to accept the load of tires for disposal if information is missing from Part I or Part II on the form.

3. Fill in all the information in Part II:

(a) Enter your name.

(b) Enter your hauler identification number.
Do not enter anything next to Merchant Identification number (this is to be used by a tire retailer if they their own tires).

(c) Enter your mailing address, phone number, city, state and zip code.

(d) In the Certification, enter the number of tires from the load you received from the Generator that you are taking to the landfill for disposal.

*****IMPORTANT***** - No other tires besides the ones you received from the Generator in Part I may be included in the load. If you remove any tires from the load (usable tires for resale), *BE SURE* to enter the lower number in the certification to indicate the correct number you are disposing. It is very important to have a correct number listed on the certification form.

(e) Sign and date the certification. The certification must have an original signature. Photo-copied signatures are not allowed.

4. Take the completed certification form with the load of tires to the landfill for disposal.

G. LAND CLEARING AND YARD WASTE DEBRIS PLAN

LAND CLEARING & YARD WASTE DEBRIS PLAN

Land clearing, yard waste, and yard trash debris is brought into the landfill by commercial and household disposers. This waste can be composed of leaves, limbs, stumps, and brush. All debris must cross the scales and a ticket generated and weights recorded. There is a charge for disposal. All land clearing debris is kept segregated from yard waste and yard trash.

The collection site is located near the C&D landfill. Disposal piles are kept to a manageable size. The City of Albemarle solicits bids, as needed, for a grinding contractor to grind the land clearing debris material. Yard waste and yard trash is actively composted to meet regulatory compliance applicable to Type 1 Compost Facilities. In accordance with 15A NCAC 13B .1406(10), Type 1 Compost facilities shall be maintained at or above 55 degrees Celsius (131 degrees Fahrenheit) 3 days and aerated to maintain elevated temperatures. After all land clearing, yard waste, and yard trash materials have met regulatory requirements; these materials are either sold by the ton or kept in-house for use by the City of Albemarle Departments.

H. RESIDENTIAL LEAF COLLECTION PLAN

RESIDENTIAL LEAF COLLECTION PLAN

The City of Albemarle contracts with an approved vendor to collect loose leaves for a 6-month period each fall/winter from residents living in the corporate City limits. The disposal area is located beside the borrow area. The vendor disposes of the leaves in windrows. Each season a new windrow is formed. This material is actively composted to meet regulatory compliance applicable to Type 1 Compost Facilities. In accordance with 15A NCAC 13B .1406(10), Type 1 Compost facilities shall be maintained at or above 55 degrees Celsius (131 degrees Fahrenheit) 3 days and aerated to maintain elevated temperatures. After the material meets regulatory requirements, it is either sold by the ton or kept in-house for use by the City of Albemarle Departments.

I. WHITE GOODS MANAGEMENT PLAN

WHITE GOODS MANAGEMENT PLAN

The City of Albemarle Public Works Department's White Goods Facility is located at the City of Albemarle Landfill. One acre has been set aside for the collection of white goods and CFC recovery. The facility consists of an 864 sq. ft. enclosed building, three (3) free standing carports, and five (5) – 40 yard open-top roll-off box(es). The building and carports are situated on a 30,000 sq.ft. concrete pad and the roll-off box(es) are positioned to the side, against a block wall, on asphalt. A roadway is built around the box(es) for travel.

Municipalities located within Stanly County, which provide white good collection for their residents, bring these to the City of Albemarle Landfill. Citizens living in unincorporated areas are asked to bring their old goods to the landfill. There is no charge for this disposal in accordance with GS 130A-309.81 (B) titles Restrictions.

Disposal Procedures:

Anyone bringing white goods to the Landfill must stop at the scale house to have their white goods counted or weighed. The driver is directed to the White Goods Facility. CFC white goods are off-loaded, intact, and stored upright until Freon is removed.

At the White Goods Facility, persons leaving white goods are directed to separate the items in appropriated box(es). Non-CFC units such as washers, dryers, stoves, ovens water heaters, and dishwashers will be placed in one designated box. CFC white goods such as refrigerators, freezers, icemakers, and a/c units are placed under a freestanding carport until CFC removal, and then placed by attendant(s) into box(es). All metals will be sorted to allow for the maximum revenue recovery. Once a box is full, the white goods will be "shopped" to the highest bidder. The roll-off truck driver will take metal to the buyer.

The City of Albemarle Public Works Department will keep records of all inbound white goods and report these figures annually in accordance with GS 130A-309.85.

White goods attendant(s) are responsible for refrigerant recovery and will keep documentation on all procedures and disposal methods of recovered CFC's.

J. ASBESTOS WASTE SHIPMENT RECORDS

NC DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES
DIVISION OF EPIDEMIOLOGY
ASBESTOS HAZARD MANAGEMENT BRANCH

PLEASE TYPE OR USE BALL POINT PEN
PRESS FIRMLY

ASBESTOS WASTE SHIPMENT RECORD

1. Waste Generator/Owner Name and Address:	Work Site Name and Physical Address:	Waste Generator/Owner Phone No: ( )
2. Contractor Name and Address:		Contractor Phone No: ( )
3. Waste Disposal Site (WDS) Name, Mailing Address:	WDS Physical Site Location: NC Landfill Permit #:	WDS Phone No: ( )

4. Name and Address of Responsible Agency:

NC Asbestos Hazard Management Branch
P.O. Box 27687
Raleigh, NC 27611-7687
(919)733-0820

AHMB Permit #: NESHAP ID #:
Start Date: Complete Date:

5. Description of Materials:

6. Containers: No: Type:	RQ, HAZARDOUS SUBSTANCE, SOLID N.O.S. ORM-E, NA 9188-ASBESTOS	7. Total Quantity: (yd3) m3

8. Special Handling Instructions and Additional Information:

9. CONTRACTOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Printed/Typed Name & Title:
Signature: Date (MM/DD/YY):

10. Transporter 1 (Acknowledgment of Receipt of Materials):

Printed/Typed Name & Title:
Address: Phone No:
Signature: Date (MM/DD/YY):

11. Transporter 2 (Acknowledgment of Receipt of Materials):

Printed/Typed Name & Title:
Address: P.O. Bx 190 Phone No: 704-982-3302
Signature: Date (MM/DD/YY):

12. Discrepancy Indication Space:

13. Waste Disposal Site: Owner or Operator Certification of Receipt of Asbestos Materials Covered by this Manifest, Except as Noted in Item #12.

Printed/Typed Name & Title: Total Weight (Tons):
Signature: Date (MM/DD/YY):

DEHNR 3787 (Eff. 06/91)
Asbestos Hazard Management Branch (Review 06/94)

(White - Waste Generator/Owner; Canary - Contractor; Pink - Transporter; Goldenrod - Disposal Site)

K. POSI-SHELL USAGE APPROVAL LETTER

H. Lowry Tribble, Jr., P.E.
William F. Hodges, P.E.
W. Michael Stubbs, P.E.
R. Brant Lane, P.E.
Clint L. Courson, CHMM

HHNT
Hodges, Harbin, Newberry & Tribble, Inc.
Consulting Engineers

Daniel E. Cheek, P.E.
K. Matthew Cheek, P.E.
Scott D. Mattox, P.E.

December 5, 2011

Mr. John E. Murray P.E.
Professional Engineer - Solid Waste Section
North Carolina Dept. of Env. & Natural Resources
Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115

Re: City of Albemarle Landfill
Revised Operation Plan
HHNT Project No. 1011-010-01

Dear Mr. Murray:

We have enclosed the revised Operation Plan for the City of Albemarle MSW Landfill. The plan has been revised to address the comments from Ms. Teresa Bradford on the Trial Period Demonstration Report for Posi-Shell Alternative Daily Cover. There were no other changes made to the Operations Plan. For your ease of review, I have included the language from Ms. Bradford's email comments below:

As discussed, the City of Albemarle will need to submit a revised operations plan to John Murray.

The plan should include, but not be limited to the following:

Application operation.
Depth and quantity to be applied on per area basis.
Application frequency during Demonstration Project.
Maximum daily area coverage.
Wet weather operation.
Equipment use, storage, and maintenance.
Staffing requirements and training program.
Contingency Plans. (Plans to address operations during any staffing shortages, emergency weather or disaster conditions, equipment failure, etc.)

Also, based on observations of the Solid Waste Section staff, the manner in which the facility applies Posi-Shell does not meet the protocol of needing to apply soil cover every five days due to the fact that the facility covers waste with more waste, additional Posi-Shell material or a tarping system.

Thank you for your assistance with these final comments. Should you have any questions please call.

3920 Arkwright Road, Suite 101 • Macon, Georgia 31210 • (478) 743-7175 • Fax (478) 743-1703 • www.hhnt.com

Sincerely,

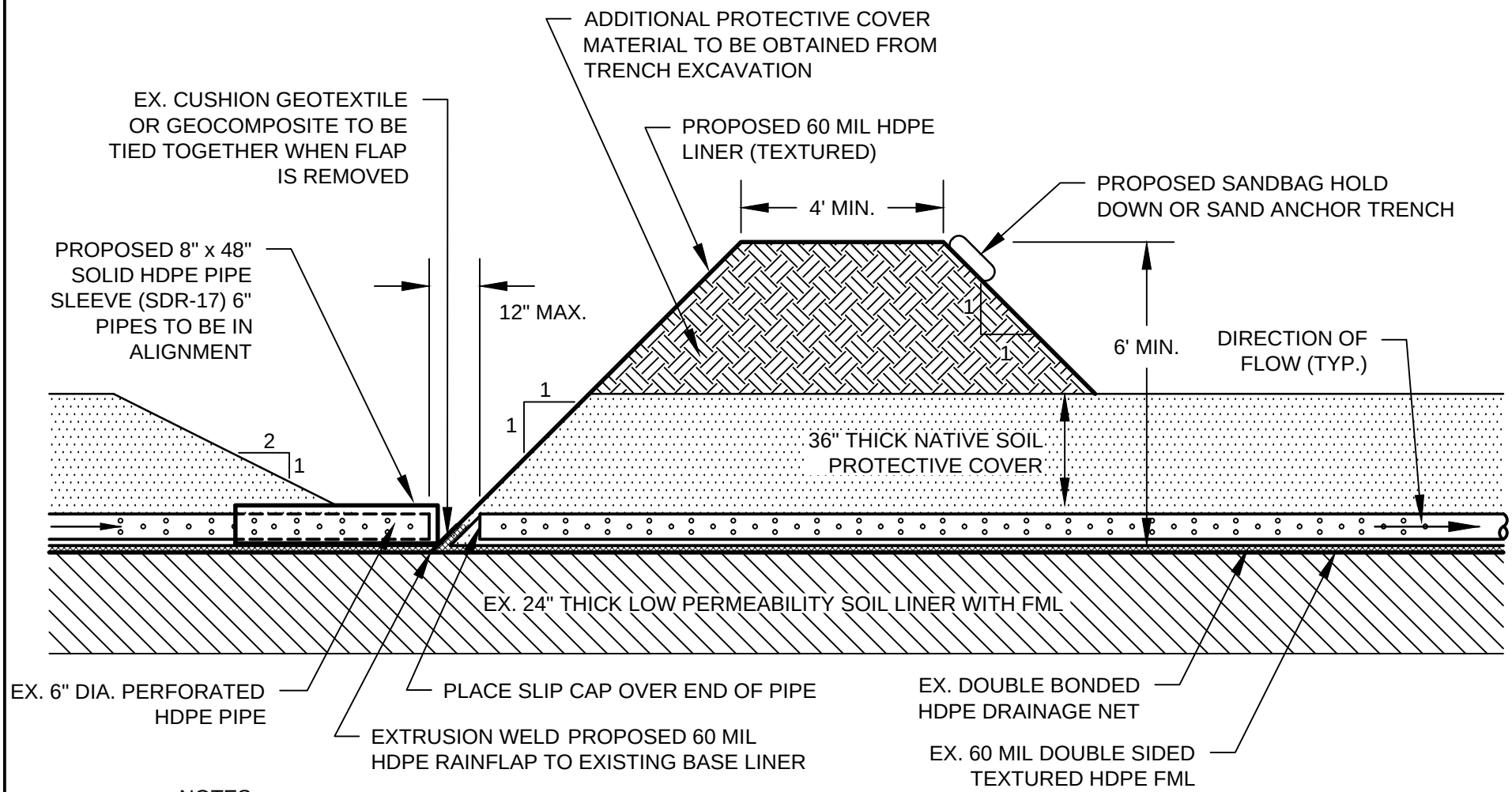
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

R. Brant Lane, P.E.
Principal

RBL/cw

cc: Mike Lambert (w/ enclosure)
Darren Preslar (w/ enclosure)
Nina Underwood (w/ enclosure)
Teresa Bradford (w/ enclosure)

L. TYPICAL STORM WATER DIVERSION BERM DETAIL



NOTES:

1. BERM IS TO BE CONSTRUCTED AS PROTECTIVE COVER IS EXCAVATED, COMPACTION IS NOT REQUIRED.
2. CONTRACTOR SHALL USE EXTREME CARE WHEN EXCAVATING DOWN TO THE LINER TO PREVENT DAMAGE BY THE EQUIPMENT. SOME HAND DIGGING WILL BE REQUIRED TO FULLY EXPOSE THE EXISTING LINER.
3. ONLY TRACKED EQUIPMENT MAY BE USED OVER THE CONSTRUCTED LINER. ALL RUBBER TIRED VEHICLES SHOULD UTILIZE MINIMUM 4' THICK HAUL ROADS.

TEMPORARY STORM WATER DIVERSION BERM (INSIDE CELL)

SCALE: 1"=3'

M. OPERATIONAL DRAWINGS

OPERATIONAL DRAWINGS

The Phase 2 Operation Plan Drawings and the Phase 2 Engineering Plan Drawings, originally prepared by Municipal Engineering Services, P.A. and dated December, 2006, are approved drawings for the facility and are incorporated into this plan by reference. A table of contents from the 2 sets of plans are summarized below:

Phase 2 Operation Plans:

Sheet No.	Description
1.	Title Sheet
2.	Index Sheet
3.	Facility Operations Plan
4.	Initial Placement of Waste
5.	Initial Fill Plan
6.	Fill Sequence 1
7.	Fill Sequence 2
8.	Fill Sequence 3
9.	Fill Sequence 4
10.	Final Fill with Intermediate Cover
11.	Methane Gas Collection
12.	Miscellaneous Details

Phase 2 Engineering Plans:

Sheet No.	Description
1.	Title Sheet
2.	Index Sheet
3.	Existing Conditions
4.	Proposed Subgrade
5.	Top of Cohesive Soil Liner
6.	Top of Protective Cover
7.	Leachate Collection System
8.	Baseline Profile and Cross Sections
9.	Base Line Details
10.	Alternate Liner Details
11.	Land Clearing Phase Erosion Control
12.	Construction Phase Erosion Control
13.	Erosion Control Details

The following plan sheets have been revised and updated to show continued waste filling within the constructed waste footprints of Phases No. 1 & 2. The Phase 2 Operation Plans, originally prepared by MESCO Engineering and dated December, 2006, show waste filling within Phases No. 1 & 2 up to an approximate elevation of 470.00 MSL.

The revised final grading plan is consistent with the final build-out grades as shown on the approved Facility Plan drawings prepared by MESCO Engineering and dated December, 2006, and will allow for

continued waste filling and more efficient operations within the existing constructed cells over the next 5 year period.

Phase 2 Permit Renewal Plans:

Sheet No.	Description
-	Title Sheet
1.	Boundary Survey – Sheet 1 of 2
2.	Boundary Survey – Sheet 2 of 2
3.	Overall Site – Existing Topographic Conditions
4.	MSW Area Facility Plan
5.	Leachate Collection Plan
6.	Leachate Collection Plan – Proposed Forcemain
7.	MSW Landfill – Phase 2 Final Grading Plan
8.	MSW Landfill – Phase 2 Cross Section A
9.	C&D Landfill Area – 5 Year Sequence Grading Plan

PERMIT RENEWAL PLANS

FOR

CITY OF ALBEMARLE MSW AND C&D LANDFILLS

CITY OF ALBEMARLE

STANLY COUNTY, NORTH CAROLINA

JUNE, 2014
REVISED: MAY, 2015

OWNER/OPERATOR/PERMITTEE

CITY OF ALBEMARLE
ALBEMARLE CITY HALL
144 NORTH 2nd STREET, P.O. BOX 190
ALBEMARLE, NC 28002
(704) 984-9667

MAYOR

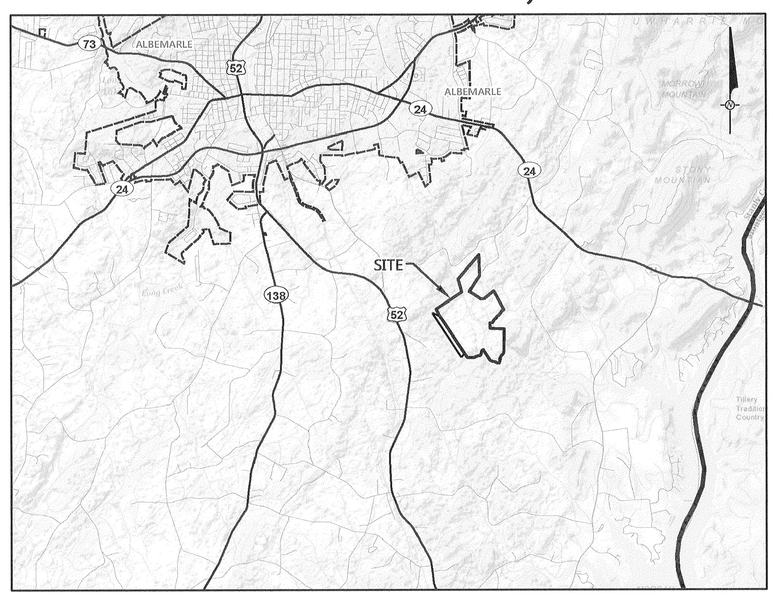
GERALD R. "RONNIE" MICHAEL

CITY MANAGER

RAYMOND I. ALLEN

DIRECTOR OF PUBLIC WORKS

NINA UNDERWOOD



PROJECT SITE LOCATION
SCALE: 1" = 1 MILE

INDEX TO DRAWINGS

SHEET NO.	DESCRIPTION
-	TITLE SHEET
1	BOUNDARY SURVEY - SHEET 1 OF 2
2	BOUNDARY SURVEY - SHEET 2 OF 2
3	OVERALL SITE - EXISTING TOPOGRAPHIC CONDITIONS
4	MSW AREA FACILITY PLAN
5	LEACHATE COLLECTION PLAN
6	LEACHATE COLLECTION PLAN - PROPOSED FORCEMAIN
7	MSW LANDFILL - PHASE 2 FINAL GRADING PLAN
8	MSW LANDFILL - PHASE 2 CROSS SECTION A
9	C&D LANDFILL AREA - 5 YEAR SEQUENCE GRADING PLAN

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHECK

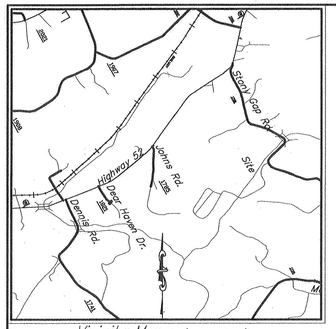
HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers

3920 ARKWRIGHT ROAD SUITE 101 - MACON, GEORGIA 31201
PHONE: (478) 743-7175
FAX: (478) 743-1703
NC CORP LICENSE NO. C-0813

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE

REVISION HISTORY

DATE	SHEET NO.
5/7/15	TS, 1-9



Vicinity Map (not to Scale)

Notice

This Plat is not for subdivision purposes, and is recorded to provide notice of landfill waste disposal areas, possible contamination and restricted landfill buffer properties.

NOTE:
Monitor Wells 13-27 Surveyed by others.

Flood Certification
I have examined the Flood Insurance Rate Map for Stanly County North Carolina, Community Panel Number 3710655600 J and 3710655700, dated September 3, 2008, and hereby certify that this property is not located in a special flood hazard area as determined by the Federal Emergency Management Agency.

Certificate of Survey and Accuracy
State of North Carolina, Union County
I, F. Donald Lawrence, certify that this plat was drawn under my supervision from an actual survey made under my supervision deed recorded in Book (As shown); that the boundaries not surveyed are clearly indicated as dashed lines drawn from adjoining owners deeds as shown; that the ratio of precision as calculated is 1:10,000 or better; that this plat was prepared in accordance with G.S. 47-30 as amended.
This survey is a recombination of existing parcels, a court ordered survey or other exception to the definition of subdivision.

Witness my original signature, registration number and seal this the 9 day of May, A.D., 20 14

F. Donald Lawrence, NCPLS L-1290

NORTH CAROLINA PROFESSIONAL SEAL L-1290 LAND SURVEYOR F. DONALD LAWRENCE

STATE OF NORTH CAROLINA
COUNTY OF STANLY

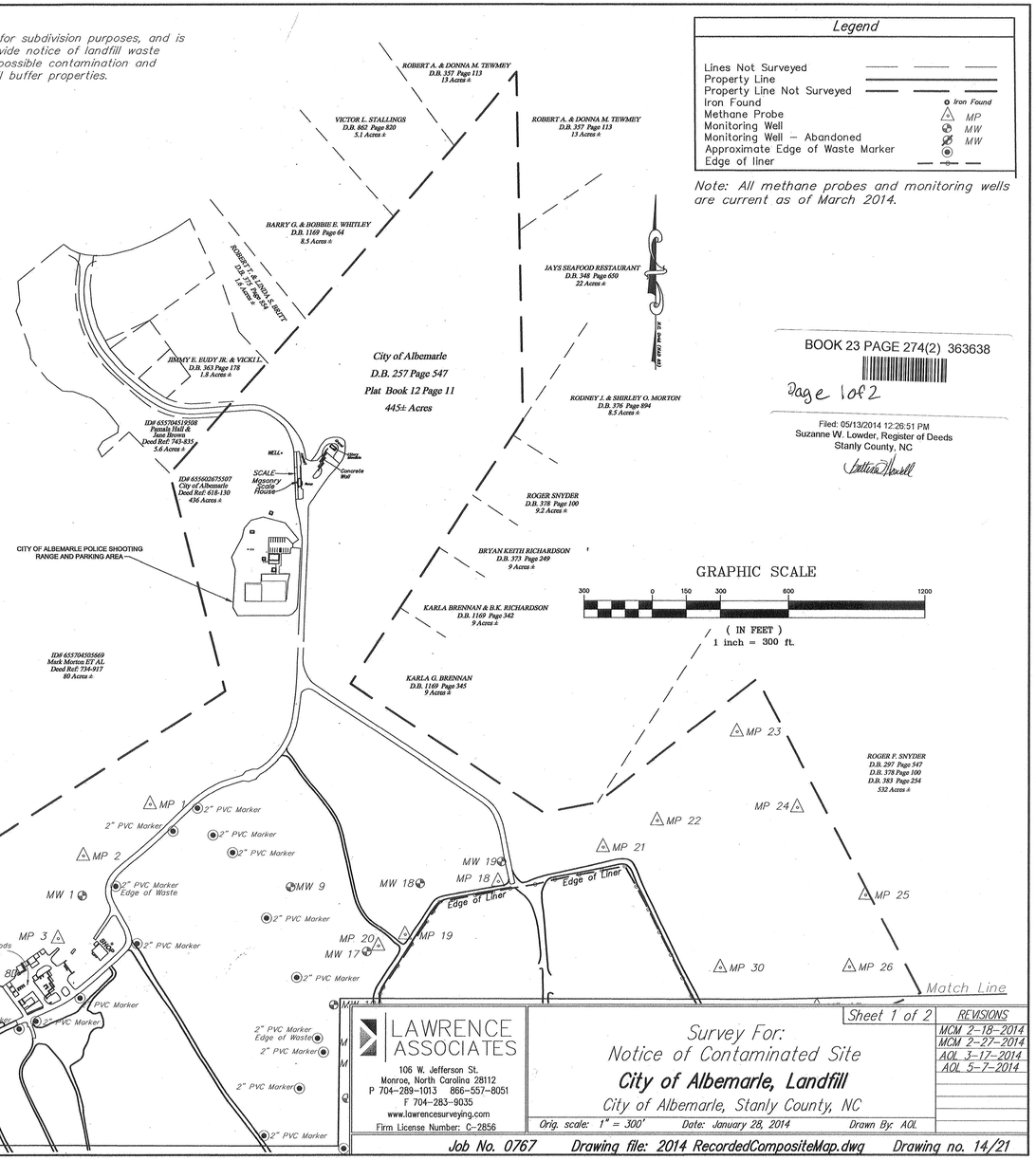
I Michael M. Sandy, Review Officer of Stanly County, certify that the map or plat to which this certification is affixed meets all statutory requirements for recording.

5-9-14
Date Review Officer

Stanly County Health Department

The Enviromental Health Section of the Stanly County Health Department has or has not conducted soil/ site evaluations and issued improvements permite on the following tracts.

Enviromental Health Specialist Date



Legend

Lines Not Surveyed	
Property Line	
Property Line Not Surveyed	
Iron Found	Iron Found
Methane Probe	MP
Monitoring Well	MW
Monitoring Well – Abandoned	MW
Approximate Edge of Waste Marker	
Edge of liner	

Note: All methane probes and monitoring wells are current as of March 2014.

BOOK 23 PAGE 274(2) 363638

Page 1 of 2

Filed: 05/13/2014 12:26:51 PM
Suzanne W. Lowder, Register of Deeds
Stanly County, NC

GRAPHIC SCALE
300 0 150 300 600 1200
(IN FEET)
1 inch = 300 ft.

LAWRENCE ASSOCIATES
106 W. Jefferson St.
Monroe, North Carolina 28112
P 704-289-1013 866-557-8051
F 704-283-9035
www.lawrencesurveying.com
Firm License Number: C-2856

Sheet 1 of 2

Survey For:
Notice of Contaminated Site
City of Albemarle, Landfill
City of Albemarle, Stanly County, NC

Orig. scale: 1" = 300' Date: January 28, 2014 Drawn By: AOL

REVISIONS
MCM 2-18-2014
MCM 2-27-2014
AOL 3-17-2014
AOL 5-7-2014

Job No. 0767 Drawing file: 2014 RecordedCompositeMap.dwg Drawing no. 14/21

L:\Michael\proj\0767 Albemarle Landfill\2014 Recorded CompositeMap-rev.dwg 2/27/2014 2:13:37 PM EST

REVISED: MAY 7, 2015

BOUNDARY SURVEY - SHEET 1 OF 2

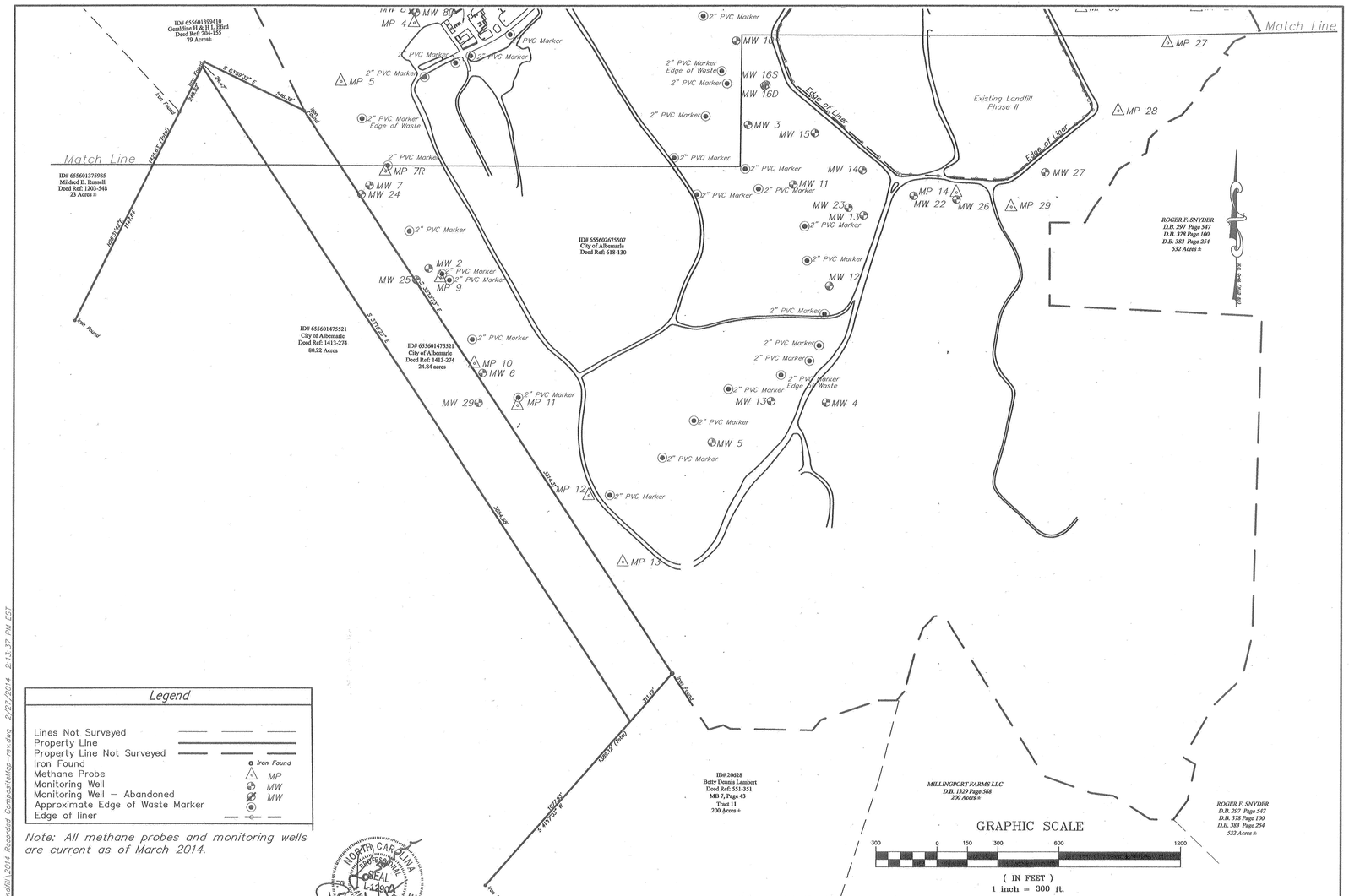
PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers
NC CORP LICENSE NO. C-0813

(478) 743-7175
(478) 743-1703(FAX)

3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-1,2-BS
SCALE	1" = 300'	SHEET 1 OF 9	
DATE	JUNE, 2014		



Legend

Lines Not Surveyed	
Property Line	
Property Line Not Surveyed	
Iron Found	Iron Found
Methane Probe	MP
Monitoring Well	MW
Monitoring Well – Abandoned	MW
Approximate Edge of Waste Marker	
Edge of liner	

Note: All methane probes and monitoring wells are current as of March 2014.

NORTH CAROLINA PROFESSIONAL SEAL L-1900 RONALD LAWRENCE

BOOK 23 PAGE 275(2) 363638

Page 2 of 2

Filed: 05/13/2014 12:28:08 PM
Suzanne W. Lowder, Register of Deeds
Stanly County, NC

Notice

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LAWRENCE ASSOCIATES
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Monroe, North Carolina 28112
P 704-289-1013 866-557-8051
F 704-283-9035
www.lawrencesurveying.com
Firm License Number: C-2856

Sheet 2 of 2

Survey For:
Notice of Contaminated Site
City of Albemarle, Landfill
City of Albemarle, Stanly County, NC

Orig. scale: 1" = 300' Date: January 28, 2014 Drawn By: AOL

REVISIONS
MCM 2-18-2014
MCM 2-27-2014
AOL 3-17-2014
AOL 3-19-2014
AOL 5-7-2014

Job No. 0767 Drawing file: 2014 RecordedCompositeMap.dwg Drawing no. 14/21

L:\Michael\proj\0767 Albemarle Landfill\2014 Recorded CompositeMap-rev.dwg 2/27/2014 2:13:37 PM EST

REVISED: MAY 7, 2015

BOUNDARY SURVEY - SHEET 2 OF 2

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
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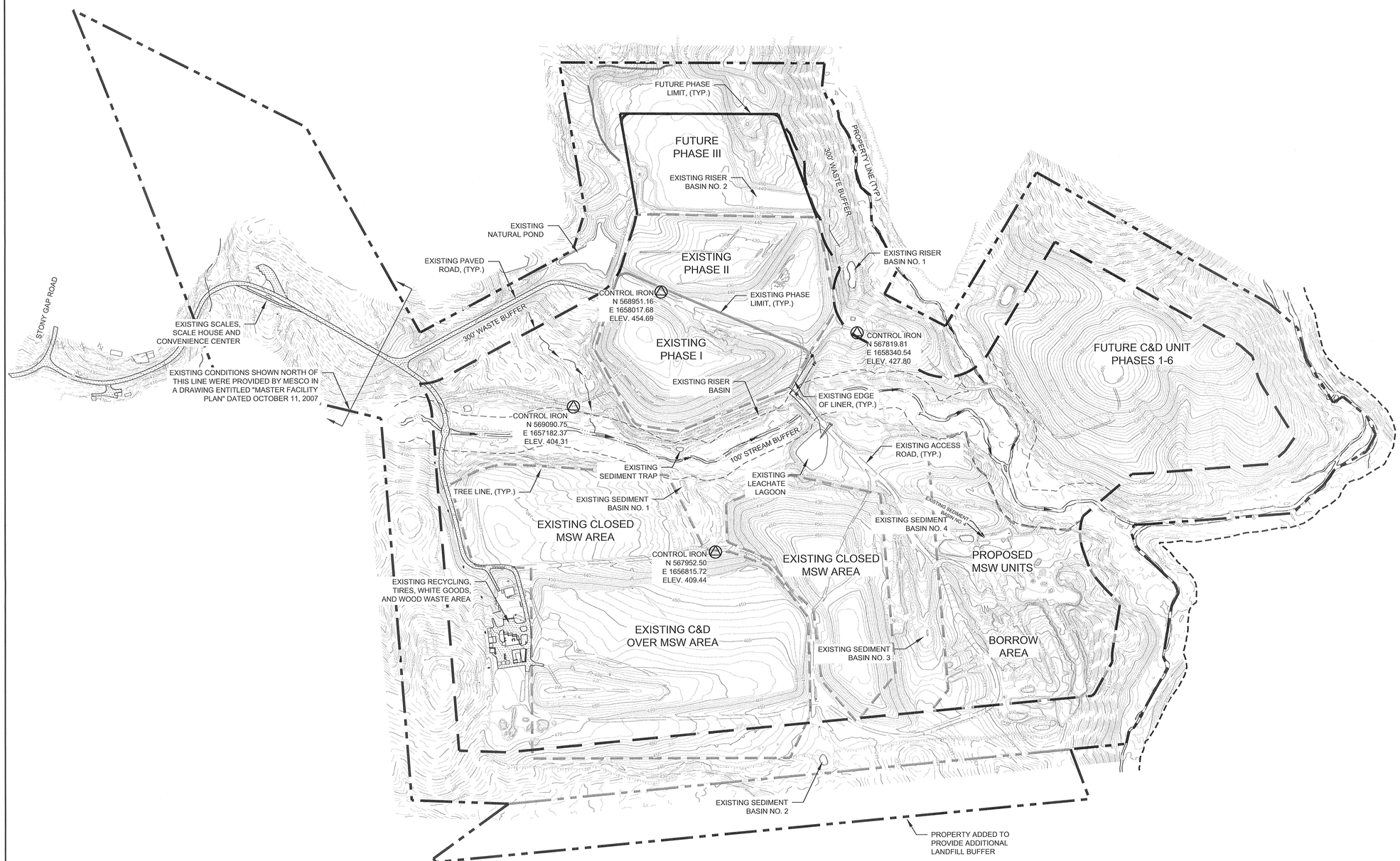
(478) 743-1703(FAX)

3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-1,2-BS
SCALE	1" = 300'	SHEET	2 OF 9
DATE	JUNE, 2014		



LEGEND

- PROPERTY LINE
- PROPERTY BUFFER
- STREAM BUFFER
- FUTURE PHASE LIMIT
- EXISTING PHASE LIMIT
- EXISTING EDGE OF LINER
- EXISTING 2' CONTOUR (102)
- EXISTING 2' CONTOUR (DASHED)
- EXISTING 10' CONTOUR (100)
- EXISTING 10' CONTOUR (DASHED)
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING TREE LINE
- EXISTING BENCH MARK

GENERAL NOTES:

1. THE EXISTING PROPERTY BOUNDARY WAS PROVIDED BY LAWRENCE ASSOCIATES IN A DRAWING ENTITLED "SURVEY FOR: NOTICE OF CONTAMINATED SITE, CITY OF ALBEMARLE, LANDFILL" DATED JANUARY 28, 2014.
2. THE EXISTING AERIAL TOPOGRAPHIC SURVEY WAS PREPARED BY SPATIAL DATA CONSULTANTS, INC., DATE OF PHOTOGRAPHY JULY 29, 2013.
3. CONTOURS PORTRAYED AS DASHED OR BROKEN LINES REPRESENT AREAS OF DENSE VEGETATION AND SHOULD BE CONSIDERED APPROXIMATE.
4. THE EXISTING SURVEY CONTROL POINT WAS PROVIDED BY LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "ALBLANDFILL3-23-11".
5. THE PHASE 1 EXISTING EDGE OF LINER WAS PROVIDED BY F. DONALD LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "AS-BUILT SURVEY - ALBEMARLE LANDFILL CELL" DATED NOVEMBER 25, 1998 AND LAST REVISED FEBRUARY 25, 1999.
6. THE PHASE 2 EXISTING EDGE OF LINER WAS PROVIDED BY ALOIS CALLEMYN, PLS IN A DRAWING ENTITLED "AS-BUILT COHESIVE SOIL LINER - MUNICIPAL SOLID WASTE LANDFILL FACILITY" DATED SEPTEMBER, 2008.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 5-18-15 ENGINEER K. MATTHEW CHEEK

300 150 0 300 600
GRAPHIC SCALE IN FEET

REVISED: MAY 7, 2015

OVERALL SITE - EXISTING TOPOGRAPHIC CONDITIONS

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers
NC CORP LICENSE NO. C-0813
(478) 743-7175
(478) 743-1703(FAX)
3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-3-TP
SCALE	1" = 300'	SHEET	3 OF 9
DATE	JUNE, 2014		

FUTURE PHASE III

FUTURE PHASE LIMIT, (TYP.)

300' WASTE BUFFER

MP 27

MP 22

MP 30

EXISTING RISER BASIN NO. 2

MP 28

MP 21

PROPERTY LINE, (TYP.)

LIMIT OF WASTE AND FINAL COVER SYSTEM SHALL BE KEPT OUTSIDE OF THE 300' BUFFER ZONE

EXISTING NATURAL POND

EXISTING PHASE II

MW 27

EXISTING RISER BASIN NO. 1

EXISTING PAVED ROAD, (TYP.)

MW 19

MP 18

CONTROL IRON
N 568951.16
E 1658017.68
ELEV. 454.69

EXISTING PHASE LIMIT, (TYP.)

LIMIT OF WASTE AND FINAL COVER SYSTEM SHALL BE KEPT OUTSIDE OF THE 300' BUFFER ZONE

MP 29

COVERED SHED

300' WASTE BUFFER

EXISTING PHASE I

CONTROL IRON
N 567819.81
E 1658340.54
ELEV. 427.80

EXISTING EDGE OF LINER, (TYP.)

MW 18

MP 14

MW 26

EXISTING LEACHATE CLEANOUT

EXISTING LEACHATE MANHOLE

EXISTING ACCESS ROAD, (TYP.)

MP 19

MW 22

EXISTING 8" x 12" DUAL CONTAINED LEACHATE PIPE

EXISTING LEACHATE MANHOLE

MP 20

CONTROL IRON
N 569090.75
E 1657182.37
ELEV. 404.31

MW 17

MW 14

EXISTING 6' DIAMETER HDPE PUMP STATION

EXISTING 4' DIAMETER HDPE LEAK DETECTION MANHOLE

EXISTING 10" x 14" DUAL CONTAINED HDPE LEACHATE PIPE CAPPED AND ABANDONED IN PLACE

MW 13

EXISTING 8" HDPE DUAL CONTAINED PIPE

MW 15

MW 23

EXISTING 4" HDPE LEAK DETECTION PIPE

MW 9

MW 16S

MW 16D

EXISTING SEDIMENT TRAP

MW 10

100' STREAM BUFFER

MW 11

EXISTING LEACHATE STORAGE LAGOON

TREE LINE, (TYP.)

MW 3

MW 12

LEGEND

PROPERTY LINE	
PROPERTY BUFFER	
STREAM BUFFER	
FUTURE PHASE LIMIT	
EXISTING PHASE LIMIT	
EXISTING EDGE OF LINER	
EXISTING 2' CONTOUR	102
EXISTING 2' CONTOUR (DASHED)	
EXISTING 10' CONTOUR	100
EXISTING 10' CONTOUR (DASHED)	
EXISTING LEACHATE LINE	L
EXISTING LEACHATE MANHOLE / PUMP STATION	
EXISTING UNPAVED ROAD	
EXISTING PAVED ROAD	
EXISTING TREE LINE	
EXISTING BENCH MARK	
EXISTING GROUNDWATER MONITORING WELL	MW-6
EXISTING METHANE MONITORING PROBE	MP-9

GENERAL NOTES:

1. THE EXISTING PROPERTY BOUNDARY WAS PROVIDED BY LAWRENCE ASSOCIATES IN A DRAWING ENTITLED "SURVEY FOR: NOTICE OF CONTAMINATED SITE, CITY OF ALBEMARLE, LANDFILL" DATED JANUARY 28, 2014.
2. THE EXISTING AERIAL TOPOGRAPHIC SURVEY WAS PREPARED BY SPATIAL DATA CONSULTANTS, INC., DATE OF PHOTOGRAPHY JULY 29, 2013.
3. CONTOURS PORTRAYED AS DASHED OR BROKEN LINES REPRESENT AREAS OF DENSE VEGETATION AND SHOULD BE CONSIDERED APPROXIMATE.
4. THE EXISTING SURVEY CONTROL POINT WAS PROVIDED BY LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "ALBLANDFILL3-23-11".
5. EXISTING LEACHATE INFORMATION BETWEEN PHASE II AND THE EXISTING LEACHATE POND WAS TAKEN FROM AN AS-BUILT SURVEY PREPARED BY LAWRENCE ASSOCIATES ENTITLED "PIPE LOCATIONS", DATED 10/22/2012.
6. THE PHASE 1 EXISTING EDGE OF LINER WAS PROVIDED BY F. DONALD LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "AS-BUILT SURVEY - ALBEMARLE LANDFILL CELL" DATED NOVEMBER 25, 1998 AND LAST REVISED FEBRUARY 25, 1999.
7. THE PHASE 2 EXISTING EDGE OF LINER WAS PROVIDED BY ALOIS CALLEMYN, PLS IN A DRAWING ENTITLED "AS-BUILT COHESIVE SOIL LINER - MUNICIPAL SOLID WASTE LANDFILL FACILITY" DATED SEPTEMBER, 2008.
8. EXISTING GROUNDWATER WELL AND METHANE MONITORING PROBE LOCATIONS PROVIDED BY LAWRENCE ASSOCIATES IN A DRAWING ENTITLED "SURVEY FOR: NOTICE OF CONTAMINATED SITE" DATED JANUARY 28, 2014 AND LAST REVISED MAY 7, 2014.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHEEK 5-21-15

100 50 0 100 200
GRAPHIC SCALE IN FEET

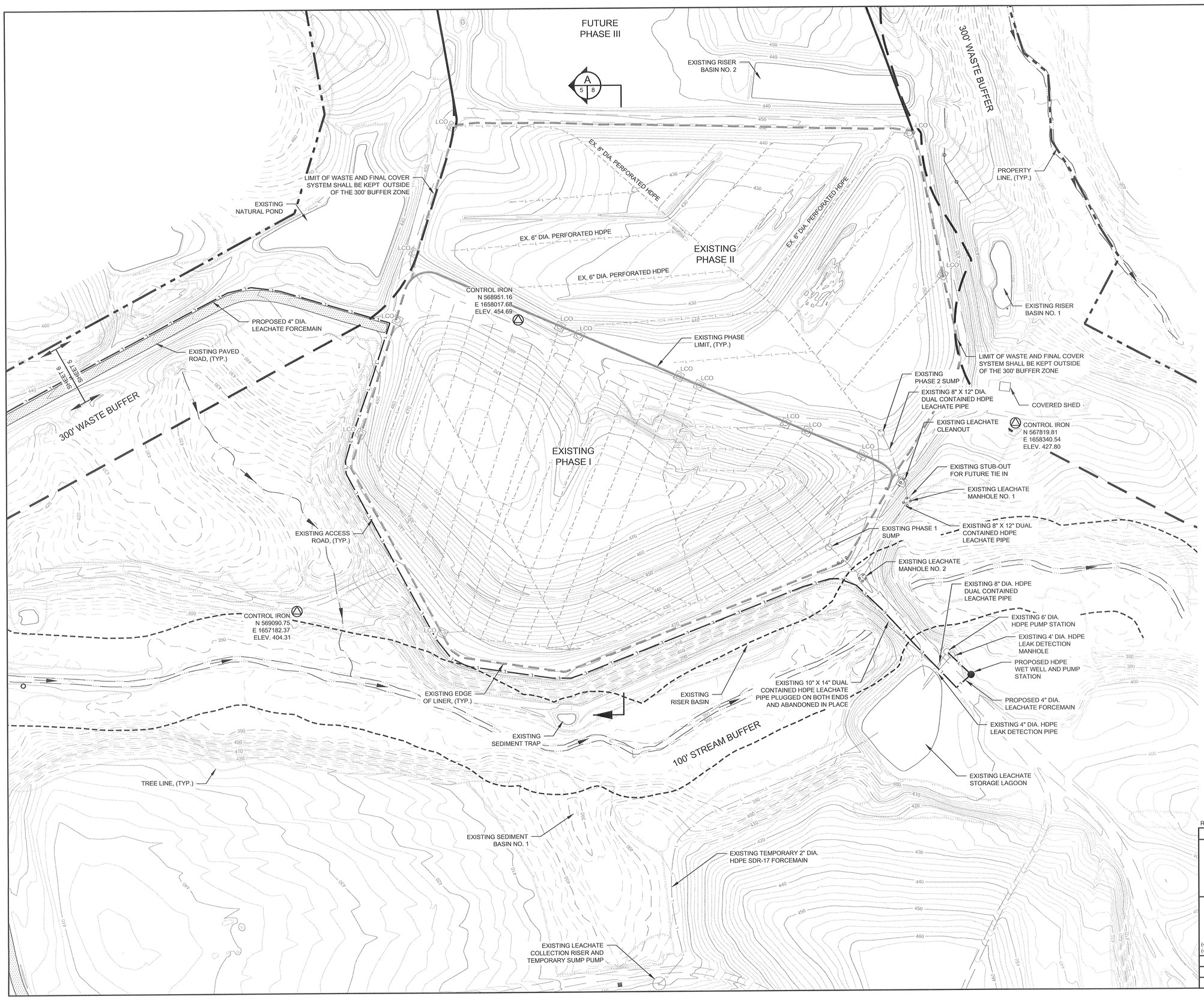
REVISED: MAY 7, 2015

MSW AREA FACILITY PLAN

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers
NC CORP LICENSE NO. C-0813
(478) 743-7175
(478) 743-1703(FAX)
3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-4-FP
SCALE	1" = 100'	SHEET 4 OF 9	
DATE	JUNE, 2014		



LEGEND

- PROPERTY LINE
- PROPERTY BUFFER
- STREAM BUFFER
- FUTURE PHASE LIMIT
- EXISTING PHASE LIMIT
- EXISTING EDGE OF LINER
- EXISTING 2' CONTOUR (102)
- EXISTING 2' CONTOUR (DASHED)
- EXISTING 10' CONTOUR (100)
- EXISTING 10' CONTOUR (DASHED)
- EXISTING LEACHATE LINE
- EXISTING LEACHATE MANHOLE / PUMP STATION
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING TREE LINE
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GENERAL NOTES:

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5. EXISTING LEACHATE INFORMATION IN THE MSW LANDFILL PHASE I AREA WAS TAKEN FROM AN AS-BUILT SURVEY PREPARED BY FDL & ASSOCIATES ENTITLED "AS BUILT OF LEACHATE COLLECTION SYSTEM", DATED 3/8/1999.
6. EXISTING LEACHATE INFORMATION IN THE MSW LANDFILL PHASE II AREA WAS TAKEN FROM A DRAWING ENTITLED "THALLE ALBERMARLE AS-BUILT".
7. EXISTING LEACHATE INFORMATION BETWEEN PHASE II AND THE EXISTING LEACHATE POND WAS TAKEN FROM AN AS-BUILT SURVEY PREPARED BY LAWRENCE ASSOCIATES ENTITLED "PIPE LOCATIONS", DATED 10/22/2012.
8. THE TEMPORARY LEACHATE COLLECTION SYSTEM FOR THE C&D OVER MSW LANDFILL AREA WAS TAKEN FROM AN AS-BUILT SURVEY DATED 2/11/11.
9. THE PHASE 1 EXISTING EDGE OF LINER WAS PROVIDED BY F. DONALD LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "AS-BUILT SURVEY - ALBEMARLE LANDFILL CELL" DATED NOVEMBER 25, 1998 AND LAST REVISED FEBRUARY 25, 1999.
10. THE PHASE 2 EXISTING EDGE OF LINER WAS PROVIDED BY ALOIS CALLEMYN, PLS IN A DRAWING ENTITLED "AS-BUILT COHESIVE SOIL LINER - MUNICIPAL SOLID WASTE LANDFILL FACILITY" DATED SEPTEMBER, 2008.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER P. GRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHEEK 5-19-15

100 50 0 100 200
GRAPHIC SCALE IN FEET

REVISED: MAY 7, 2015

LEACHATE COLLECTION PLAN

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
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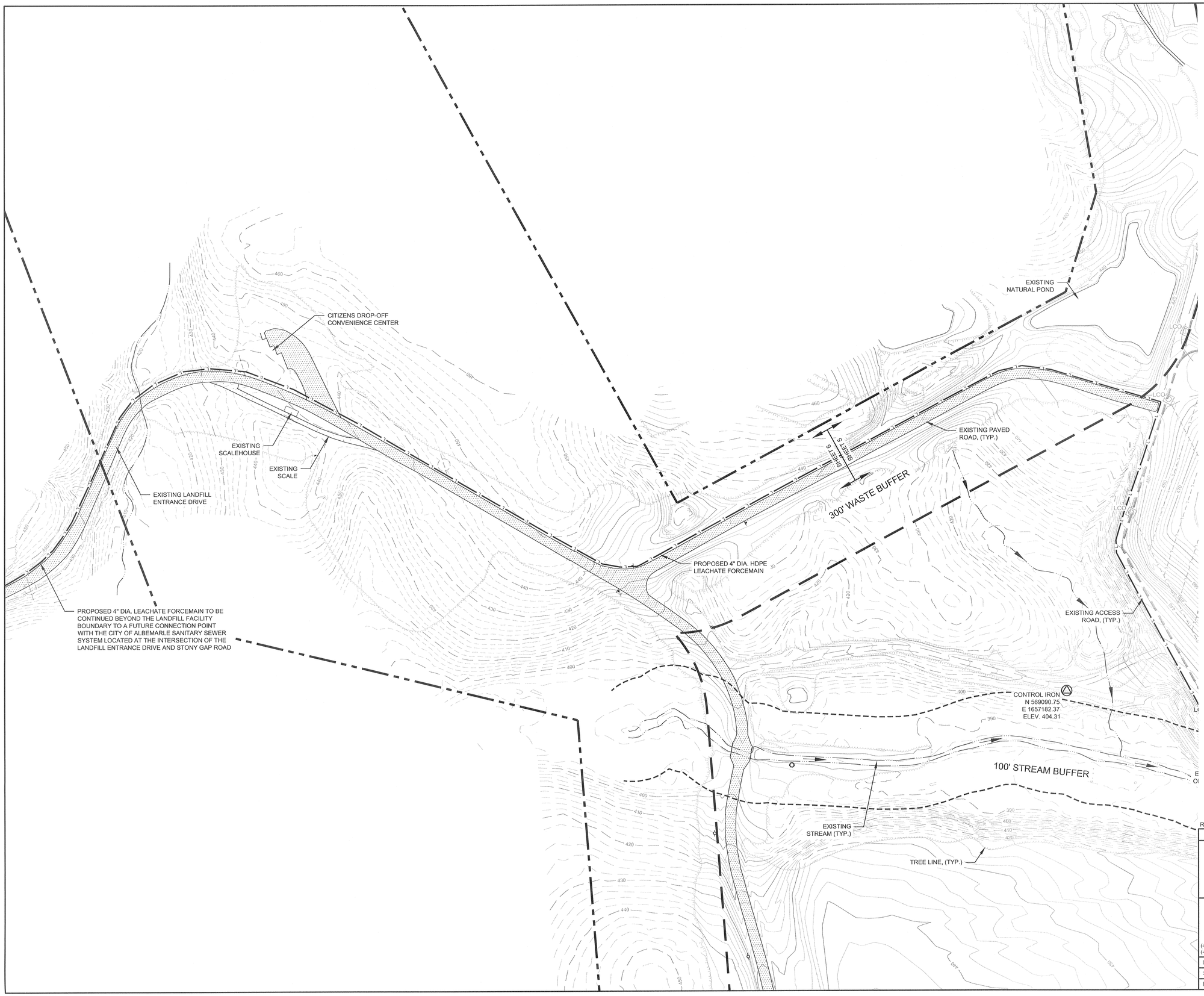
3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-5-L
SCALE	1" = 100'	SHEET	5 OF 9
DATE	MAY, 2015		



LEGEND

- PROPERTY LINE
- PROPERTY BUFFER
- STREAM BUFFER
- FUTURE PHASE LIMIT
- EXISTING PHASE LIMIT
- EXISTING EDGE OF LINER
- EXISTING 2' CONTOUR (102)
- EXISTING 2' CONTOUR (DASHED)
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- EXISTING LEACHATE LINE
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GENERAL NOTES:

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10. THE PHASE 2 EXISTING EDGE OF LINER WAS PROVIDED BY ALOIS CALLEMYN, PLS IN A DRAWING ENTITLED "AS-BUILT COHESIVE SOIL LINER - MUNICIPAL SOLID WASTE LANDFILL FACILITY" DATED SEPTEMBER, 2008.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW GREEK 5/18/15

100 50 0 100 200
GRAPHIC SCALE IN FEET

REVISED: MAY 7, 2015

LEACHATE COLLECTION PLAN - PROPOSED FORCEMAIN

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers
NC CORP LICENSE NO. C-0813
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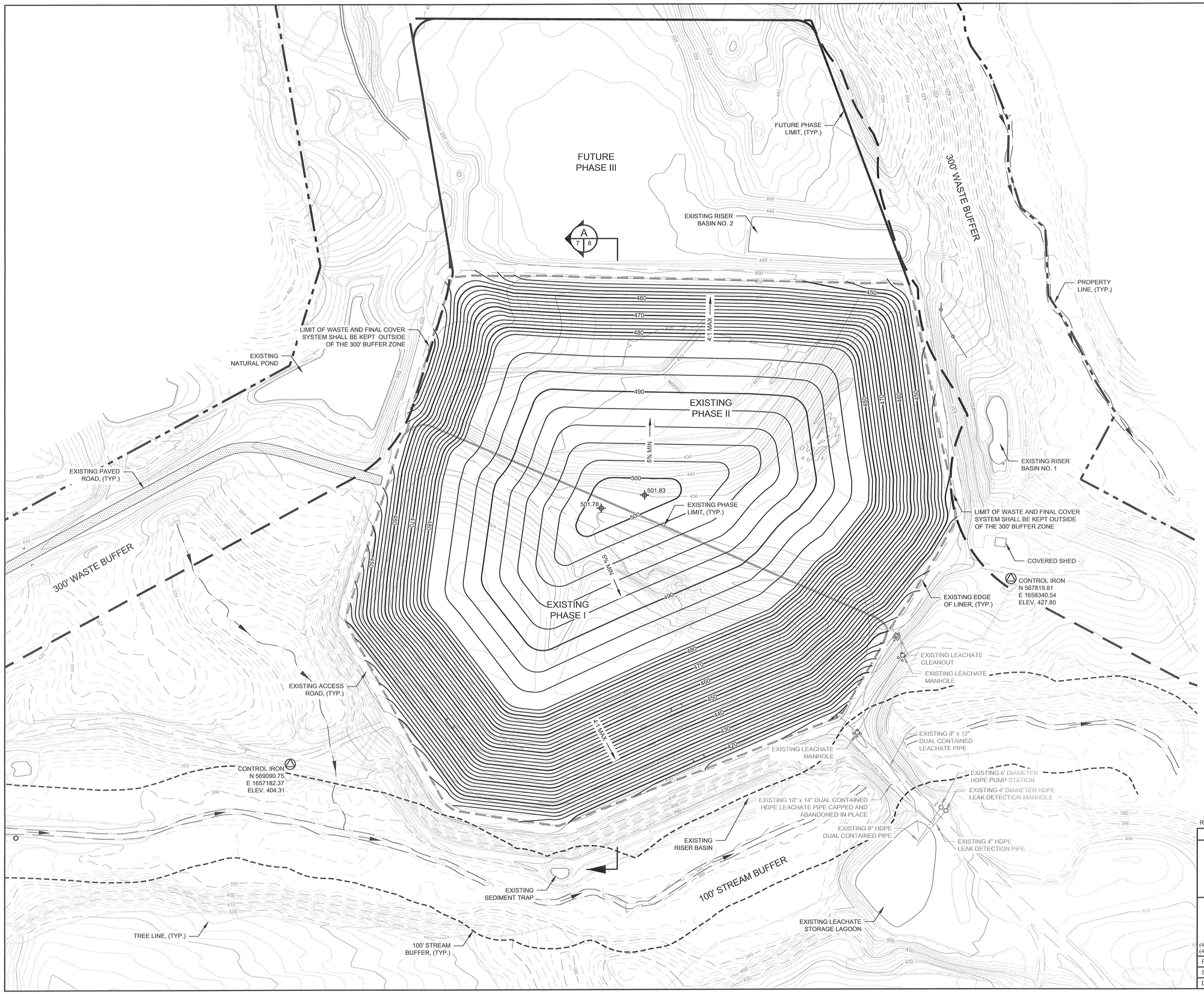
(478) 743-1703(FAX)
3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-6-L2
SCALE	1" = 100'	SHEET	6 OF 9
DATE	MAY, 2015		



LEGEND

PROPERTY LINE	
PROPERTY BUFFER	
STREAM BUFFER	
FUTURE PHASE LIMIT	
EXISTING PHASE LIMIT	
EXISTING EDGE OF LINER	
EXISTING 2' CONTOUR	102
EXISTING 2' CONTOUR (DASHED)	
EXISTING 10' CONTOUR	100
EXISTING 10' CONTOUR (DASHED)	
PROPOSED 2' CONTOUR	
PROPOSED 10' CONTOUR	450
EXISTING UNPAVED ROAD	
EXISTING PAVED ROAD	
EXISTING TREE LINE	
EXISTING BENCH MARK	
PROPOSED SPOT ELEVATION	552.00

GENERAL NOTES:

1. FINAL GRADES SHOWN ON THIS SHEET HAVE BEEN REVISED FROM WHAT WAS SHOWN ON THE PHASE 2 OPERATION PLANS, ORIGINALLY PREPARED BY MESCO ENGINEERING AND DATED DECEMBER, 2006, WHICH SHOW WASTE FILLING WITHIN PHASES 1 & 2 UP TO AN APPROXIMATE ELEVATION OF 470.00 MEAN SEA LEVEL. THESE REVISED GRADES ARE CONSISTENT WITH THE FINAL BUILD-OUT GRADES AS SHOWN ON THE APPROVED FACILITY PLAN DRAWINGS PREPARED BY MESCO ENGINEERING AND DATED DECEMBER, 2006, AND WILL ALLOW FOR CONTINUED WASTE FILLING AND MORE EFFICIENT OPERATIONS WITHIN THE EXISTING CONSTRUCTED CELLS OVER THE NEXT 5 YEAR PERIOD.
2. THE EXISTING PROPERTY BOUNDARY WAS PROVIDED BY LAWRENCE ASSOCIATES IN A DRAWING ENTITLED "SURVEY FOR: NOTICE OF CONTAMINATED SITE, CITY OF ALBEMARLE, LANDFILL" DATED JANUARY 28, 2014.
3. THE EXISTING AERIAL TOPOGRAPHIC SURVEY WAS PREPARED BY SPATIAL DATA CONSULTANTS, INC., DATE OF PHOTOGRAPHY JULY 29, 2013.
4. THE CONTOURS PORTRAYED AS DASHED OR BROKEN LINES REPRESENT AREAS OF DENSE VEGETATION AND SHOULD BE CONSIDERED APPROXIMATE.
5. THE EXISTING SURVEY CONTROL POINT WAS PROVIDED BY LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "ALBLANDFILL3-23-11".
6. THE EXISTING LEACHATE COLLECTION SYSTEM OUTSIDE OF THE LINED AREA WAS PROVIDED BY HODGES, HARBIN, NEWBERRY, & TRIBBLE, INC IN A DRAWING ENTITLED "LEACHATE MANHOLE DETAILS - AS-BUILT CONDITIONS" DATED APRIL, 2012.
7. THE PHASE 1 EXISTING EDGE OF LINER WAS PROVIDED BY F. DONALD LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "AS-BUILT SURVEY - ALBEMARLE LANDFILL CELL" DATED NOVEMBER 25, 1998 AND LAST REVISED FEBRUARY 25, 1999.
8. THE PHASE 2 EXISTING EDGE OF LINER WAS PROVIDED BY ALOIS CALLEMYN, PLS IN A DRAWING ENTITLED "AS-BUILT COHESIVE SOIL LINER - MUNICIPAL SOLID WASTE LANDFILL FACILITY" DATED SEPTEMBER, 2008.
9. THE PROPOSED CONTOURS SHOWN WITHIN THE LANDFILL FOOTPRINT REPRESENT THE TOP OF FINAL COVER ON ALL OUTSIDE PERMANENT SLOPES .
10. THESE PROPOSED FINAL GRADES SHALL BE AT A MAXIMUM SLOPE OF 4(H):1(V) AND SHALL HAVE A MINIMUM SLOPE OF 5.0%.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHEEK

100 50 0 100 200
GRAPHIC SCALE IN FEET

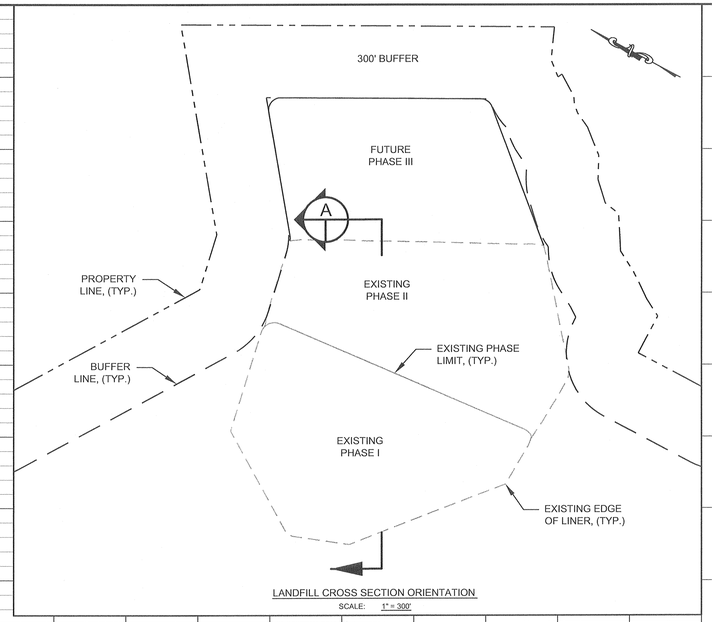
REVISED: MAY 7, 2015

MSW LANDFILL - PHASE 2 FINAL GRADING PLAN

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

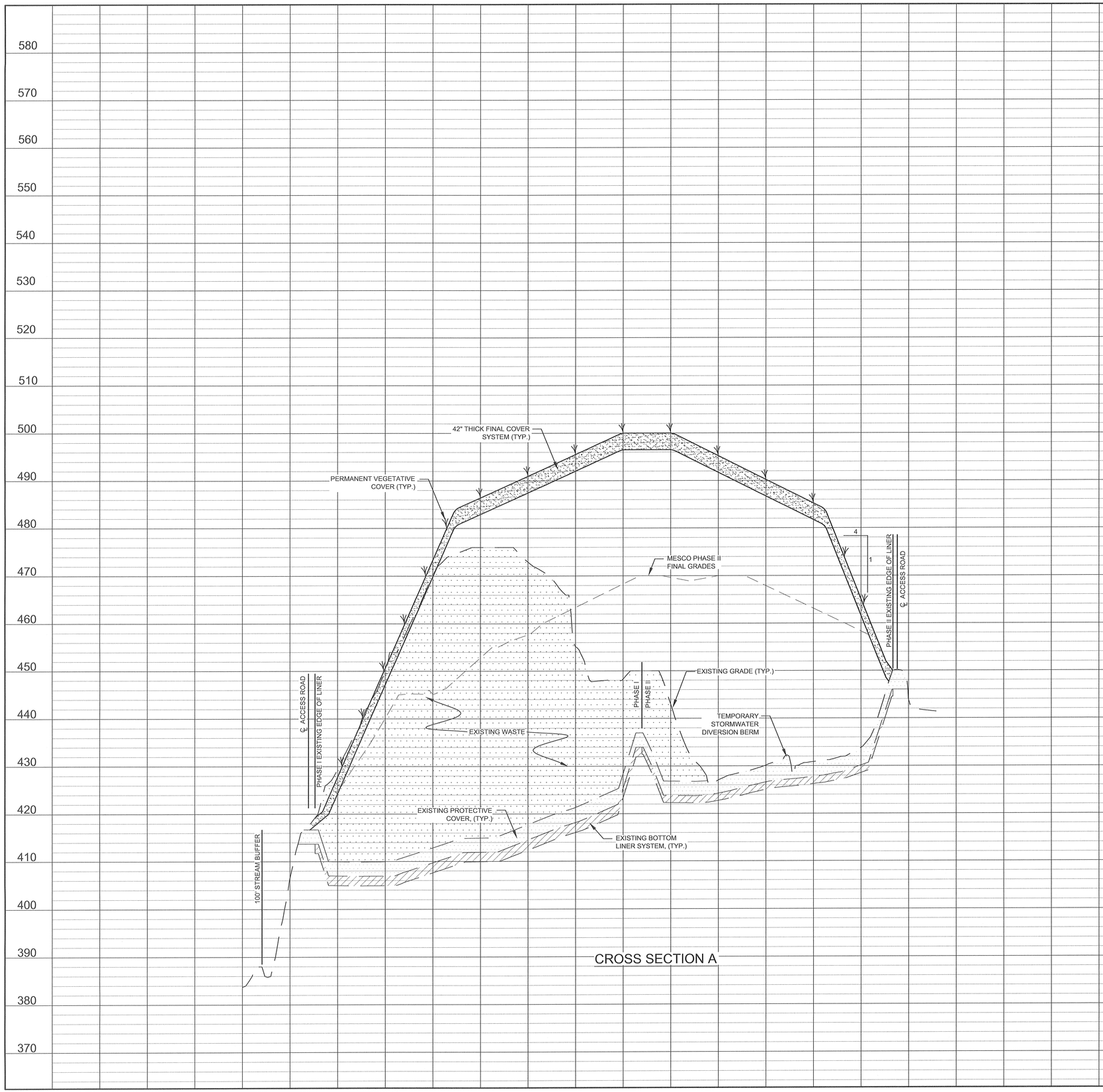
HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers
NC CORP LICENSE NO. C-0813
(478) 743-7175
(478) 743-1703(FAX)
3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALBM-PH2-7-FG
SCALE	1" = 100'	SHEET 7 OF 9	
DATE	JUNE, 2014		



LANDFILL CROSS SECTION ORIENTATION

SCALE: 1" = 300'



CROSS SECTION A

GENERAL NOTES:

1. THE EXISTING GRADE WAS TAKEN FROM AERIAL TOPOGRAPHIC INFORMATION PROVIDED BY SPATIAL DATA CONSULTANTS, INC., DATE OF PHOTOGRAPHY: JULY 29, 2013.
2. THE PHASE I SUBGRADE ELEVATIONS WERE PROVIDED BY F. DONALD LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "AS-BUILT SURVEY - ALBEMARLE LANDFILL CELL" DATED NOVEMBER 25, 1999. SUBGRADE ELEVATIONS WERE RAISED 2.0' TO REPRESENT THE TOP OF CLAY.
3. THE PHASE II CLAY AS-BUILT ELEVATIONS WERE PROVIDED BY ALOIS CALLEMYN, PLS IN A DRAWING ENTITLED " AS-BUILT COHESIVE SOIL LINER - MUNICIPAL SOLID WASTE LANDFILL FACILITY" DATED SEPTEMBER, 2008.
4. THE MESCO PHASE II FINAL GRADES WERE PREPARED BY MUNICIPAL ENGINEERING SERVICES COMPANY (MESCO) IN A DRAWING ENTITLED "OPERATION PLAN - PHASE 2 FINAL FILL PLAN" DATED OCTOBER 03, 2006.
5. FINAL GRADES WERE PREPARED BY HODGES, HARBIN, NEWBERRY, & TRIBBLE, INC. AND TAKEN FROM A DRAWING ENTITLED "OPERATION PLAN - PHASE 2 FINAL FILL PLAN" DATED APRIL, 2014.

100 50 0 100 200
GRAPHIC HORIZONTAL SCALE IN FEET

10 5 0 10 20
GRAPHIC VERTICAL SCALE IN FEET

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHECK 5/18/15

REVISED: MAY 7, 2015

MSW LANDFILL - PHASE 2 CROSS SECTION A

PERMIT RENEWAL PLANS

FOR

CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
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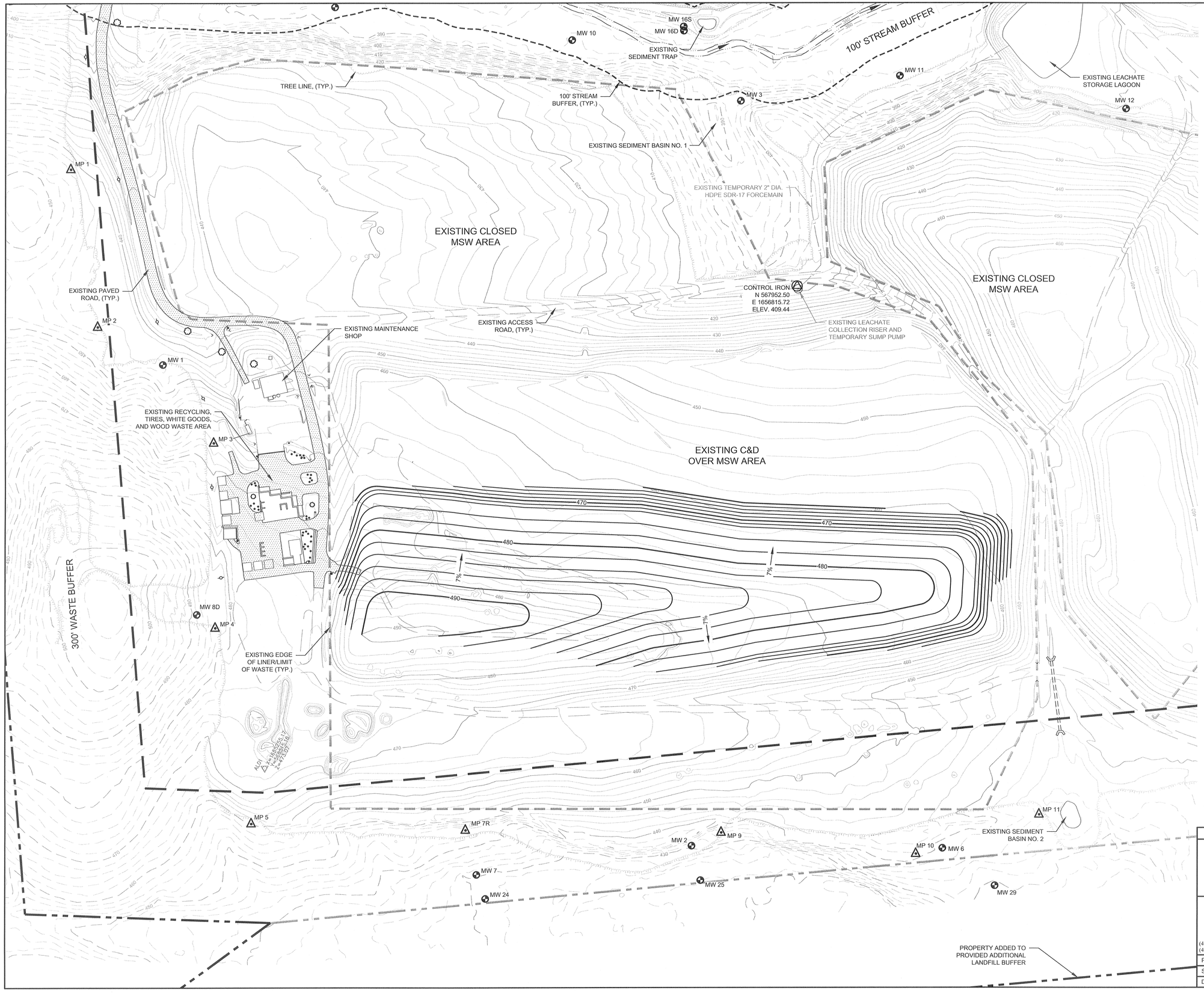
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALB-PH2-8-XSECA
SCALE	HORIZ. 1" = 100'; VERT 1" = 10'	SHEET 8 OF 9	
DATE	JUNE, 2014		



LEGEND

PROPERTY LINE	
PROPERTY BUFFER	
STREAM BUFFER	
EXISTING EDGE OF LINER	
EXISTING 2' CONTOUR	102
EXISTING 2' CONTOUR (DASHED)	
EXISTING 10' CONTOUR	100
EXISTING 10' CONTOUR (DASHED)	
PROPOSED 2' CONTOUR	
PROPOSED 10' CONTOUR	450
EXISTING UNPAVED ROAD	
EXISTING PAVED ROAD	
EXISTING TREE LINE	
EXISTING BENCH MARK	
PROPOSED SPOT ELEVATION	552.00
EXISTING LEACHATE LINE	
EXISTING GRONDWATER MONITORING WELL	MW-6
EXISTING METHANE MONITORING PROBE	MP-9

GENERAL NOTES:

1. THE EXISTING PROPERTY BOUNDARY WAS PROVIDED BY LAWRENCE ASSOCIATES IN A DRAWING ENTITLED "SURVEY FOR: NOTICE OF CONTAMINATED SITE, CITY OF ALBEMARLE, LANDFILL" DATED JANUARY 28, 2014.
2. THE EXISTING AERIAL TOPOGRAPHIC SURVEY WAS PREPARED BY SPATIAL DATA CONSULTANTS, INC., DATE OF PHOTOGRAPHY JULY 29, 2013.
3. THE CONTOURS PORTRAYED AS DASHED OR BROKEN LINES REPRESENT AREAS OF DENSE VEGETATION AND SHOULD BE CONSIDERED APPROXIMATE.
4. THE EXISTING SURVEY CONTROL POINT WAS PROVIDED BY LAWRENCE & ASSOCIATES IN A DRAWING ENTITLED "ALBLANDFILL3-23-11".
5. THE PROPOSED CONTOURS SHOWN WITHIN THE LANDFILL FOOTPRINT REPRESENT THE ANTICIPATED GRADES OVER THE NEXT 5 YEARS . INTERMEDIATE COVER SHALL BE APPLIED AS CALLED FOR IN THE PERMIT.
6. THESE PROPOSED 5 YEAR SEQUENCE GRADES SHALL BE AT A MAXIMUM SLOPE OF 4(H):1(V) AND SHALL HAVE A MINIMUM SLOPE OF 5.0%.
7. EXISTING GROUNDWATER WELL AND METHANE MONITORING PROBE LOCATIONS PROVIDED BY LAWRENCE ASSOCIATES IN A DRAWING ENTITLED "SURVEY FOR: NOTICE OF CONTAMINATED SITE" DATED JANUARY 28, 2014 AND LAST REVISED MAY 7, 2014.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER H. BRANT LANE 5/21/15

NORTH CAROLINA PROFESSIONAL SEAL 32249 ENGINEER K. MATTHEW CHECK

100 50 0 100 200
GRAPHIC SCALE IN FEET

C&D LANDFILL AREA - 5 YEAR SEQUENCE GRADING PLAN

PERMIT RENEWAL PLANS
FOR
CITY OF ALBEMARLE MSW AND C&D LANDFILLS
CITY OF ALBEMARLE
STANLY COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
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SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	1011-010-01	DWG.	ALBM-PH2-9-FG-C&D
SCALE	1" = 100'	SHEET	9 OF 9
DATE	MAY, 2015		

WATER QUALITY MONITORING PLAN

CITY OF ALBEMARLE LANDFILL
ALBEMARLE, NORTH CAROLINA

DSWM PERMIT #84-01

Prepared for:
CITY OF ALBEMARLE PUBLIC WORKS DEPARTMENT
ALBEMARLE, NORTH CAROLINA

By:

SHIELD ENGINEERING, INC.
4301 TAGGART CREEK ROAD
CHARLOTTE, NC 28208

J. David Wallace, P.E.
Project Manager
Registered Engineer #NC 20055

Keith A. Anthony, P.E.
Chief Engineer
Registered Engineer #NC 11260

NORTH CAROLINA PROFESSIONAL SEAL 20055 ENGINEER J. DAVID WALLACE 5/15/15

MAY 2015

WATER QUALITY MONITORING PLAN

CITY OF ALBEMARLE LANDFILL
ALBEMARLE, NORTH CAROLINA

DSWM PERMIT NO. 84-01

Prepared for:

City of Albemarle – Public Works Department
Stanly County, North Carolina

Prepared by:

Shield Engineering, Inc.
Charlotte, North Carolina

May 14, 2015
Shield Project 1110192

TABLE OF CONTENTS

Page

1.0 BACKGROUND INFORMATION 1-1

1.1 INTRODUCTION AND OBJECTIVE 1-1

1.2 SITE CHARACTERISTICS 1-1

1.2.1 Transport Processes 1-2

1.2.2 Site Hydrogeology 1-2

1.2.3 Hydrogeologic Characteristics 1-4

2.0 WATER QUALITY MONITORING PLAN 2-1

2.1 GROUND AND SURFACE WATER MONITORING SYSTEM 2-1

2.1.1 Active C&D and Closed MSWLF 2-1

2.1.2 Subtitle D Lined MSWLF 2-3

2.2 BACKGROUND MONITORING WELL 2-4

2.3 SAMPLING AND ANALYSIS PLAN 2-5

2.3.1 Appendix I Sampling 2-5

2.3.2 Appendix II Sampling 2-6

2.3.3 Monitored Natural Attenuation Sampling 2-6

2.4 ADDITIONS WITH FURTHER CORRECTIVE ACTION 2-6

3.0 SAMPLING AND ANALYSIS PROCEDURES 3-1

3.1 EQUIPMENT 3-1

3.1.1 Water Depth Indicators 3-2

3.1.2 Bailers 3-2

3.1.3 pH Meter 3-3

3.1.4 Conductivity Meter 3-3

3.1.5 Sample Jars 3-3

3.1.6 Sample Shipper 3-4

3.2 SAMPLING PROTOCOL 3-4

3.2.1 Depth-to-Groundwater Measurements 3-5

3.2.2 Total Well Depth 3-5

3.2.3 Groundwater Quality Sampling 3-5

3.2.4 Surface Water Sampling 3-7
3.2.5 Documentation and Delivery 3-8
3.3 ANALYTICAL LABORATORY PROCEDURES 3-10
3.3.1 Analytical Methodology 3-10
3.3.2 Quality Control 3-10
4.0 REFERENCES 4-1

List of Figures

Figure 1 Site Vicinity Map
Figure 2 Water Quality Sampling Locations

List of Tables

Table 1 Summary of Groundwater Monitoring Well Details – Active C&D and Closed MSW Landfill
Table 2 Summary of Groundwater Monitoring Well Details – Subtitle D Lined MSW Landfill
Table 3 Monitored Natural Attenuation (MNA) Parameters
Table 4 Sampling Schedule for Ground and Surface Water Monitoring Locations – Active C&D and Closed MSW Landfill
Table 5 Sampling Schedule for Ground and Surface Water Monitoring Locations – Subtitle D MSW Landfill

1.0 BACKGROUND INFORMATION

1.1 INTRODUCTION AND OBJECTIVE

The Water Quality Plan objective is to provide clear guidelines and procedures for field and laboratory personnel when obtaining and analyzing groundwater and surface water samples. This plan applies to the City of Albemarle Landfills: both the Active C&D and closed MSWLF; and, the Subtitle D Lined MSWLF. Previously, the City of Albemarle Landfill had two Sampling and Analysis Plans (SAPs). One SAP was drafted for the Active C&D and closed MSWLF (*Groundwater and Surface Water Sampling and Analysis Plan* contained in the *Corrective Action Effectiveness Report* [CAER] dated July 1, 2011); and, the second SAP was for the Subtitle D Lined MSWLF (*Ground and Surface Water Sampling and Analysis Plan* contained in the *Design Hydrogeologic Study* completed for the Phase 2 Cell and dated March 2, 2009). This plan is an update of and supersedes both of these SAPs for this site. The sampling procedures outlined in this analysis plan are guidelines by which sampling will be performed. Deviation from the procedures may be warranted depending on facility conditions or unforeseen sampling variables. Alternative sampling procedures must conform to the Solid Waste Section (SWS) *2008 Guidelines for Groundwater, Soil and Surface Water Sampling.*

1.2 SITE CHARACTERISTICS

The City of Albemarle landfill is located off Stony Gap Road (SR 1720), in Stanly County, North Carolina. The City of Albemarle landfill operates under Division of Solid Waste Management (DSWM) Permit #84-01. Prior to operating as an active C&D landfill the site operated as an unlined Municipal Solid Waste sanitary landfill (MSWLF) that consisted of two units. One unit was closed prior to October 1991 with a 24-inch thick final soil cover. The second unit was closed with an 18-inch thick cohesive soil cap with a permeability of 1×10^{-5} centimeter per second, and an 18-inch thick erosive layer. This unit was closed by June 1999 as part of the Transition Plan for this MSWLF. The Active C&D landfill is constructed and operating on top of the Closed MSWLF and is hereby designated as the Active C&D and Closed MSWLF. Adjacent to the Active C&D and Closed MSWLF, across the unnamed tributary of

Jacobs Creek and utilizing the same scale house, is an existing Subtitle D lined MSWLF, which also operates under Permit #84-01. The site is monitored under the Solid Waste Management Rules Title 15A, Subchapter 13B, Rule 1630 of the North Carolina Administrative Code (15A NCAC 13B.1630). A site vicinity map showing the locations of both permitted facilities is included in Figure 1.

1.2.1 Transport Processes

The primary transport method which moves constituents within an aquifer is advection (Freeze and Cherry, 1979). Secondary transport processes for solutes in groundwater include dispersion, and retardation. Groundwater monitoring well pairs were positioned perpendicular to groundwater flow in order to detect an early release of constituents from advection flow. The placement of the monitoring wells, based on groundwater flow, determined the number of wells needed for early detection of a release. In the case of the Active C&D and Closed MSWLF cells the groundwater generally flows southwestward, south, and southeastward toward the unnamed tributary of Jacobs Creek. Whereas, in the case of the Subtitle D Lined MSWLF cells the groundwater generally flows southwestward and southward toward the unnamed tributaries of Jacobs Creek.

1.2.2 Site Hydrogeology

The locations of the multiple landfill cells (closed and open) require a groundwater and surface water monitoring system capable of encompassing each of the avenues by which water (i.e., surface water and groundwater) can leave this site. The nature of the groundwater flow, the local geology, and the location of the unnamed tributary of Jacobs Creek will require monitoring encompassing both the ridge to the west upon which the Active C&D and Closed MSWLF cells are located and, the elevated topographic area to the east upon which Phase 1 and 2 cells are located, for early detection of a release from these cells.

The design bases for a groundwater monitoring plan for the landfill site is based on the conceptual understanding of the hydrogeological system underlying the area based upon published sources for both the region and the local area. A conceptual understanding of the hydrogeological system enables the hydrogeologist and others, to have an understanding of

groundwater movement within the subsurface. This area is located within the Piedmont Physiographic Province of North Carolina (Piedmont). The Piedmont consists of the following components (Harned, 1989):

- Unsaturated zone in the regolith
- Saturated zone in the regolith
- Transition zone between the regolith and the bedrock, and
- Fractured bedrock.

The unsaturated zone is that zone of the subsurface materials (i.e., usually only soil, but on occasions may also include bedrock) which does not have all the pore spaces, between the soil particles, full of water. This zone extends from ground surface to the water table. Infiltrating rainwater moves through this zone by means of intergranular pore spaces, burrows, and passages left by decayed matter (e.g., roots).

The saturated zone is the zone that has all the pore spaces between the soil particles full of water. This zone in the regolith extends from the water table downward to the transition zone. The saturated zone in the regolith provides the bulk of the water storage within the Piedmont groundwater system (Heath, 1980). The amount of water stored in the saturated regolith is a function of the saturated thickness of the regolith. This water storage serves as a reservoir supplying water to both the transition zone, with open pores through enough of the bedrock to intercept sufficient fractures to furnish acceptable yields (Harned, 1989).

The transition zone usually has a higher hydraulic conductivity, probably due to incomplete weathering (Harned, 1989). The presence of a high hydraulic conductivity zone on top of the bedrock has the potential to create a zone of concentrated groundwater flow with the hydrogeological system. Underlying the upper three zones is the fractured bedrock. Typically fractures are more common at the top of the bedrock, especially beneath valleys and draws (Heath, 1980; LeGrand, 1988). Fracture openings and frequency generally decrease in size and number with increasing depth below ground surface (Harned, 1989).

1.2.3 Hydrogeologic Characteristics

The following geologic and hydrogeological characteristics are framed as hypotheses that pertain to the hydrogeology of the area where these landfill cells are located as follows:

- Recharge to the groundwater is from rainfall to the upland and upper topographic slopes and ridges.
- Subsurface consists of transitioning weathering horizons that range from soil, saprolite to bedrock.
- Mantle of unconsolidated material varies in thickness and prevails across various types of underlying rock.
- Recharge of water to, and the discharge of water from, the fractured bedrock commonly occurs through the mantle of unconsolidated materials.
- Mantle thickness is generally related to the degree of fracturing due to weathering in the underlying bedrock.
- Density of fractures due to weathering within the underlying bedrock declines with depth.
- Fractures due to weathering usually extend no deeper than several hundred feet below ground surface.
- Groundwater in both the overlying mantle and fractured bedrock (i.e., due to weathering) is contiguous.
- Surface water basins are useful entities for delineating groundwater conditions.
- Unweathered and unfractured rocks have low porosity and hydraulic conductivity.
- Fractures capable of transmitting groundwater are a subset of the total fracture population.
- Movement of groundwater through the bedrock is controlled by density, capacity, and interconnectivity of the water-producing fractures.
- Groundwater flow in the Piedmont can be best described by a topographically dependent flow model (i.e., water table is a subdued reflection of topography).
- Base of the uppermost groundwater system is indistinct but generally fractured rock grades into unfractured rock below the 200- to 300-foot depth range.
- Areas of fractured and more highly weathered rock are frequently expressed topographically as valleys and draws.

- Contact zones and stress-relief fractures are the dominant features for the presence of water-producing fractures.
- Discharge of groundwater is to perennial streams in the valleys and draws.

These hypotheses form the basis of the conceptual hydrogeologic model for the area of the City of Albemarle Landfill Site. The following narrative description summarizes the elements of this model.

Recharge to the hydrogeologic system occurs in upland areas. Discharge of groundwater occurs on a continuous basis to perennial streams and on an intermittent basis to intermittent streams. The groundwater contours for the City of Albemarle Landfill Site exhibit the upland recharge areas and the discharge to the streams in the low areas (see Figure 2). Intermittent discharge of groundwater is controlled by a temporarily high water table intersecting ground surface following rainfall events and/or natural seasonal fluctuations. Such discharge is evidenced by springs, marshy areas, seeps, and similar waterlogged areas at ground surface. Below ground surface the subsurface consists of transitioning weathering horizons ranging from soil, saprolite to bedrock. Fracturing due to weathering within the bedrock declines with depth. Those fractures capable of transmitting water are a subset of all fractures. The uppermost fracture patterns evident within the rock underlying the area indicate multiple interconnected fractures at varied orientations and dip angles, with limited lengths. A topographically dependent flow model can best describe groundwater flow within the subsurface media and flow basins are similar to surface water drainage basins. Such flow within the upper fractured rock can be represented by the application of continuum flow models. Groundwater within both the unconsolidated media and the fractured rock is generally contiguous.

2.0 WATER QUALITY MONITORING PLAN

2.1 GROUND AND SURFACE WATER MONITORING SYSTEM

A groundwater monitoring system is required to have a sufficient number of wells installed at appropriate locations and depths, to yield groundwater samples at the relevant point of compliance, from the uppermost aquifer identified under the site {15A NCAC 13B.1631(a)(2)}. In so doing these down gradient monitoring wells are required to detect possible leakage from landfill cells located at the site. The number of these down gradient monitoring wells is required to have a sufficient spread in order to enable detection of possible leakage from the landfill cells within the groundwater system.

2.1.1 Active C&D and Closed MSWLF

A groundwater monitoring system for the Active C&D and the Closed MSWLF has been installed in accordance 15A NCAC 13B.1630 - .1637. A combination of detection, assessment, and corrective action monitoring are used to analyze constituent levels in the two plumes associated with the Active C&D and the closed MSWLF site. The two plumes identified in the Assessment of Corrective Measures are the:

- Eastern Plume: The plume associated with Monitoring Wells MW-3, MW-9, and MW-10 formerly consisted of benzene, methylene chloride, and tetrachloroethene.
- Western Plume: The plume associated with Monitoring Wells MW-2, MW-6, and MW-7 consists of benzene, chlorobenzene, methylene chloride, cis-1,2-dichloroethene, tetrachloroethene, and trichlorofluoromethane.

Groundwater is sampled from seventeen monitoring wells (i.e., MW-1, MW-2, MW-3, MW-4R, MW-5R, MW-6, MW-7, MW-8D, MW-9, MW-10, MW-11, MW-12, MW-13, MW-23, MW-24, MW-25 and MW-29: see Table 1) which are spaced around the Active C&D and the closed MSWLF perimeter.

Monitoring Well MW-1 is the background well located up gradient of the landfill. Monitoring

Well MW-2 is a down gradient monitoring well for the western portion and is designed to intersect groundwater flow from the northwestern portion prior to reaching the property line. Monitoring Well MW-3 is a down gradient monitoring well in the northeastern portion of the landfill, selected based on the groundwater flow from the northern portion of the landfill in a southeastern direction. Monitoring Well MW-4R is installed on the southeastern half of the landfill. Monitoring Well MW-5R is a down gradient well utilized for the detection of a release from the southwestern portion of the landfill. Monitoring Well MW-6 is a down gradient monitoring well located on the southwestern side of the landfill, positioned to detect a release flowing in the southwestern direction. Monitoring Well MW-7 is the westernmost, down gradient monitoring well, designed to intersect the more southerly flow from the northern portion of both units, transported by advection.

Monitoring Well MW-8D is an additional up gradient monitoring well. Monitoring Well MW-8D was installed June 2007 to replace dry Monitoring Well MW-8 (which was abandoned on May 30, 2013). Monitoring Well MW-9 is installed on the northern side of the landfill. Monitoring Well MW-10 is a down gradient well utilized for the detection of a release from the southwestern portion of the landfill, including the center of the northern unit. Monitoring Well MW-11 is a down gradient well designed to monitor the center of the closed site, before it reaches the unnamed tributary of Jacobs Creek. Monitoring Well MW-12 is a down gradient well monitoring groundwater flow in the northeasterly direction. Monitoring Wells MW-24, MW-25 and MW-29 are downgradient wells, positioned below Monitoring Wells MW-7, MW-2, and MW-6, respectively, along the former property line.

Monitoring Wells MW-13 and MW-23 were installed on the downgradient side (i.e., northeast side) of the leachate lagoon (see Figure 2), between the lagoon and the unnamed tributary of Jacobs Creek. These two wells serve as downgradient monitoring wells for the leachate lagoon. Characteristics of these monitoring wells included in this plan are summarized in Table 1 and their locations are shown on Figure 2.

Surface water is sampled at four locations for the Active C&D and closed MSWLF. Three of the four surface water sampling locations monitor the unnamed tributary of Jacobs Creek (i.e., SW-1, SW-7, and SW-8); with SW-1 upstream, SW-8 downstream, and SW-7 is located between these two locations (i.e., SW-1 and SW-8). Surface water sampling locations SW-3 and SW-4 have always been dry and are therefore no longer sampled. Surface water sampling location SW-6 was replaced by SW-8, as the latter location provides a more representative sample of surface water leaving from the site. Since the unnamed tributary of Jacobs Creek passes between the Active C&D and closed MSWLF and the Subtitle D lined MSWLF, these three surface water sampling locations are also included for the Subtitle D lined MSWLF. A fourth surface water sampling location (SW-5) monitors surface water runoff from the Active C&D and closed MSWLF before the runoff enters into the unnamed tributary of Jacobs Creek. These four surface water monitoring locations are shown on Figure 2.

Groundwater and surface water samples have been collected at this site on a semi-annual basis since 1994, in accordance with Solid Waste Management Rule 15A NCAC 13B.1633(b). As a condition of the water quality monitoring program, semi-annual sampling and analysis reports are required to be submitted to the North Carolina Solid Waste Section (SWS). Semi-annual sampling events, and other sampling events, are to be performed in accordance with the guidelines and specifications outlined in this Water Quality Monitoring Plan, and the SWS *Guidelines for Groundwater, Soil, and Surface Water Sampling* dated April 2008.

2.1.2 Subtitle D Lined MSWLF

A groundwater monitoring system for the Subtitle D Lined MSWLF has been installed in accordance 15A NCAC 13B.1630 - .1637. Detection monitoring is used to analyze groundwater emanating from the area underlying the lined MSWLF cells. Groundwater is sampled from ten monitoring wells (i.e., MW-14, MW-15, MW-16D, MW-16S, MW-17, MW-18, MW-19, MW-22, MW-26, and MW-27: see Table 2) which are spaced around the Subtitle D Lined MSWLF perimeter. Monitoring Well MW-19 is located upgradient from Phase 1 of the MSWLF and therefore serves as a background well for these landfill cells. Monitoring Wells MW-14, MW-

15, MW-16D, MW-16S, MW-17, and MW-22 are located downgradient of both phases of the Subtitle D MSWLF. Monitoring Wells MW-26, and MW-27 are located downgradient of Phase 2 of the Subtitle D MSWLF. Monitoring Well MW-18 is located side-gradient to the Phase 1 MSWLF cell. Characteristics of the monitoring wells included in this plan are summarized in Table 2. Locations of these monitoring points are shown on Figure 2.

Surface water is sampled at four locations for the Subtitle D Lined MSWLF. Three of the four surface water sampling locations monitor the unnamed tributary of Jacobs Creek (i.e., SW-1, SW-7, and SW-8); with SW-1 upstream, SW-8 downstream, and SW-7 is located between these two locations (i.e., SW-1 and SW-8: see Figure 2). Since the unnamed tributary of Jacobs Creek passes between the Active C&D and closed MSWLF and the Subtitle D lined MSWLF, these three surface water sampling locations are also included for monitoring the Active C&D and closed MSWLF. A fourth surface water sampling location (SW-2) monitors surface water runoff from the Subtitle D lined MSWLF before the runoff enters into the unnamed tributary of Jacobs Creek. These four surface water monitoring locations are shown on Figure 2.

Groundwater and surface water samples have been collected at this site on a semi-annual basis since 2007, in accordance with Solid Waste Management Rule 15A NCAC 13B.1633(b). As a condition of the water quality monitoring program, semi-annual sampling and analysis reports are required to be submitted to the North Carolina Solid Waste Section (SWS). Semi-annual sampling events, and other sampling events, are to be performed in accordance with the guidelines and specifications outlined in this Water Quality Monitoring Plan, and the SWS *Guidelines for Groundwater, Soil, and Surface Water Sampling* dated April 2008.

2.2 BACKGROUND MONITORING WELL

As a basis for evaluating the water quality data for the site, the groundwater monitoring system is required to have sufficient background monitoring well(s) in order to provide a basis to evaluate the water quality data for the down gradient monitoring wells. The purpose of the background monitoring well(s) is to determine the quality of the background water that has not

been affected by leakage from the landfill cells [in accordance with SWS Rule 15A NCAC 13B.1631(a)(1)]. Monitoring Well MW-1 is the background monitoring well for the Active C&D and closed MSWLF site. Monitoring Well MW-19 is the background monitoring well for the Subtitle D lined MSWLF site.

2.3 SAMPLING AND ANALYSIS PLAN

2.3.1 Appendix I Sampling

Water quality monitoring for the Active C&D landfill and closed MSWLF will be performed semi-annually on Monitoring Wells MW-1, MW-2, MW-3, MW-4R, MW-5R, MW-6, MW-7, MW-8D, MW-9, MW-10, MW-11, and MW-29; and Surface Water monitoring stations SW-1, SW-5, and SW-7 for the constituents listed in 40 CFR 258, Appendix I (see Table 4).

Similarly, water quality monitoring for the Subtitle D lined MSWLF will be performed semi-annually on Monitoring Wells MW-14, MW-15, MW-16D, MW-16S, MW-17, MW-18, MW-19, MW-22, MW-26, and MW-27; and Surface Water monitoring station SW-2 for the constituents listed in 40 CFR 258, Appendix I (Surface Water sampling locations SW-1 and SW-7 along the unnamed tributary of Jacobs Creek are included in the previous paragraph) (see Table 5).

At a meeting with SWS on June 26, 2013 it was agreed that detection Monitoring Wells MW-24 and MW-25 (southwest of the Active C&D landfill: see Figure 2) would be sampled on an annual basis for the constituents listed in 40 CFR 258, Appendix I. Since that meeting an additional monitoring well (i.e., MW-29) was installed in August 2013 down gradient from Monitoring Well MW-6 (see Figure 2). At this time this monitoring well (MW-29) is being sampled on a semi-annual basis for the constituents listed in 40 CFR 258, Appendix I (see Table 4).

As part of each sampling event field parameters including dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, temperature, turbidity, and conductivity will also be collected for all samples.

2.3.2 Appendix II Sampling

SWS Rule 15A NCAC 13B.1634(d)(2) requires that an Appendix I detection exceeding the NC 2L Groundwater Standards within the groundwater at any of the monitoring wells be followed by re-sampling of "all wells of the approved detection monitoring system for the unit for all constituents listed in the Appendix I and for those constituents in Appendix II that have been detected". In the vicinity of the leachate lagoon Appendix II sampling has been previously performed at Monitoring Wells MW-12, MW-13, and MW-23. Therefore, at present, Monitoring Wells MW-12, MW-13, and MW-23 and downstream Surface Water Monitoring Station SW-8 will be sampled for Appendix II list constituents and turbidity semi-annually (see Table 4).

2.3.3 Monitored Natural Attenuation Sampling

At a meeting with SWS on June 26, 2013 it was agreed that sampling for Monitored Natural Attenuation (MNA) parameters shall be performed every two (2) years on Monitoring Wells MW-3, MW-9, and MW-10 and every four (4) years on groundwater Monitoring Wells MW-2, MW-6, MW-7, MW-24, and MW-25. MNA sampling will be conducted in addition to traditional water quality monitoring. The selected parameters will be based on independent well conditions and NCDENR SWS approval. A list of the performance parameters for MNA sampling is shown in Table 3. The sampling schedule for all ground and surface water monitoring locations is shown in Tables 4 and 5.

2.4 ADDITIONS WITH FURTHER CORRECTIVE ACTION

Several changes have been made to the water monitoring plan for Active C&D and Closed MSWLF landfill site since the SAP contained in the *CAER* dated July 1, 2011 was issued. First, the City of Albemarle purchased a 104.9-acre property on July 18, 2012. This property acquisition provided the City of Albemarle a 300-foot compliance buffer zone along the southwest side of the former unlined landfill. Following the property acquisition and receipt of agreement from SWS, a Monitoring Well MW-29 was installed on August 2, 2013. The purpose

of installing Monitoring Well MW-29 was to monitor the groundwater down gradient from Monitoring Well MW-6. This well was located approximately 250 feet from the nearest "Approximate Edge of Waste" marker. These additions to the groundwater monitoring network at the City of Albemarle landfill site were made to improve the groundwater quality monitoring system. Currently, both the eastern and western constituent plumes are delineated within the City of Albemarle property.

Additionally, the sampling schedule, particularly for the MNA parameters within those wells associated with each of the two constituent plumes (i.e., see Section 2.3.3), has been changed as discussed and approved by the SWS.

3.0 SAMPLING AND ANALYSIS PROCEDURES

This section includes an updated SAP that addresses the methods to be used for sampling and analysis of groundwater from monitoring wells in the vicinity of, and down gradient from both former unlined landfill cells and the Subtitle D lined cells at the City of Albemarle Landfill Site. This plan is designed to cover sampling and analyses for the water samples collected at the Site for the semi-annual sampling events and any other sampling events required to be completed at this Site.

The groundwater and surface water sampling under this Water Quality Monitoring Plan will be performed primarily using *Guidelines for Groundwater, Soil, and Surface Water Sampling* (SWS, 2008), and secondarily using US Environmental Protection Agency (USEPA) Region 4 Science and Ecosystem Support Division (SESD) operating procedures for field measurements, field sampling, and quality system (USEPA, various dates). These latter operating procedures consist of a series of technical procedures for field measurements, groundwater sampling, surface water sampling, cleaning and decontamination of field equipment, packing, marking, labeling, and shipping of water samples; and, are part of the "Field Branches Quality System and Technical Procedures" used by the two SESD Field Branches: the Ecological Assessment Branch and the Enforcement and Investigations Branch. The Field Branches Quality System and Technical Procedures series of procedures supersedes the USEPA *Environmental Investigations Standard Operating Procedures Quality Assurance Manual* or EISOPQAM.

3.1 EQUIPMENT

Prior to each sample collection event, all materials and supplies required are assembled and all equipment is checked and calibrated as needed. Sampling equipment is to be decontaminated prior to field operations, as necessary during field operations, and at the conclusion of field operations. Sufficient clean equipment and sample containers are to be transported to the field so that there should be no need to clean the equipment in the field. Field cleaning procedures are included to cover those special situations where individual pieces of equipment (bailer, sampling

pump, etc.) require field cleaning.

The equipment used in the field will be consistent with USEPA field sampling procedures as developed by the Science and Ecosystem Support Division (SESD) in Athens, Georgia.

3.1.1 Water Depth Indicators

Electronic Water-Level Indicator: This device consists of an insulated, aluminum cable and a 3/8-inch diameter probe. Occurrence of water is dictated as a response to change in conductivity by a light on the cable reel. The cable is graduated in feet and hundredths of a foot.

Steel Tape: A steel tape is graduated in feet and hundredths of a foot. The lower end of the calibrated steel tape, which may be coated with white chalk, is lowered into the water. Depth to water is determined by subtracting the wetted length of the tape from the total depth from the measuring point.

Decontamination: Prior to use at any well or sump, the following cleaning procedure is performed on equipment not dedicated to a particular well or sump:

- Clean the portion of the meter or tape which will enter the monitoring well or sump with tap water and phosphate-free laboratory detergent.
- Rinse thoroughly with tap water.
- Triple-rinse with deionized water.

3.1.2 Bailers

A Teflon, polyolefin or PVC bailer is to be dedicated to each well for the duration of the sampling event. Disposable bailers are acceptable in lieu of dedicated bailers. The bailers are to be fitted with check valves so that they fill from the bottom. A new length of nylon or polypropylene cord is to be used with each bailer for each sampling event. Used cord is to be discarded.

Purchased bailers in original sealed envelopes may be used as is. The following procedures are to be used to clean bailers:

- Clean inside and out with tap water and phosphate-free laboratory detergent.
- Rinse thoroughly with tap water.
- Rinse with 10 percent nitric acid.
- Rinse thoroughly with deionized water.
- Rinse with isopropanol.
- Allow to completely air dry.

Following the cleaning process as outlined above, the clean bailers are to be stored in a secure area and shall be wrapped in a protective wrapping, such as aluminum foil, during storage.

3.1.3 pH Meter

An acceptable pH meter and probe is the YSI-63 or equivalent. Prior to each series of samplings, either the battery in the meter is to be fully recharged or a fresh battery is to be installed. The meter is be to calibrated using premixed calibration standards, usually equaling 2.0, 4.0 and 7.0 Standard Units (SU) and traceable to National Institute of Standards and Technology (NIST) standards. The pH value of the standards used must bracket the anticipated sample pH.

3.1.4 Conductivity Meter

A YSI-63, or equivalent, will be used to determine the specific conductance of the groundwater. Standard solutions of potassium chloride will be used to calibrate the conductivity meter.

3.1.5 Sample Jars

The cleanliness of the sample containers is of utmost importance. The laboratory performing the analysis shall provide clean sample jars. Immediately after the samples are collected, the sample aliquots to be analyzed for total metals are to be preserved with reagent grade nitric acid to a pH less than 2.0 SU. Usually the sample jars to be used for the total metal analyses will come from

the laboratory prepared with reagent grade nitric acid in the sample jar.

3.1.6 Sample Shipper

A suitable sample shipper should have the following characteristics:

- The sample shipper should be sturdy and not deteriorate when wet.
- The sample shipper should have a lid and keeps the samples in darkness.
- The sample shipper should be roomy enough to fit the sample jars and coolant (blue or wet ice), yet it has to have enough padding to prevent contact between the sample jars and their possible movement or breakage.
- The sample shipper should be insulated well enough that it will maintain a temperature of 4° C for at least 24 hours.

If the samples are to be sent from the field to the laboratory via a commercial carrier, the sample shipper should also possess the following additional characteristics:

- The sample shipper shall conform to applicable Department of Transportation regulations, including labeling.
- The sample shipper is sealed such that tampering while in transit is evident upon delivery.

The packing of the sample shipper should consist of placing the ice or ice-packs in clean, sealed, plastic bags, such that the potential for movement of sample jars and ice packs during transportation is minimal.

3.2 SAMPLING PROTOCOL

The basic premise in developing a set of technical procedures for sampling is the need for obtaining representative samples for analyses. Representative samples are those which have the physical and chemical characteristics of the groundwater in the zone being monitored. In particular, emphasis is placed on reducing the potential for contamination or degradation of the sample by the sampling, preservation, or shipping processes. Additionally, another purpose for

developing a set of technical procedures is the need for a consistent sampling approach so that sample collection activities at solid waste management facilities provide reliable data.

Since some constituents can be detected in the parts per billion range, care is to be taken to prevent contamination of the samples, and monitoring wells by the sampling and water level measurement activities. The following precautions are to be taken:

- A new clean pair of water-proof, laboratory-grade gloves is to be worn each time a different well is visited.
- Data and sample collection are to proceed progressively from the least contaminated to the most contaminated wells.

3.2.1 Depth-to-Groundwater Measurements

The depth-to-groundwater measurements within the monitoring wells at the site should always precede the groundwater sampling. The depth to groundwater measurement is to be determined in each well using one of the water-level indicators described in Section 3.1.1. The cable or tape is read to the nearest one hundredth of a foot against the known elevation point which is usually a marked point on the top of the well casing. This reading provides the depth to groundwater within the well. All depths to groundwater measurements in each area will be obtained within a 24-hour period.

3.2.2 Total Well Depth

Annually during the depth-to-groundwater measurements, the total depth of the well should be determined. Following the water level measurement, the measuring device is to be lowered into the well until the bottom of the well is reached. The well depth is to be measured to the reference mark on the well casing. The total well depth measurement provides a check on the integrity of the well screen within the monitoring well.

3.2.3 Groundwater Quality Sampling

For wells that do not purge to dryness, indicator parameters pH, temperature, specific

conductance and turbidity should be measured prior to purging, and after each of three successive well casing volumes have been removed. If the final three measurements of temperature and specific conductance exhibit greater than 10% variability, or in the case of pH, a change greater than 0.2 SU, purging and sampling should continue until these indicators stabilize, or until a maximum of five well volumes is removed, whichever comes first. After five volumes, it will be the samplers' decision whether or not to collect a sample or continue purging.

At low yielding wells which purge to dryness, indicator parameters should be measured immediately prior to purging and again as part of groundwater sampling, in no case more than 24 hours after purging.

An aliquot of water is to be removed from the wells, and tested in the field for the indicator parameters. The pH will be measured according to EPA Method 150.1; field specific conductance will be measured in accordance the EPA Method 120.1 and water temperature will be measured with a thermometer in accordance with EPA Procedure 170.1.

The water quality samples are to be collected at each sampling location in the following order:

- Volatile organics and volatile inorganics,
- Extractable organics, petroleum hydrocarbons,
- Total metals,
- Inorganic nonmetallics, physical and aggregate properties, and biological,
- Microbiological.

The water quality sample is to be collected by lowering the bailer just below the water surface, withdrawing the sample, and pouring it directly into sample jars. The bailer is to be gently lowered into the water to prevent excessive aeration. The sample aliquots destined for analyses for total metals are to be preserved in the field as outlined in Section 3.1.5. Place in appropriate sample jars with minimum air space. As soon as a sample has been placed into the jars, the tops of the jars should be securely screwed onto the jars. The filled jars are then to be placed in a cooler so that the sample temperature is lowered to 4° C.

After all measurements have been made and samples taken at each location, the field technician is to clean up the work area. The monitoring well caps are to be replaced and the protective casings relocked. Any trash, such as paper towels or plastic bags, is to be properly disposed.

Each reusable bailer is to be stored in accordance with the procedures given in Section 3.1.2. If, during a subsequent sampling event, the field technician sees that the protective wrapping on a reusable bailer has been damaged, this to be noted and the bailer is to be cleaned according to the procedure described previously (see Section 3.1.2). A trip blank sample shall be analyzed for each sampling episode.

3.2.4 Surface Water Sampling

During each well sampling event, samples shall also be collected at each of the five surface water sampling locations shown on Figure 2. There are three locations that monitor the unnamed tributary of Jacobs Creek (i.e., SW-1, SW-7, and SW-8) located between the Active C&D and closed MSWLF and the Subtitle D lined MSWLF. The fourth location (SW-5) monitors surface water runoff from the Active C&D and closed MSWLF before the runoff enters into the unnamed tributary of Jacobs Creek. The fifth location (SW-2) monitors surface water runoff from the Subtitle D lined MSWLF before the runoff enters into the unnamed tributary of Jacobs Creek.

Previous surface water locations SW-3, SW-4, and SW-6 are no longer being used. The former two locations were usually dry and the latter location was replaced with Surface Water sampling location SW-8 (see Figure 2). Collection of the surface water sampling locations should commence at the downstream sampling locations and proceed toward the upstream sampling location.

The samples shall be taken with a clean container using the precautions listed in Section 3.1 above. The same field measurements and chemical analyses shall be made as for monitoring well analyses. During dry periods there may be insufficient flow in the creek to provide

representative samples. Such dry conditions should be noted in the fieldbook or on a field well sampling report.

When wading in the stream, the surface water samples shall be collected upstream from the body and avoid disturbing the sediment in the area of the proposed surface water sampling. Where practical, use the actual sample container submitted to the laboratory for collecting surface water samples. This procedure eliminates the possibility of contaminating the sample with an intermediate collection container. However, if any of the sample jars contain premeasured amounts of preservative, a sample container without any preservative can be used to collect a surface water sample, for transfer to a sample container in which a preservative has already been added. This procedure reduces sample handling and eliminates potential contamination from other sources (e.g., additional sampling equipment, containers not being taken to the laboratory, etc.).

3.2.5 Documentation and Delivery

Following the collection of the sample the sample container label shall be filled with the following information:

- Designation of sample site and identification number,
- Name of sample collector(s),
- Date and time of collection,
- Preservative(s) used, if any,
- Analysis required for that sample,

Field data are to be recorded either in a Fieldbook dedicated to this site or on a Field Well Sampling Report, with one reporting page per sampling location. Field data to be recorded include:

- Designation of sample site and identification number,
- Name of sample collector(s),
- Date and time of collection,

- Depth to groundwater,
- Preservative(s) used, if any,
- Analysis required for that sample,
- Field measurements and observations, such as turbidity, odor, and appearance which may change before laboratory analyses,
- Sampling equipment used, with appropriate calibration data, and
- Any other noteworthy information.

An accurate written record (Chain of Custody) is to be used to trace possession and handling of each sample container from the moment of collection through laboratory analyses. A sample is in someone's custody if:

1. It is in one's actual physical possession;
2. It is one's view after being in one's physical possession;
3. It was in one's physical possession and then locked up so that no one can tamper with the sample; and
4. It is kept in a secure area, restricted to authorized personnel.

The Chain of Custody Record shall show the sample number, date and time of collection, the sample types and preservation method and the analyses required. It also shall show all transfers between individuals until received by the laboratory which performs the analyses.

The Chain of Custody Record also serves as the analytical request providing the laboratory details on the analyses requested for the water samples being submitted to the laboratory. This Chain of Custody Record is to be delivered to the laboratory at the same time as the water samples listed on the Chain of Custody. All records are to be filled out legibly in pen. After being properly labeled, the sample container is to be placed in a sample shipper along with the Chain of Custody Record. The sample shipper is then prepared according to Section 3.l.6.

All samples sent to the laboratory are to be accompanied by the Chain of Custody Record.

Copies of these forms are to be retained by the originating office. If samples are sent by common carrier, receipts are to be retained as part of the permanent chain of custody documentation if the carrier does not maintain an electronic record of the shipment.

When transferring the possession of samples, the transferee is to sign and record the date and time on the Chain of Custody Record. Custody transfers are to account for each individual sample, although samples may be transferred as a group. Each person who takes custody is to fill in the appropriate section of the Chain of Custody Record.

Samples are to be shipped in a sample shipper which has been so sealed that any evidence of tampering may be readily detected. If tampering is found, it is to be noted on the Chain of Custody Record.

Samples must be delivered to the laboratory in a timely fashion so that the laboratory can meet the maximum holding times for the appropriate analyses required for these samples. This means that the samples must either be delivered personally to a local laboratory or shipped via an overnight express courier.

3.3 ANALYTICAL LABORATORY PROCEDURES

3.3.1 Analytical Methodology

The methods of analyses for the groundwater and surface water samples will be appropriate to achieve detection limits at least as low as required by the NCDENR. If the indicated detection limits are not achieved, an explanation for the deviation is to be provided.

3.3.2 Quality Control

Chain of Custody is to be maintained throughout the laboratory. All results are to be clearly traceable so that the following information can be readily accessed:

- Sample identification;
- Dates of sampling and dates of testing;

- Name and address of the laboratory performing the analyses;
- All notes and calculations used to derive the results;
- All the laboratory quality assurance data relative to the samples analyzed;
- Names of the analysts; and
- Certification of accuracy by a senior reviewer.

The laboratory manager is to ensure that all samples are logged in and that permanent records are kept on file. He or she is responsible for assigning analyses to specific chemists, properly storing the samples and maintaining the conditions for preservation, and reviewing all calculations and results posted by the chemists.

The analytical work shall be performed by a laboratory approved by the NCDENR.

General quality control practices required of the laboratory are summarized as follows:

- Reagent Standardization: Each laboratory prepared reagent is to be labeled as to date prepared, concentration, and the chemist who prepared it. Only Class A volumetric glassware is to be used. Only Type I water and only reagent grade or better chemicals are to be used. The silver nitrate titrant is to be standardized at least once daily each time it is used for chloride analyses.
- Standard Curves: A new standard curve is to be established with each batch of samples. The standard curve is to utilize at least four concentration levels plus a reagent blank.
- Statistical Verification: At least one duplicate analysis is to be performed for each batch or set of ten samples. At least one spike recovery analysis is to be performed for each batch or set of ten samples. The results of the duplicated and spiked analyses are to lie within the range defined by the Upper Confidence Limit and Lower Confidence Limit established with the laboratory quality control charts.
- Laboratory Equipment: Laboratory equipment calibration records are to be maintained. Equipment which requires accurate adjustment or measurement of temperature, mass, volume, or light wavelength for proper use is to be calibrated prior to use, traceable to the

National Bureau of Standards. Maintenance checks and repairs of all major equipment are to be documented in logbooks.

- Quality Control Samples: Quality control samples will be utilized as required by EPA-SESD Quality Assurance Procedures. Trip blanks will be utilized when analyses include volatile organics, one for each volatile organic sample shipment. If sampling is to be performed during dusty conditions a field blank will be used. Other quality control samples may be obtained as needed to assist evaluation of laboratory anomalies.

Prior to beginning the sampling, a section of clean plastic sheeting will be placed at the sampling location in order to insulate the ground surface or floor from sampling equipment and vice versa. Disposable gloves will be worn prior to making contact with either the sample container or the sampling equipment.

4.0 REFERENCES

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SWS, 2008; Guidelines for Groundwater, Soil, and Surface Water Sampling, Raleigh, NC.

TABLES

TABLE 1

SUMMARY OF GROUNDWATER MONITORING WELL DETAILS
ACTIVE C&D AND CLOSED MSW LANDFILL
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Well Identification	Ground Elevation (Feet above NAVD)	Top of Casing Elevation (Feet above NAVD)	Drilled Depth (Feet below Ground Surface)	Screen Interval (Depth in Feet below Ground Surface)
ACTIVE C&D AND CLOSED MSWLF				
MW-1	445.6	447.21	20.2	3-18
MW-2	429.9	431.85	20.1	2.5-17.5
MW-3	393.9	396.11	24.2	7.5-22.5
MW-4R	412.8	415.36	37.8	19.4-34.4
MW-5R	413.1	416.06	28.3	15-25
MW-6	437.7	439.63	37.8	20.5-35.5
MW-7	429.4	431.30	30.3	12.9-27.9
MW-8D	488.8	491.38	77.7	60.9-75.9
MW-9	389.1	392.64	19.4	1.1-16.1
MW-10	385.4	388.01	20.2	2.1-17.7
MW-11	384.4	386.78	20.3	2.2-17.2
MW-12	398.1	399.47	26	7-22
MW-13	385.7	388.52	19	8-18
MW-23	383.9	386.41	18	7-17
MW-24	429.2	432.19	24.1	6.3-21.3
MW-25	422.3	425.22	21.0	6.2-18.2
MW-29	430.2	432.14	37.7	21-35

Notes:

1. All locations have a locked cover.
2. NAVD - North American Vertical Datum

TABLE 2

SUMMARY OF GROUNDWATER MONITORING WELL DETAILS
SUBTITLE D LINED MSW LANDFILL
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Well Identification	Ground Elevation (Feet above NAVD)	Top of Casing Elevation (Feet above NAVD)	Drilled Depth (Feet below Ground Surface)	Screen Interval (Depth in Feet below Ground Surface)
SUBTITLE D LINED MSW LANDFILL				
MW-14	380.8	383.55	25.0	8.4-23.4
MW-15	383.2	385.72	23.5	12.7-22.7
MW-16S	384.4	386.75	10	5-10
MW-16D	384.4	386.88	22.9	7-22
MW-17	393.5	396.47	21.7	6.7-21.7
MW-18	410.4	409.41	26.0	10.2-25.2
MW-19	450.8	452.34	48.0	33-48
MW-22	385.0	388.41	20.0	5-20
MW-26	411.0	413.98	40.0	28.9-38.9
MW-27	402.4	404.71	22.9	7.9-22.9

Notes:

1. All locations have a locked cover.
2. NAVD - North American Vertical Datum

TABLE 3

MONITORED NATURAL ATTENUATION (MNA) PARAMETERS
ACTIVE C&D AND CLOSED MSW LANDFILL
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

MNA Performance Parameters		
Parameter	**Analysis Type**	**Analytical Method**
Dissolved Oxygen (DO)	Field Reading	Multi-parameter Field Instrument w/ flow-through cell
pH	Field Reading	
Oxidation Reduction Potential (ORP)	Field Reading	
Turbidity	Field Reading	
Conductivity	Field Reading	
Temperature	Field Reading	
Dissolved CO_2	Laboratory	RSK-175
Alkalinity (Total as $CaCO_2$)	Laboratory	SM2320B or EPA 310.2
Chloride	Laboratory	SM 4500-CLB or EPA 300.0
Iron	Laboratory	EPA 6010
Nitrate	Laboratory	EPA 353.2 / SM 2320B
Sulfate	Laboratory	EPA 300.0
Sulfide	Laboratory	SM18 4500-S D or SM 4500-S2D
TOC/BOD/COD	Laboratory	SM 5310B / SM 5210B / SM 5220D
Methane	Laboratory	RSK-175
Ethane, Ethene	Laboratory	
Hydrogen	Laboratory	AM20GAX
Volatile Fatty Acids	Laboratory	VGC-13
NOTE: These parameters as presented in Table 2.3 in "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater" EPA/600/R-98/128, September 1998, Office of Research and Development, Washington D.C.		

TABLE 4

SAMPLING SCHEDULE FOR GROUND AND SURFACE WATER MONITORING LOCATIONS
ACTIVE C&D AND CLOSED MSW LANDFILL
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Well Identification	Water Quality Monitoring		MNA Parameters	Field Parameters*
	40 CFR 258, Appendix I	40 CFR 258, Appendix II		
ACTIVE C&D AND CLOSED MSWLF				
MW-1	Semi-Annually	NA	NA	Semi-Annually
MW-2	Semi-Annually	NA	Every 4 Years	Semi-Annually
MW-3	Semi-Annually	NA	Every 2 Years	Semi-Annually
MW-4R	Semi-Annually	NA	NA	Semi-Annually
MW-5R	Semi-Annually	NA	NA	Semi-Annually
MW-6	Semi-Annually	NA	Every 4 Years	Semi-Annually
MW-7	Semi-Annually	NA	Every 4 Years	Semi-Annually
MW-8D	Semi-Annually	NA	NA	Semi-Annually
MW-9	Semi-Annually	NA	Every 2 Years	Semi-Annually
MW-10	Semi-Annually	NA	Every 2 Years	Semi-Annually
MW-11	Semi-Annually	NA	NA	Semi-Annually
MW-12	NA	Semi-Annually	NA	Semi-Annually
MW-13	NA	Semi-Annually	NA	Semi-Annually
MW-23	NA	Semi-Annually	NA	Semi-Annually
MW-24	Annually	NA	Every 4 Years	Annually
MW-25	Annually	NA	Every 4 Years	Annually
MW-29	Semi-Annually	NA	Every 4 Years	Semi-Annually
SURFACE WATER SAMPLING LOCATIONS				
SW-1	Semi-Annually	NA	NA	Semi-Annually
SW-5	Semi-Annually	NA	NA	Semi-Annually
SW-7	Semi-Annually	NA	NA	Semi-Annually
SW-8	NA	Semi-Annually	NA	Semi-Annually

Notes:

1. *Field Parameters include dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, temperature, turbidity, and conductivity
2. NA= Not Applicable
3. MNA Parameters are listed in Table 3.
4. Both the 2-year and 4-year cycles began on January 1, 2014. Therefore 2-year sampling will be performed in July 2015, July 2017, etc. The 4-year sampling will be performed in July 2017, July 2021, etc.

TABLE 5

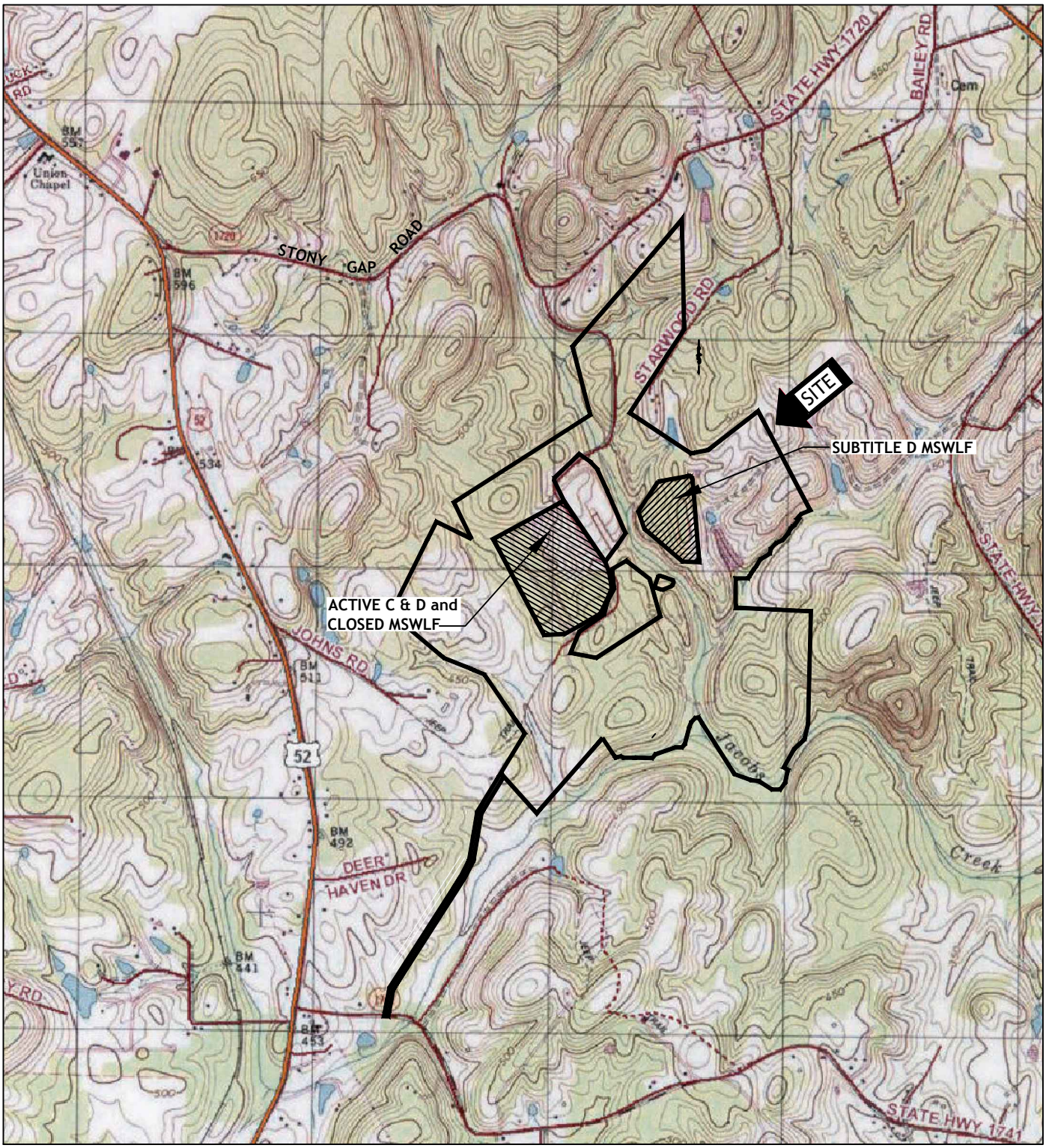
SAMPLING SCHEDULE FOR GROUND AND SURFACE WATER MONITORING LOCATIONS
SUBTITLE D LINED MSW LANDFILL
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Well Identification	Water Quality Monitoring		Field Parameters*
	40 CFR 258, Appendix I	40 CFR 258, Appendix II	
SUBTITLE D LINED MSWLF			
MW-14	Semi-Annually	NA	Semi-Annually
MW-15	Semi-Annually	NA	Semi-Annually
MW-16S	Semi-Annually	NA	Semi-Annually
MW-16D	Semi-Annually	NA	Semi-Annually
MW-17	Semi-Annually	NA	Semi-Annually
MW-18	Semi-Annually	NA	Semi-Annually
MW-19	Semi-Annually	NA	Semi-Annually
MW-22	Semi-Annually	NA	Semi-Annually
MW-26	Semi-Annually	NA	Semi-Annually
MW-29	Semi-Annually	NA	Semi-Annually
SURFACE WATER SAMPLING LOCATIONS			
SW-1	Semi-Annually	NA	Semi-Annually
SW-2	Semi-Annually	NA	Semi-Annually
SW-7	Semi-Annually	NA	Semi-Annually
SW-8	NA	Semi-Annually	Semi-Annually

Notes:

1. *Field Parameters include dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, temperature, turbidity, and conductivity
2. NA= Not Applicable

FIGURES



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GRAPHIC SCALE

0 1,000 2,000

SCALE: 1 in. = 2,000 ft.

SOURCE: NATIONAL GEOGRAPHIC USGS TOPO, 7.5 MINUTE MAP SERIES, STANLY COUNTY, NORTH CAROLINA

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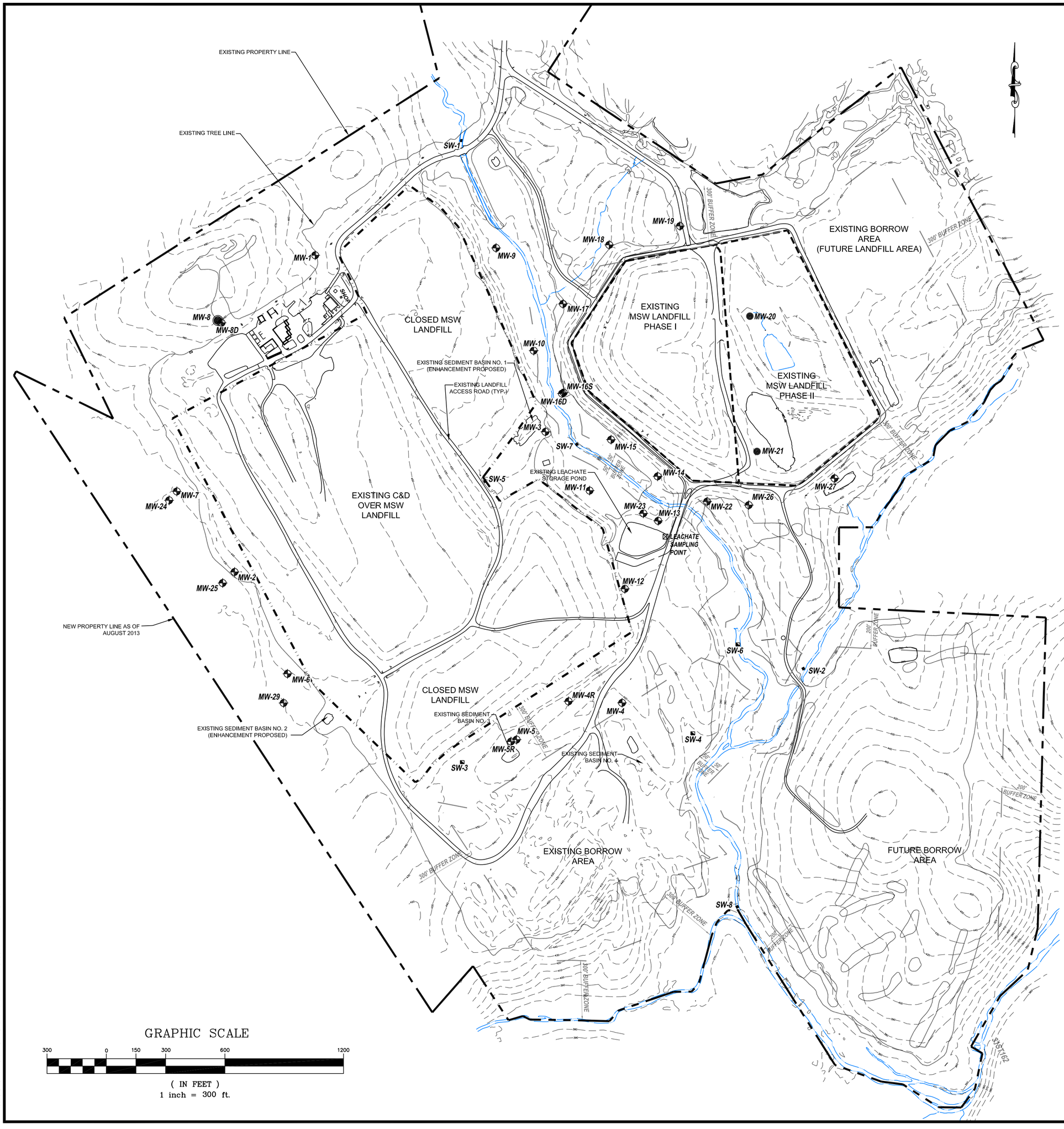
SITE VICINITY MAP

CITY OF ALBEMARLE LANDFILL

STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD # 1110192-01

DATE :	3/5/15	DRAWN BY :	RBS
SCALE :	AS SHOWN	FIGURE :	1

H:\PROJECTS\2011\1110192 - CITY OF ALBEMARLE LANDFILL\GROUNDWATER MONITORING\MONITORING PLANS\SITE VICINITY MAP 11-01-12.DWG



LEGEND

- 2013 CONTOURS
- PROPERTY LINE
- ROAD
- WATER
- CLOSED MSWLF SANITARY UNIT
- EXISTING MSWLF SANITARY UNIT
- BUFFER ZONE
- SW-1 SURFACE WATER SAMPLING LOCATION
- MW-4 MONITORING WELL
- SW-3 ABANDONED SURFACE WATER SAMPLING LOCATION
- MW-21 ABANDONED MONITORING WELL
- LEACHATE SAMPLING POINT
- > < CULVERT PIPE
-) (CULVERT HEADWALL

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WATER QUALITY SAMPLING LOCATIONS

CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD PROJECT # 1110192-02

DATE:	3/5/15	DRAWN BY:	RBS
SCALE:	AS SHOWN	FIGURE:	2

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GAS MONITORING PLAN

CITY OF ALBEMARLE LANDFILL
ALBEMARLE, NORTH CAROLINA

DSWM PERMIT #84-01

Prepared for:
CITY OF ALBEMARLE PUBLIC WORKS DEPARTMENT
ALBEMARLE, NORTH CAROLINA

By:
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4301 TAGGART CREEK ROAD
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Project Manager
Registered Engineer #NC 20055

Keith A. Anthony, P.E.
Chief Engineer
Registered Engineer #NC 11260

MAY 2015

GAS MONITORING PLAN

CITY OF ALBEMARLE LANDFILL
ALBEMARLE, NORTH CAROLINA

DSWM PERMIT NO. 84-01

Prepared for:

City of Albemarle – Public Works Department
Stanly County, North Carolina

Prepared by:

Shield Engineering, Inc.
Charlotte, North Carolina

May 13, 2015
Shield Project 1110192

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 BACKGROUND 1
1.2 GEOLOGY AND HYDROGEOLOGY 2
1.2.1 Regional Geology 2
1.2.2 Regional Hydrogeology 3
1.2.3 Hydrogeologic Characteristics 4
1.2.4 Groundwater Depth 6
1.3 REGULATORY LIMITS 6
2.0 LANDFILL GAS MONITORING 8
2.1 EXISTING MONITORING LOCATIONS 8
2.2 STRUCTURE MONITORING 9
2.3 MONITORING FREQUENCY 9
3.0 LANDFILL GAS MONITORING PROCEDURES 10
3.1 DETECTION EQUIPMENT 10
3.2 LANDFILL GAS MONITORING PROCEDURE 10
4.0 RECORD KEEPING AND REPORTING 12
4.1 LANDFILL GAS DATA FORM 12
4.2 GAS MONITORING REPORTS 12
4.3 PERMANENT RECORD KEEPING 12
5.0 CONTINGENCY PLAN 13
5.1 IMMEDIATE ACTION 13
5.2 REMEDIATION PLAN 14
5.3 REPORTING AND DOCUMENTATION 14
6.0 REFERENCES 15
PROFESSIONAL CERTIFICATION 16

List of Figures

Figure 1 Site Vicinity Map

Figure 2 Groundwater Contour Map

Figure 3 Gas Monitoring Probe Location Map

List of Tables

Table 1 Summary of Gas Monitoring Probes

1.0 INTRODUCTION

1.1 BACKGROUND

The objective of the Gas Monitoring Plan is to provide a monitoring system to effectively detect a release of methane or hydrogen sulfide to the unsaturated zone of the underlying soils above the groundwater. The monitoring of both methane and hydrogen sulfide along compliance boundaries (i.e., property boundary) to demonstrate regulatory compliance is required by Title 15A North Carolina Administrative Code Subchapter 13B Section .1626(4)(a)(ii) and .1626(4)(b) [15A NCAC 13B.1626(4)(a)(ii) and .1626(4)(b)].

The City of Albemarle Landfill (DSWM [Division of Solid Waste Management] Permit #84-01) is located on Stony Gap Road (SR 1720), in Stanly County, North Carolina (see Figure 1). Prior to operating as a C&D Landfill, the site formerly operated as an unlined Municipal Solid Waste Landfill (MSWLF) that consisted of two units. The first unit (Unit #1) was closed prior to October 1991 with a 24-inch thick final soil cover. The second unit (Unit #2) was closed with an 18-inch thick cohesive soil cap with a permeability of 10^{-5} centimeters per second (cm/sec) and an 18-inch thick soil erosive layer prior to June 1999 in accordance with the *Transition Plan*. The C&D Landfill is constructed and operating on top of the Unit #1 MSWLF.

Adjacent to the C&D Landfill, across the unnamed tributary of Jacob's Creek, on the same contiguous property is the active Subtitle D lined MSWLF. The lined MSWLF is comprised of two contiguous phases (Phase 1 and 2) which are combined and treated as a single unit for continuity of the reporting to the SWS. This active MSWLF also operates under DSWM Permit #84-01. This Gas Monitoring Plan includes both the active C&D over the closed MSWLF and the lined Subtitle D landfill facilities.

An unnamed tributary of Jacobs Creek divides the facility, separating the C&D over closed MSWLF on the west part of the facility from the lined Subtitle D landfill to the east. The unnamed creek flows southeast and joins another unnamed tributary south of the Subtitle D

landfill. These tributaries join Jacobs Creek, which flows along the southern property boundary, before exiting the site. Jacobs Creek empties into Lake Tillery (Pee Dee River) approximately 2.5 miles southeast of the landfill. Pine and hardwood forest exist beyond the landfill facility.

1.2 GEOLOGY AND HYDROGEOLOGY

The locations of the landfill cells (closed and open) require a gas monitoring system capable of encompassing both cells around the compliance boundary, which is the property boundary for these sites. The migration of explosive gases is through diffusion and pressure gradient within the unsaturated zone above the water table. This migration is restricted by perennial streams (i.e., Jacobs Creek and the unnamed tributaries of Jacobs Creek that divide the facility).

1.2.1 Regional Geology

The landfill is located within the Piedmont Physiographic Province (Piedmont), an area underlain by ancient igneous and metamorphic rocks. This province is primarily underlain by several geologic zones or belts of plutonic rocks and low-grade to high-grade metamorphic rocks. Geologists have subdivided the Piedmont into five parallel geologic belts from east to west: Carolina Slate, Charlotte, King's Mountain, Inner Piedmont, and Blue Ridge. The site is located within the Carolina Slate Belt. These rocks commonly have a mantle of residual soil overlying the bedrock (LeGrand, 1988). The Carolina Slate Belt is characterized by low, generally rolling hills with gentle to moderately steep slopes. Total relief across the facility is approximately 110 feet.

The stratigraphic sequence in the Albemarle-Asheboro region has been mapped as a thick, primarily felsic volcanic unit (Uwharrie Formation) overlain by a dominantly volcanic-sedimentary package (Albemarle Group), with various metagabbro and metabasalt intrusions (Conley, 1962). Lithologies are fairly uniform, and consist of brown to gray sandy silt/sandy clay transitioning into a sandy silt/sandy clay layer with gravel and finally the highly fractured gray to greenish argillite of the Cid Formation (Conley, 1962).

The virgin soils encountered in this area are the residual product of in-place chemical weathering

of rock, similar to the rock presently underlying the site. In areas not altered by erosion or disturbed by the activities of man, the typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands. A transitional zone is normally found overlying the parent bedrock. The uppermost soils within the flood plains of streams often are alluvial (water-deposited) materials.

1.2.2 Regional Hydrogeology

The design bases for a gas monitoring plan for the City of Albemarle Landfill sites stems from the conceptual understanding of the hydrogeological system underlying the area based upon published sources for the region and data collected for the Site. The Piedmont consists of the following components (Harned, 1989):

- Unsaturated zone in the regolith
- Saturated zone in the regolith
- Transition zone between the regolith and the bedrock, and
- Fractured bedrock.

The unsaturated zone is that zone of the subsurface materials (i.e., usually only soil, but on occasions may also include bedrock) which does not have all the pore spaces, between the soil particles, full of water. This zone extends from ground surface to the water table. Infiltrating rainwater moves through this zone by means of intergranular pore spaces, burrows, and passages left by decayed matter (e.g., roots).

The saturated zone is the zone that has all the pore spaces between the soil particles full of water. This zone in the regolith extends from the water table downward to the transition zone. The saturated zone in the regolith provides the bulk of the water storage within the Piedmont ground-water system (Heath, 1980). The amount of water stored in the saturated regolith is a function of the saturated thickness of the regolith. This water storage serves as a reservoir supplying water to both the transition zone, with open hole through enough of the bedrock to intercept sufficient fractures to furnish acceptable yields (Harned, 1989).

The transition zone usually has a higher hydraulic conductivity, probably due to incomplete weathering (Harned, 1989). The presence of a high hydraulic conductivity zone on top of the bedrock has the potential to create a zone of concentrated ground-water flow with the hydrogeological system. Underlying the upper three zones is the fractured bedrock. Typically fractures are more common at the top of the bedrock, especially beneath valleys and draws (Heath, 1980; LeGrand, 1988). Fracture openings and frequency generally decrease in size and number with increasing depth below ground surface (Harned, 1989).

1.2.3 Hydrogeologic Characteristics

The following geologic and hydrogeologic characteristics are framed as hypotheses that pertain to the hydrogeology of the area as follows:

- Recharge to the ground water is from rainfall to the upland and upper topographic slopes and ridges.
- Subsurface consists of transitioning weathering horizons that range from soil, saprolite to bedrock.
- Mantle of unconsolidated material varies in thickness and prevails across various types of underlying rock.
- Recharge of water to and the discharge of water from the fractured bedrock commonly occurs through the mantle of unconsolidated materials.
- Mantle thickness is generally related to the degree of fracturing due to weathering in the underlying bedrock.
- Density of fractures due to weathering within the underlying bedrock declines with depth.
- Fractures due to weathering usually extend no deeper than several hundred feet below ground surface.
- Ground water in both the overlying mantle and fractured bedrock (i.e., due to weathering) is contiguous.
- Surface water basins are useful entities for delineating ground-water conditions.
- Unweathered and unfractured rocks have low porosity and hydraulic conductivity.
- Fractures capable of transmitting ground water are a subset of the total fracture population.
- Movement of ground water through the bedrock is controlled by density, capacity, and

interconnectivity of the water-producing fractures.

- Ground-water flow in the Piedmont can be best described by a topographically dependent flow model (i.e., water table is a subdued reflection of topography).
- Base of the uppermost ground-water system is indistinct but generally fractured rock grades into unfractured rock below the 200- to 300-foot depth range.
- Areas of fractured and more highly weathered rock are frequently expressed topographically as valleys and draws.
- Contact zones and stress-relief fractures are the dominant features for the presence of water-producing fractures.
- Discharge of ground water is to perennial streams in the valleys and draws.

These hypotheses form the basis of the conceptual hydrogeological model for the area of the City of Albemarle Landfill Site. The following narrative description summarizes the elements of this model.

Recharge to the hydrogeological system occurs in upland areas. Discharge of ground water occurs on a continuous basis to perennial streams and on an intermittent basis to intermittent streams. The groundwater contours for the City of Albemarle Landfill Site exhibit the upland recharge areas and the discharge to the streams in the low areas (see Figure 2). Intermittent discharge of ground water is controlled by a temporarily high water table intersecting ground surface following rainfall events and/or natural seasonal fluctuations. Such discharge is evident by springs, marshy areas, seeps, and similar waterlogged areas at ground surface. Below ground surface the subsurface consists of transitioning weathering horizons ranging from soil, saprolite to bedrock. Fracturing due to weathering within the bedrock declines with depth. Those fractures capable of transmitting water are a subset of all fractures. The uppermost fracture patterns evident within the rock underlying the area indicate multiple interconnected fractures at varied orientations and dip angles, with limited lengths. A topographically dependent flow model can best describe ground-water flow within the subsurface media and flow basins are similar to surface water drainage basins. Such flow within the upper fractured rock can be

represented by the application of continuum flow models. Ground water within both the unconsolidated media and the fractured rock is generally contiguous.

1.2.4 Groundwater Depth

Previous groundwater elevation data measured at the monitoring wells provided guidance for the design of the existing gas probes at the Site. Groundwater contours, as shown in Figure 2, were developed from depth-to-groundwater measurements at monitoring wells collected on January 13, 2015 (Active C&D and closed MSWLF) and February 24, 2015 (Subtitle D lined MSWLF). These generalized groundwater contours may be used to establish estimated depth-to-groundwater data in the vicinity of future gas probes.

Depth-to-groundwater measurements from the semi-annual sampling have typically exhibited similar potentiometric elevations across the site. The most recent potentiometric map for the site is shown on Figure 2. The direction of groundwater flow across the site is generally from the elevated topographic ridges toward the drainage features (i.e., the unnamed tributaries of Jacobs Creek) and Jacobs Creek that are evident across the site. Total relief across the facility is approximately 110 feet. Generally, the annual cycle of the groundwater elevations vary less in those wells in close proximity to streams compared to wells located on topographic uplands. Groundwater elevation data gathered at this Site does bear out this generalization.

1.3 REGULATORY LIMITS

The regulatory limits for this site are twofold as follows:

1. The concentrations of explosive gases will not exceed the lower explosive limit (LEL) for either methane (i.e., 5% of methane concentration in air) or hydrogen sulfide (i.e., 4.3% of hydrogen sulfide concentration in air) at the facility property boundary; and
2. The concentration of explosive gas generated by the facility will not exceed 25% of the LEL for either methane (i.e., 1.25% of methane concentration in air) or hydrogen sulfide (i.e., 1.15% of hydrogen sulfide concentration in air) in facility structures (excluding gas control or recovery system).

Together these two regulatory criteria should be met at the site. These regulatory criteria can be found within the regulations as per 15A NCAC 13B.1626(4)(a)(i) and .1626(4)(a)(ii).

2.0 LANDFILL GAS MONITORING

2.1 EXISTING MONITORING LOCATIONS

The current gas monitoring network is outlined below and is summarized in Table 1. This gas monitoring system is focused near the property boundary (i.e., the compliance boundary) around the site, particularly where the property is closest to the landfill cells. The locations of the monitoring probes are shown in Figures 2 and 3. The gas monitoring probe design criteria and rationale for the locations were previously completed by Municipal Engineering Services Company, P.A. (MESCO) and are described below:

> *Quarterly, the City of Albemarle landfill will monitor the explosive gas at the landfill structures and at or near the landfill boundary. The permanent probes will consist of a plastic stand pipe similar to a piezometer used for groundwater detection. A typical permanent methane probe is detailed in the operation drawings. The permanent probe will be constructed at a depth of six (6) feet. A 6" diameter hole will contain a one (l) inch slotted PVC pipe. The bottom two (2) feet will be backfilled with non-carbonate pea gravel with a bentonite seal one (1) foot thick above it. The remaining three (3) feet will be backfilled with insitu soils. The one (1) inch PVC pipe will be approximately three (3) feet above the existing grade. The PVC pipe will be capped with a one (1) inch PVC cap, one quarter (1/4) inch NPT hose barb, and 1" tubing, plugged or capped.*
>
> *The locations were determined by the relationship of solid waste with property lines and landfill structures. The spacing of the monitoring probes is between 200 and 400 feet. The migration of methane gas is induced by pressure gradients. The methane will move from areas of high pressure to those of low pressure following the path of least resistance. The methane will migrate vertically until it reaches the landfill cap, where it will begin to flow horizontally. This occurs until it finds a pathway out, either by the installed methane collection trenches or migration through the permeable in situ soils. Since methane is lighter than air, it wants to escape into the atmosphere. It has been our experience that whenever gas is migrating no matter what the spacing or depth of the monitoring probes, the gas will fill the void created by the monitoring point and an explosive meter will monitor the level. The six-foot depth of the monitoring probes is to ensure a stable monitoring point. The only time a shallow monitoring point has not worked is in a very heavy, impermeable clay layer that acts as a seal to the migration of the gas. If a clay layer is encountered during the construction of the monitoring points, it will either be moved beyond the clay or excavated to a depth that is in the conductive zone below the clay.* **Source:** "Operation Plan, Solid Waste Landfill Facility, City of Albemarle Landfill, Albemarle, North Carolina", November 2014: Hodges, Harbin, Newberry & Tribble, Inc.

2.2 STRUCTURE MONITORING

For public health and safety the City of Albemarle continues to monitor landfill facility structures on a quarterly basis. The on-site structures include both the maintenance and recycle shops. These structures are monitored using a calibrated gas instrument.

2.3 MONITORING FREQUENCY

The gas monitoring frequency is quarterly for the monitoring probes located around the site. The methane and hydrogen sulfide data are reported to the SWS on a quarterly basis. In conjunction with the gas data from the monitoring probes, the buildings and structures are also monitored on a quarterly basis and these data are both reported to the SWS and retained at the site.

3.0 LANDFILL GAS MONITORING PROCEDURES

Section 3.1 provides details of the equipment used for the monitoring of the gas around the City of Albemarle Landfill sites. The procedures used to perform this gas monitoring are described in Section 3.2.

3.1 DETECTION EQUIPMENT

Gas monitoring at the City of Albemarle Landfill sites is performed on a quarterly basis using a LANDTEC gas analyzer and extraction monitoring instrument, such as a GEM5000, or acceptable equivalent meter. This instrument is rented from a local provider that also provides the required factory calibration records. A copy of the calibration records is provided with the quarterly gas monitoring report.

In addition to the semi-annual factory calibration, the instrument is also calibrated in the field. Field calibration is performed within a controlled environment and is initiated by zeroing the instrumentation data files. Each of the methane, oxygen, and carbon dioxide alarms are subsequently checked to ensure proper function. The pump flow rate is measured and recorded and the instrument vacuum is tested to 70 inches of water.

The final step of the instrument calibration for the monitoring event is the gas calibration using the 35/50 gas canisters (i.e., 35% carbon dioxide and 50% methane). Each of these two calibrations are required to be within $\pm$ 3% of the calibration gas concentration. The calibration for the oxygen is conducted using 4% oxygen and is required to be within $\pm$ 1% of the calibration gas concentration.

3.2 LANDFILL GAS MONITORING PROCEDURE

Monitoring times are important when conducting landfill gas monitoring. Proper landfill gas monitoring should include sampling during times when landfill gas is most likely to migrate. Because subsurface gas pressures are considered to be at a maximum during the afternoon hours,

monitoring should be conducted in the afternoon or whenever the barometric pressure is low. The landfill gas monitoring procedures used to operate the LANDTEC GEM5000 are as follows:

- Following the instrument calibration, make sure the static pressure shows a reading of zero on the instrument prior to taking the first sampling;
- Purge the sample tube for at least one minute prior to taking the gas reading. Connect the sample tube to the monitoring probe;
- Open the valve and record the initial gas reading and then the stabilized reading. A stabilized reading does not vary by more than 0.5% by volume on the instrument's scale;
- Record the stabilized reading including the oxygen and carbon dioxide concentrations and the barometric pressure;
- Turn off the gas entering the instrument and disconnect the tubing from the monitoring probe fitting;

These steps are repeated from probe to probe, until all of the monitoring probes have been measured around both sites.

4.0 RECORD KEEPING AND REPORTING

Section 4 provides details of the record keeping and reporting for the gas monitoring at the City of Albemarle Landfill sites.

4.1 LANDFILL GAS DATA FORM

The data form provided by the SWS is used for recording gas monitoring data measured at the City of Albemarle Landfill sites. A supplement form is also used for additional gas monitoring probes beyond the ten provided for on the SWS data form. This supplemental form also includes the facility identification, the permit number for the facility, date of the data collection, and the same certification statement as included on the SWS data form, with a signature block for the person recording the data. The supplemental form can be appropriately linked directly to the SWS data form with the appropriate instrument and calibration information.

4.2 GAS MONITORING REPORTS

The gas monitoring data collected at the landfill is compiled into a quarterly report and submitted to SWS. The report includes a copy of the data collected during the monitoring event as recorded on the SWS data form, and any supplemental data forms. Additionally, a copy of the factory calibration records are provided with a copy of the calibration records for each field monitoring event.

4.3 PERMANENT RECORD KEEPING

The SWS data forms and the quarterly gas monitoring report are retained at the City of Albemarle Landfill for inspection. These documents are a part of the permanent record for the landfill.

5.0 CONTINGENCY PLAN

A contingency plan for the site is required in the event an explosive gas is recorded above the LEL at the property boundary. The contingency plan includes the specific steps that should be implemented to protect human health and the environment. Components of the contingency plan consist of immediate action; reporting and documentation; and, remediation plan.

5.1 IMMEDIATE ACTION

The following actions comprise an immediate response to the finding of explosive gas in a property boundary probe exceeding the LEL:

- Confirm the instrument calibration and check the presence of the gas in the monitoring probe with a second reading, if the gas persists use another calibrated gas monitoring instrument for acquiring a confirmatory gas reading;
- Check for the presence of gas in structures near the monitoring probe in which the gas exceedance was identified;
- If the gas within the structure exceeds the 25% of the LEL, the structure will be evacuated following communication with County Agencies, the site manager, and SWS;
- Notification of the situation shall be conveyed to City of Albemarle Landfill employees;
- As appropriate, draft a plan of remedial action and begin remedy procedures to control gas concentrations within the building(s) in which the gas was found to exceed 25% of the LEL;
- Check other monitoring probes in the area and also investigate the possible source and avenue of transport of the gas to the area of concern. Such an investigation may consist of a soil gas survey in the area, bar hole probes to check for the gas, or other gas monitoring methodology acceptable to all parties (i.e., City of Albemarle, SWS, and adjacent property owners); and
- Inform the SWS within 24 hours in writing of the regulatory exceedance of the explosive gas in air.

These immediate actions provide a basis for moving forward in a relatively rapid manner upon the identification of a gas accumulation in structures adjacent to the landfill property.

5.2 REMEDIATION PLAN

In the event that the prolonged gas concentrations persist and as identified during the implementation of the Immediate Action Plan as described in Section 5.1, a Remediation Plan shall be prepared. This plan will describe the nature of the problem, the extent of the problem, and the proposed remedial action to be implemented in the field to alleviate the extent of the gas in the area of the recorded gas exceedances of the LEL.

5.3 REPORTING AND DOCUMENTATION

Following the Immediate Action Plan provided in Section 5.1, and within seven days, the County must place the explosive gas concentrations and a description of executed actions to protect human health in the operating record at the City of Albemarle Landfill office. Within sixty (60) days a remediation plan describing nature of the problem, extent of the problem, and the proposed remedy shall be implemented and a copy of the Remediation Plan will be placed in the operating record.

6.0 REFERENCES

Conley, J.F., 1962, Geology of the Albemarle quadrangle, North Carolina: Bulletin 75, Division of Mineral Resources, North Carolina Department of Conservation and Development, p26

Harned, D.A., 1989; The Hydrogeological Framework and a Reconnaissance of Ground-Water Quality in the Piedmont Province of North Carolina, with a Design for Future Study, United States Geological Survey, Water Resources Investigations Report 88-4130, Raleigh, North Carolina.

Heath, Ralph C., 1980; Basic Elements of Ground-Water Hydrology with Reference to Conditions in North Carolina, United States Geological Survey, Water Resources Open-File Report 80-44, Raleigh, North Carolina.

LeGrand, Harry E., 1988; Region 21, Piedmont and Blue Ridge, in Back, W., Rosenhein, J.S. and P.R. Seaber, (Editors), *Hydrogeology – The Geology of North America*, Volume O-2, The Geological Society of America, Boulder, Colorado.

PROFESSIONAL CERTIFICATION

The certification statement below must be signed and sealed by a North Carolina Professional Geologist or Professional Engineer and submitted with the Landfill Gas Monitoring Plan. The landfill gas monitoring plan for this facility has been prepared by a qualified geologist or engineer who is licensed to practice in the State of North Carolina. The plan has been prepared based on first-hand knowledge of site conditions and familiarity with North Carolina solid waste rules and industry standard protocol. This certification is made in accordance with North Carolina Solid Waste Regulations, indicating this Landfill Gas Monitoring Plan should provide early detection of any release of hazardous constituents to the uppermost aquifer, so as to be protective of public health and the environment. No other warranties, expressed or implied, are made.

Signed J. David Wallace

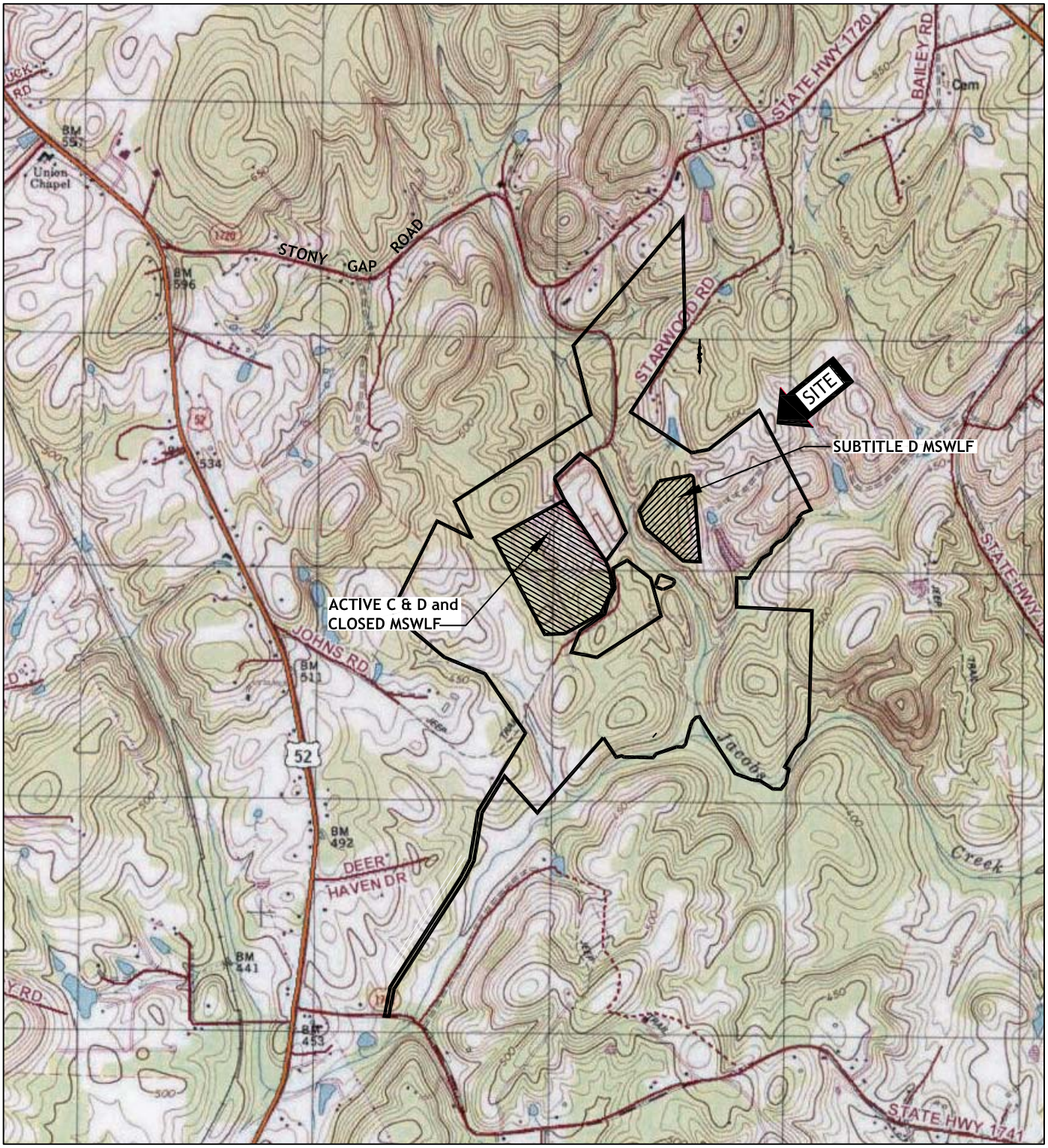
Printed J. DAVID WALLACE

Date May 13, 2015

NORTH CAROLINA PROFESSIONAL SEAL 20055 ENGINEER J. DAVID WALLACE

Not valid unless this document bears the seal of the above mentioned licensed professional.

FIGURES



N

GRAPHIC SCALE

0 1,000 2,000

SCALE: 1 in. = 2,000 ft.

SOURCE: NATIONAL GEOGRAPHIC USGS TOPO, 7.5 MINUTE MAP SERIES, STANLY COUNTY, NORTH CAROLINA

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SITE VICINITY MAP

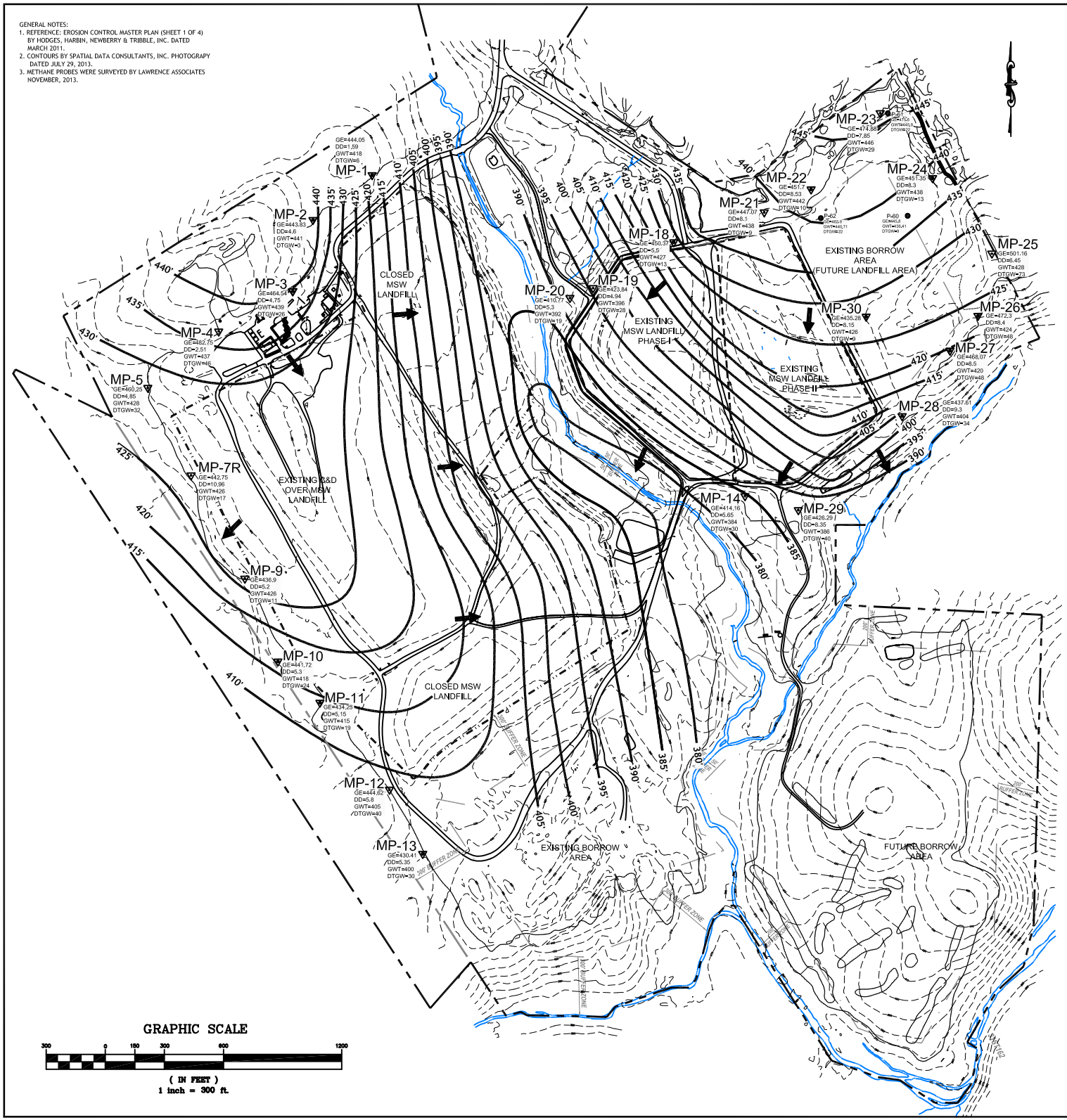
CITY OF ALBEMARLE LANDFILL

STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD # 1110192-01

DATE :	11/01/12	DRAWN BY :	RBS
SCALE :	AS SHOWN	FIGURE :	1

H:\PROJECTS\2011\1110192 - CITY OF ALBEMARLE LANDFILL\FIGURES\SITE VICINITY MAP 11-01-12.DWG

GENERAL NOTES:
1. REFERENCE: EROSION CONTROL MASTER PLAN (SHEET 1 OF 4) BY HODGES, HARBIN, NEWBERRY & TRIBBLE, INC. DATED MARCH 2011.
2. CONTOURS BY SPATIAL DATA CONSULTANTS, INC. PHOTOGRAPY DATED JULY 29, 2013.
3. METHANE PROBES WERE SURVEYED BY LAWRENCE ASSOCIATES NOVEMBER, 2013.



LEGEND

NAVD	NORTH AMERICAN VERTICAL DATUM
GE	GROUND ELEVATION (FEET ABOVE NAVD)
DD	DRILLED DEPTH OF METHANE PROBE (FEET BELOW GROUND ELEVATION)
GWT	GROUNDWATER ELEVATION (FEET ABOVE NAVD)
DTGW	DEPTH TO GROUNDWATER TABLE (FEET BELOW GROUND ELEVATION)
	PZIEMETER LOCATION
	METHANE MONITORING PROBE LOCATION
	2013 CONTOURS
	PROPERTY LINE
	GROUNDWATER CONTOUR (FEET ABOVE NAVD)
	ROAD
	WATER
	CLOSED MSWLF SANITARY UNIT
	EXISTING MSWLF SANITARY UNIT
	BUFFER ZONE
	TREE LINE
	GENERALIZED GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER CONTOURS WERE DEVELOPED FROM DEPTH-TO-GROUNDWATER MEASUREMENTS AT MONITORING WELLS COLLECTED ON JANUARY 13, 2015 (ACTIVE C&D AND CLOSED MSWLF) AND FEBRUARY 24, 2015 (SUBTITLE D LINED MSWLF). THESE GENERALIZED GROUNDWATER CONTOURS WERE USED TO ESTABLISH ESTIMATED DEPTH-TO-GROUNDWATER DATA FOR EACH METHANE PROBE.

SHIELD ENGINEERING, INC.
4301 TAGGART CREEK ROAD
CHARLOTTE, NC 28208
704-596-0010
704-596-0065 fax
www.shieldengineering.com

GROUNDWATER CONTOUR MAP

CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD #1110192-01

DATE :	03/12/15	DRAWN BY :	CRC
SCALE :	AS SHOWN	FIGURE :	2

LEGEND

- 2013 CONTOURS
- PROPERTY LINE
- MP-19 GAS MONITORING PROBE LOCATION
- ROAD
- BUFFER ZONE
- WATER
- CULVERT PIPE
- CULVERT HEADWALL

EXISTING PROPERTY LINE
EXISTING TREE LINE
MP-1
MP-2
MP-3
MP-4
MP-5
MP-7R
MP-9
MP-10
MP-11
MP-12
MP-13
MP-14
MP-18
MP-19
MP-20
MP-21
MP-22
MP-23
MP-24
MP-25
MP-26
MP-27
MP-28
MP-29
MP-30
MAINTENANCE SHOP
RECYCLE SHOP
CLOSED MSW LANDFILL
EXISTING MSW LANDFILL PHASE I
EXISTING MSW LANDFILL PHASE II
EXISTING BORROW AREA (FUTURE LANDFILL AREA)
EXISTING SEDIMENT BASIN NO. 1 (ENHANCEMENT PROPOSED)
EXISTING LANDFILL ACCESS ROAD (TYP.)
EXISTING SEDIMENT BASIN NO. 5
EXISTING SEDIMENT BASIN NO. 6
EXISTING SEDIMENT BASIN NO. 7
EXISTING SEDIMENT BASIN NO. 8
EXISTING LEACHATE SEEPAGE POND
EXISTING C&D OVER MSW LANDFILL
LEACHATE SAMPLING POINT
EXISTING SEDIMENT BASIN NO. 2 (ENHANCEMENT PROPOSED)
EXISTING SEDIMENT BASIN NO. 3
EXISTING SEDIMENT BASIN NO. 4
CLOSED MSW LANDFILL
EXISTING BORROW AREA
FUTURE BORROW AREA
300' BUFFER ZONE
ID# 655601475521
City of Albemarle
Deed Ref: 1413-274
105.06 Acres

NOTES:
1. REFERENCE: EROSION CONTROL MASTER PLAN (SHEET 1 OF 4) BY HODGES, HARBIN, NEWBERRY & TRIBBLE, INC. DATED MARCH 2011.
2. CONTOURS BY SPATIAL DATA CONSULTANTS, INC. PHOTOGRAPY DATED JULY 29, 2013.
3. METHANE WELLS WERE SURVEYED BY LAWRENCE ASSOCIATES NOVEMBER, 2013.

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

SHIELD ENGINEERING, INC.
4301 TAGGART CREEK ROAD
CHARLOTTE, NC 28208
704-394-6913
704-394-6968 fax
www.shieldengineering.com

GAS MONITORING PROBE LOCATION PLAN

CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD #1110192-01

DATE : 05/13/15	DRAWN BY : RBS
SCALE : AS SHOWN	FIGURE : 3

H:\PROJECTS\2011\1110192 - CITY OF ALBEMARLE LANDFILL\METHANE MONITORING\MONITORING PLAN\GAS MONITORING PROBE LOCATION PLAN 05-13-15.DWG

TABLES

TABLE 1

SUMMARY OF GAS MONITORING PROBES
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Probe Identification	Ground Elevation (Feet above NAVD)	Screen Interval (Feet below Ground Surface)	Drilled Depth (Feet)	*Estimated Depth to Groundwater
MP 1	444.05	NA	1.59	6
MP 2	443.83	NA	4.6	3
MP 3	464.54	NA	4.75	26
MP 4	482.75	NA	2.51	46
MP 5	460.25	NA	4.85	32
MP 7R	442.75	3 - 11	10.96	17
MP 9	436.90	NA	5.2	11
MP 10	441.72	NA	5.3	24
MP 11	434.25	NA	5.15	19
MP 12	444.62	NA	5.8	40
MP 13	430.41	NA	5.35	30
MP 14	414.16	NA	5.65	30
MP 18	450.37	NA	5.5	13
MP 19	423.84	NA	4.94	28
MP 20	410.77	NA	5.3	19
MP 21	447.07	NA	8.1	9
MP 22	451.70	NA	8.53	10
MP 23	474.88	NA	7.85	29
MP 24	451.35	3 - 8	8.3	13
MP 25	501.16	3 - 8	6.45	73
MP 26	472.30	3 - 8	8.4	48
MP 27	468.07	3 - 8	8.5	48
MP 28	437.61	NA	9.3	34
MP 29	426.29	3 - 8	8.35	40
MP 30	435.28	3 - 8	8.15	9

Notes:
1. All depths are in feet below ground surface.
2. NAVD - North American Vertical Datum
3. NA - Not Available

*Estimated depth-to-Groundwater data for each monitoring probe was derived from groundwater contours shown in Figure 2. These generalized groundwater countours were developed from depth-to-groundwater measurements at Monitoring Wells collected on January 13, 2015 for the Active C&D and Closed MSWLF and on February 24, 2015 for the Subtitle D Lined MSWLF.

REPORT OF GAS MONITORING
SECOND QUARTER 2015
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Prepared for:
CITY OF ALBEMARLE
Albemarle, North Carolina

By:
Shield Engineering
4301 Taggart Creek Road
Charlotte, North Carolina

Shield Project 1110192

May 19, 2015

SHIELD
ENGINEERING, INC.

SHIELD ENGINEERING, INC.

May 19, 2015

Mr. Ervin Lane
Solid Waste Section
Division of Waste Management
NCDENR
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: **Report of Gas Monitoring – Second Quarter 2015**
City of Albemarle Landfill
DSWM Permit No. 84-01
Shield Project 1110192

Dear Mr. Lane:

On behalf of City of Albemarle (Albemarle), Shield Engineering, Inc. (Shield) is pleased to submit this Report of Gas Monitoring for the Second Quarter of 2015 for the subject site. This report includes the results of the Second Quarter 2015 gas monitoring of permanent probes. The activities were performed in accordance with the *Landfill Gas Monitoring Guidance* dated November 2010.

If you have any questions or comments, please contact us at (704) 394-6913.

Sincerely,
SHIELD ENGINEERING, INC.

NORTH CAROLINA PROFESSIONAL SEAL 20055 ENGINEER J DAVID WALLACE

J. David Wallace, P.E.
Senior Engineer

Keith A. Anthony, P.E.
Principal Engineer

JDW/KAA:

cc: Ms. Nina Underwood, Director of Public Works (City of Albemarle)

4301 Taggart Creek Road
Charlotte, NC 28208

www.shieldengineering.com

Telephone 704.394.6913
Fax 704.394.6968

1.0 INTRODUCTION

1.1 Background

The City of Albemarle Landfill (DSWM [Division of Solid Waste Management] Permit #84-01) is located on Stony Gap Road (SR 1720), in Stanly County, North Carolina (see Figure 1). Prior to operating as a C&D Landfill, the site formerly operated as an unlined Municipal Solid Waste Landfill (MSWLF) that consisted of two units. The first unit (Unit #1) was closed prior to October 1991 with a 24-inch thick final soil cover. The second unit (Unit #2) was closed with an 18-inch thick cohesive soil cap with a permeability of 10^{-5} centimeters per second (cm/sec) and an 18-inch thick soil erosive layer prior to June 1999 in accordance with the *Transition Plan.* The C&D Landfill is constructed and operating on top of the Unit #1 MSWLF.

Adjacent to the C&D Landfill, across the unnamed tributary of Jacob's Creek, on the same contiguous property is the active Subtitle D lined MSWLF. The lined MSWLF is comprised of two contiguous phases (Phase 1 and 2) which are combined and treated as a single unit for continuity of the reporting to the SWS. This active MSWLF also operates under DSWM Permit #84-01 and is also reported herein.

1.2 Gas Monitoring Program

The Gas Monitoring Program for the active C&D Landfill on top of the former MSWLF has included the monitoring of the permanent gas monitoring probes located around the site (MP-1 through MP-13; excluding MP-6, MP-8), and both the maintenance and recycling shops.

A series of gas monitoring probes have also been installed around the Subtitle D lined MSWLF (MP-14, and MP-18 through MP-30) to monitor for explosive gases as required by Title 15A North Carolina Administrative Code Subchapter 13B Section .1626(4)(a)(ii) and .1626(4)(b) [15A NCAC 13B.1626(4)(a)(ii) and .1626(4)(b)].

The locations of the gas monitoring probes are shown on the attached Figure 1. Together these two groups of gas monitoring probes and the two shops comprise the current gas monitoring for the City of Albemarle Landfill.

1.3 Gas Data Collection and Presentation

The percentage of methane gas in air data and hydrogen sulfide gas concentrations within the gas monitoring probes were measured on April 22, 2015 using a LANDTEC GEM-5000™ gas monitor. These data were entered onto the SWS forms from the LANDTEC GEM-5000™ gas monitor and the original copy of these forms is retained as part of the landfill operating record (see Appendix A).

Methane is explosive at concentrations ranging from 5 percent (%) of methane gas (lower explosive limit – LEL) to 15 % of methane gas (upper explosive limit – UEL) by volume in air. Hydrogen sulfide is explosive at concentrations ranging from 4.3 percent (%) of hydrogen sulfide gas (LEL) to 46% of hydrogen sulfide gas (UEL) by volume in air. SWS management guidelines state that explosive gases should not exceed either the LEL (5 % of methane gas in air and 4.6% of hydrogen sulfide in air) at property boundaries or 25 % of the LEL (1.25 % of methane gas in air and 1.08% of hydrogen sulfide in air) in facility structures [15A NCAC 13B.1626(4)(a)].

The gas measurement procedures used for monitoring for explosive gases at this Site follow both the manufacturer's specifications for the gas monitor and those procedures outlined in *Landfill Gas Monitoring Guidance* dated November 2010.

The gas results are summarized in Table 1. The instrument calibration records and the Landfill Gas Monitoring Data Forms as required by *Landfill Gas Monitoring Guidance* are included in Appendix A.

2.0 GAS DATA

2.1 Gas Data Results Summary

2.1.1 Active C&D and closed MSWLF

Both hydrogen sulfide and methane were undetected in eight of the eleven gas probes around the active C&D Landfill and closed MSWLF. Neither of the two shops exhibited the presence of methane, though hydrogen sulfide was detected at 1 part per million (ppm), which is significantly below the limit of 25% of the LEL (i.e., 10,750 ppm for hydrogen sulfide). Methane concentration was found to be above zero for Gas Probes MP-5 (2.9%), MP-9 (75.7%) and MP-12 (82.9%) along the southwest perimeter of the active C&D Landfill and closed MSWLF. The regulatory limit at the compliance boundary or property boundary is 5% of methane in air. However, the purchase of the adjacent property located west from this methane probe, has moved the property boundary about 1100 feet from MP-9 and 900 feet further south from MP-12. Additionally, at the time of these gas measurements surface water was present in the drainage feature between these gas probes and the property boundary located to the west of both of these gas probes. Surface water would prevent the migration of gas toward the property boundary west of these two gas probes. The following briefly describes the historical trend to date for MP-9 and MP-12 methane monitoring probes since 2010:

- MP-5: Methane has been detected only once before, in February 2013 (2.5%), otherwise methane has been undetected in this probe since the first quarter of 2011.
- MP-9: Methane has been undetected since 2010 through to the Fourth Quarter of 2012 (i.e., except for one methane detection at 4.9% of methane gas in air [May 2011]). To date methane has been detected since the first quarter of 2013, except for the last quarter of 2013 and the last quarter of 2014.
- MP-12: Methane had been previously detected for the period from July 2007 through January 2009, during which it ranged from 2 to 9% of methane gas in air. Methane has been undetected since April 2009 through to the Fourth Quarter of 2012. To date methane has been detected above the LEL since the First Quarter of 2013.

Methane measurements obtained from those methane probes closer to the property boundary than MP-9 and MP-12 (i.e., MP-1 through MP-5, MP-7R, and MP-13: see Figure 1) exhibited either no methane or methane below 5% during the Second Quarter of 2015.

Hydrogen sulfide gas was detected at 1 ppm in Methane Probe MP-1 through MP-7R, and MP-10, and at 7 ppm in Methane Probe MP-9. These concentrations are orders of magnitude below the LEL for hydrogen sulfide. No hydrogen sulfide was detected in the remaining monitored probes at this site during this quarter.

2.1.2 Subtitle D lined MSWLF

Methane was undetected for all of the gas probes around the active Subtitle D lined MSWLF (see Table 1), except Methane Probes MP-18 and MP-19. The methane in air concentration in these gas probes was at 2.2% and 26.8% of methane in air, respectively on April 22, 2015 (see Table 1). This is the first time methane has been detected in Gas Probe MP-18. Gas Probe MP-19 has previously exhibited methane in air above 30% during three quarters of 2013 (except for the last quarter of 2013). Prior to 2013 this methane probe had exhibited previous methane detections of 3.8% of methane in air in May 2011 and 2.8% of methane in air in November 2012. During the Second and Third Quarters of 2014 this methane probe exhibited methane in air at 5.1% and 5.9%, respectively, and in the First Quarter of 2015 had exhibited 15.6% of methane in air. Hence this methane probe has previously exhibited variable trends for the presence of methane.

However, Methane Probe MP-18 which is located between MP-19 and the property boundary, has not exhibited methane above the LEL of 5% during this monitoring period. The regulatory limits were met by the methane monitoring probe closer to the property boundary at this site.

No hydrogen sulfide was detected in the monitored probes at this site during this quarter.

2.2 Comments

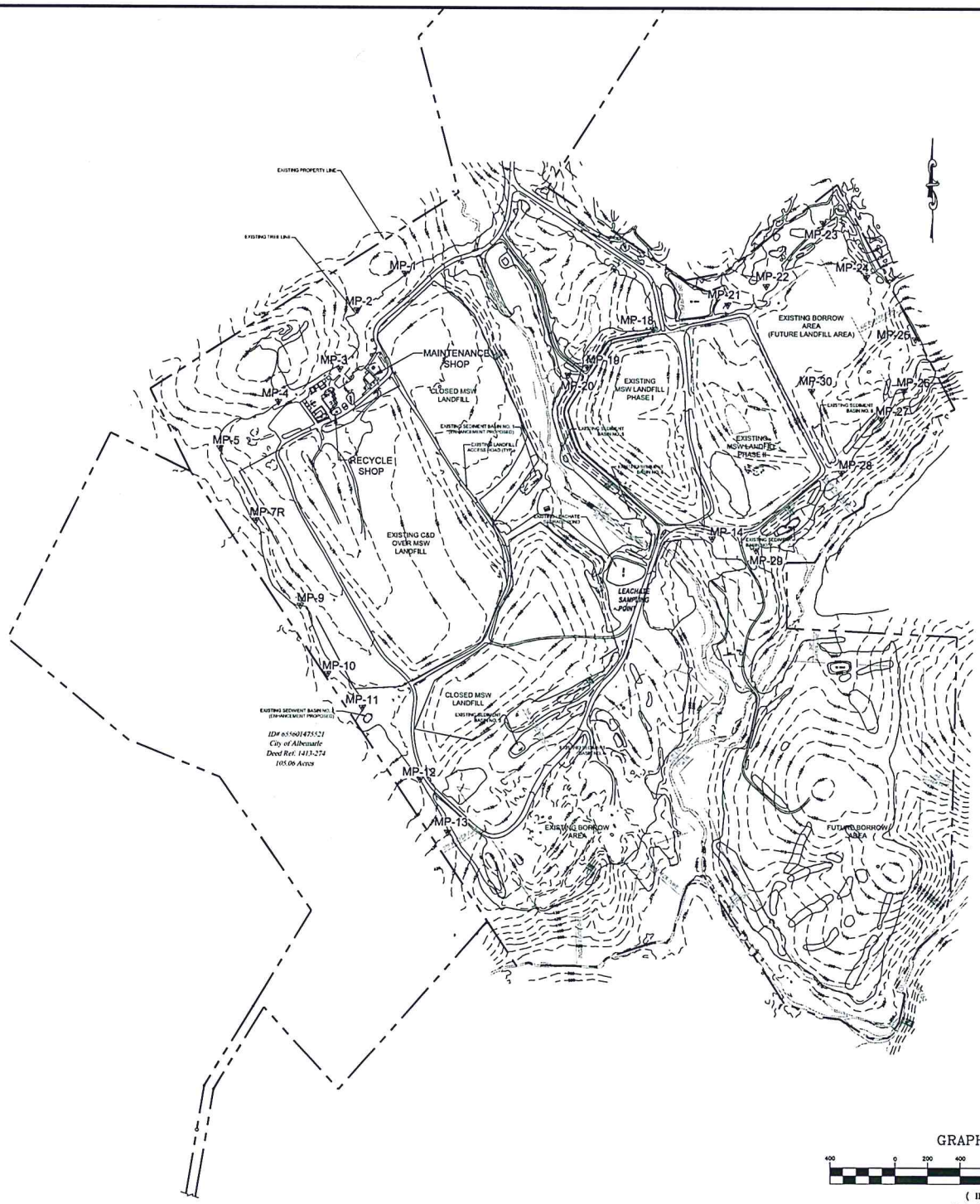
Based on results of recent methane monitoring data for both sites, methane gas concentrations at the methane monitoring probes closest to the property boundary are below regulatory limits for the Second Quarter of 2015. Additionally, in the case of both MP-9 and MP-12 the surface

water along a drainage feature west of these two gas probes prevents the migration of gas to the property boundary to the west.

TABLE 1
METHANE MONITORING DATA
CITY OF ALBEMARLE LANDFILL
STANLY COUNTY, NORTH CAROLINA

Methane Monitoring Probe Identification	Date of Readings: April 22, 2015	
	Methane in Air (%)	H_2S (ppm)
ACTIVE C&D AND CLOSED MSWLF		
MP-1	ND	1
MP-2	ND	1
MP-3	ND	1
MP-4	ND	1
MP-5	**2.9**	1
MP-7R	ND	1
MP-9	**75.7**	7
MP-10	ND	1
MP-11	ND	0
MP-12	**82.9**	0
MP-13	ND	0
SUBTITLE D LINED MSWLF		
MP-14	ND	0
MP-18	**2.2**	0
MP-19	**26.8**	0
MP-20	ND	0
MP-21	ND	0
MP-22	ND	0
MP-23	ND	0
MP-24	ND	0
MP-25	ND	0
MP-26	ND	0
MP-27	ND	0
MP-28	ND	0
MP-29	ND	0
MP-30	ND	0
Maintenance Shop	ND	1
Recycling Shop	ND	1

NOTES: 1) ND - Not Detected
2) NM - Not Measured



LEGEND

- 2013 CONTOURS
- PROPERTY LINE
- MP-19 (METHANE) MONITORING PROBE LOCATION
- ROAD
- BUFFER ZONE
- WATER
- CULVERT PIPE
- CULVERT HEADWALL

NOTES:
1. REFERENCE: EROSION CONTROL MASTER PLAN (SHEET 1 OF 4) BY HODGES, HARBIN, NEWBERRY & TRIBBLE, INC. DATED MARCH 2011.
2. CONTOURS BY SPATIAL DATA CONSULTANTS, INC. PHOTOGRAPHY DATED JULY 29, 2013.
3. METHANE WELLS WERE SURVEYED BY LAWRENCE ASSOCIATES NOVEMBER, 2013.

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400 ft.

SHIELD ENGINEERING, INC.
4301 TAGGART CREEK ROAD
CHARLOTTE, NC 28209

METHANE MONITORING LOCATION PLAN

CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD 01110192-01

DATE :	01/02/14	DRAWN BY :	RBS
SCALE :	AS SHOWN	FIGURE :	1

H:\PROJECTS\2011\11101192 - CITY OF ALBEMARLE LANDFILL\FIGURES\METHANE MAPS NEW 2014\METHANE MONITORING LOCATION PLAN WITH NEW PROPERTY AND SURVEYED LOCATIONS 01-02-14.DWG

APPENDIX A

(Landfill Gas Monitoring Data Form)

NC Division of Waste Management - Solid Waste Section

Landfill Gas Monitoring Data 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).

Facility Name: City of Albemarle Landfill Permit Number: #84-01

Date of Sampling: 4-22-15 NC Landfill Rule (.0500 or .1600): .1600

Name and Position of Sample Collector: Joanna Harrison Staff Scientist

Type and Serial Number of Gas Meter: Gem 5000+ S/N 6502512 Calibration Date of Gas Meter: 1-6-15

Date and Time of Field Calibration: 4-20-15

Type of Field Calibration Gas (15/15 or 35/50): 35/50 Expiration Date of Field Calibration Gas Canister: 1-19-19

Pump Rate of Gas Meter: _____

Ambient Air Temperature: 84.6°F Barometric Pressure: 29.18" Hg General Weather Conditions: Sunny 75°

Instructions: Under "Location or LFG Well" identify the monitoring wells or describe the location for other tests (e.g., inside buildings). A drawing showing the location of test must be attached. Report methane readings in both % LEL and % methane by volume. A reading in percent methane by volume can be converted to % LEL as follows: % methane by volume = % LEL/20

Location or LFG Well ID	Sample Tube Purge min	Time	Time Pumped (s) min	Initial %LEL	Stabilized %LEL	%CH4 by Volume	%O2	%CO2	H2S (ppm)	Notes Bar Pressure "Hg
MP-1	1	1358	1	—	—	0	18.8	1.4	1	29.42
MP-2	1	1402	1	—	—	0	16.6	2.7	1	29.42
MP-3	1	1405	1	—	—	0	15.4	2.2	1	29.42
MP-4	1	1408	1	—	—	0	18.0	1.9	1	29.42
MP-5	1	1422	1	—	—	2.9	4.5	11.1	1	29.42
MP-7R	1	1426	1	—	—	0	14.7	2.4	1	29.42
MP-9	1	1430	1	—	—	75.7	0.2	24.1	7	29.42
MP-10	1	1445	1	—	—	0	15.6	2.8	1	29.42
MP-11	1	1453	1	—	—	0	20.5	0.3	0	29.42
MP-12	1	1458	1	—	—	82.9	0.4	17.5	0	29.42

If your facility has more gas monitoring locations than there is room on this form, please attach additional sheets listing the same information as contained on this form.

Certification

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

SIGNATURE

Staff Scientist

TITLE

Facility Name: **CITY OF ALBEMARLE LANDFILL** Permit Number: **#8401** Date of Sampling: 4-22-15

Methane Probe ID	Sample Tube Purge min	Time	Time Pumped min	Initial %LEL	Stabilized %LEL	% CH4 by Volume	%O2	%CO_2	H_2S (ppm)	Baro Pressure "Hg	NOTES
MP-13	1	1503	1	—	—	0	10.5	2.6	0	29.42	
MP-14	1	1512	1	—	—	0	10.7	4.4	0	29.42	
MP-18	1	1551	1	—	—	2.2	19.3	2.4	0	29.42	
MP-19	1	1555	1	—	—	26.8	0.3	9.0	0	29.42	
MP-20	1	1559	1	—	—	0	13.9	4.6	0	29.42	
MP-21	1	1546	1	—	—	0	17.3	2.4	0	29.42	
MP-22	1	1544	1	—	—	0	20.4	0.9	0	29.42	
MP-23	1	1540	1	—	—	0	19.7	2.6	0	29.42	
MP-24	1	1533	1	—	—	0	20.5	0.7	0	29.42	
MP-25	1	1529	1	—	—	0	20.6	0.2	0	29.42	
MP-26	1	1526	1	—	—	0	18.2	1.7	0	29.42	
MP-27	1	1523	1	—	—	0	20.6	0.1	0	29.42	
MP-28	1	1520	1	—	—	0	20.6	0.6	0	29.42	
MP-29	1	1515	1	—	—	0	8.8	4.6	0	29.42	
MP-30	1	1536	1	—	—	0	19.9	0.7	0	29.42	
SHOP	1	1345	1	—	—	0	20.6	0.1	1	29.42	
Recycle Shop	1	1352	1	—	—	0	20.7	0.0	1	29.42	

Certification: **To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.**

SIGNATURE

Staff Scientist
TITLE

CERTIFICATION OF CALIBRATION

ISSUED BY: Landtec North America Instrument Services Facility
Date Of Calibration: January 6, 2015
Certificate Number: G502512_1/14618

PJLA Calibration Accreditation No. 66916

Approved By Signatory

Landtec North America Instrument Services Facility,
850 South Via Lata, Suite 112, Colton CA 92324
www.landtecna.com

Andrew Tillman
Quality Manager

Customer: *Pine Environmental Services*
P.O. Box 942
Hightstown, NJ 08520
USA

Description: GEM5000 *Model:* GEM5000
Serial Number: G502512

Accredited Results:

Methane (CH4)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
50.0	49.5	1.03
15.0	14.8	0.66
5.0	4.8	0.42

Carbon Dioxide (CO2)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
50.0	50.0	1.19
15.0	14.8	0.71
5.0	4.9	0.43

Oxygen (O2)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
21.0	21.0	0.25

Gas cylinders are traceable and details can be provided if requested.

CH4, CO2 readings recorded at: 34.8 °C/94.6 °F Barometric Pressure: 29.18 "Hg
O2 readings recorded at: 24.2 °C/75.6 °F

Method of Test: The analyzer is calibrated in a temperature controlled chamber using reference gases. All analyzers are calibrated in accordance with our procedure ISP-17 using high purity grade gas.

All calibrations are performed in accordance with ISO 17025 at LANDTEC, an ISO 17025:2005 – accredited service facility through PJLA.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with NIST requirements.

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI). Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATION OF CALIBRATION

PJLA ACCREDITED CALIBRATION LABORATORY NO. 66916

Certificate Number
G502512_4/14618

Non Accredited results:

Pressure Transducers (inches of water column)					
Transducer	Certified (Low)	Reading (Low)	Certified (High)	Reading (High)	Accuracy
Static	0"	0.00"	40"	40.05"	2.0"
Differential	0"	0.00"	4"	3.91"	0.7"

Barometer (mbar)	
Reference	Instrument Reading
0988 mbar / 29.18 "Hg	0989 mbar / 29.21 "Hg

Additional Gas Cells		
Gas	Certified Gas (ppm)	Instrument Reading (ppm)
H2	1003	LOW
CO	500	490
H2S	500	500

End of Certificate

CALIBRATION LOG
LANDTEC - GEM 5000+

Instrument: LANDTEC | Serial Number: GS02542

Calibrated materials required:

Lot: DAP-1-4 O2 (20.9%)
Exp: 7/10/2018

Lot: BAP-161-4-7 02 (4%)
Exp: 1/19/2019

Lot: BAP-98-200-3 H2S (200ppm)
Exp: 4/19/2016

Lot: HAO-341TSM-1 CH4 (10%) CO2 (10%)
Exp: 7/10/2018

Lot: BAP-399-4 CH4 (50%) C02 (35%)
Exp: 01/19/19

Lot: BAP-49-1000-1 CO (1000ppm)
Exp: 01/19/19

Carbon Filter Saturation (CH4) - Condition: PASS Initials: DSR

Gas Calibration Check Perfomred at Room Temperature

GEM 5000+ (ZERO AIR CALIBRATION)

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
CO (ppm)	-2.0	0.0	+/- 5 ppm	
H2S (ppm)	-1.0	0.0	+/- 5 ppm	
O2 (%)	21.1	20.9	+/- 1.0%	
CH4 (%)	0.1	0.0	+/- 0.5%	
H2 (%)	-17.0	0	+/- 1.5%	

GEM 5000+ (MULTI SPAN GAS CALIBRATION)

CH4 HIGH CALIBRATION

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
CH4 (%)	50.0	50.0	+/- 0.5%	
C02 (%)	34.6	35.0	+/- 1.5%	
O2 (%)	0.0	0.0	+/- 1.5%	

CH4 LOW CALIBRATION

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
CH4 (%)	9.4	10.0	+/- 0.5%	
C02 (%)	19.4	10.0	+/- 1.5%	
O2 (%)	0.0	0.0	+/- 1.5%	

02 LOW CALIBRATION

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
O2 (%)	3.9	4.0	+/- 0.5%	

02 HIGH CALIBRATION

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
O2 (%)	20.7	20.9	+/- 0.5%	

CO CALIBRATION

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
CO (ppm)	986	1000	+/- 50 ppm	

H2S CALIBRATION

SENSOR	Initial Reading	CAL Reading	Tolerance	Comments
H2S (ppm)	197	200	+/- 10 ppm	

Signature: LMS

Date: 4/20/15

DENR USE ONLY: ☐ Paper Report ☐ Electronic Data - Email CD (data loaded: Yes / No) 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):

SHIELD ENGINEERING, INC.

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

Name: J. David Wallace, P.E. Phone: (704)-971-4149

E-mail: dwallace@shieldengineering.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
CITY OF ALBEMARLE LANDFILL	40592-B STONY GAP ROAD ALBEMARLE NORTH CAROLINA, 28001	84-01	.1600	April 22, 2015

Environmental Status: (Check all that apply)

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

Type of data submitted: (Check all that apply)

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

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.

J. David Wallace, P.E. SENIOR ENGINEER (704)-971-4149

Facility Representative Name (Print) Title (Area Code) Telephone Number

J. David Wallace 5/19/15

Signature Date

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA PROFESSIONAL SEAL 20055 ENGINEER J. DAVID WALLACE

4301 TAGGART CREEK ROAD, CHARLOTTE, NC 28208

Facility Representative Address

F-0856

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

Revised 6/2009