2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY
LANDFILL V
PERMIT # 13-04

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC
CABARRUS COUNTY, NORTH CAROLINA

APRIL 2012

HHNT

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I. INTRODUCTION

This report was prepared on behalf of BFI Waste Systems of North America, LLC, in accordance with the North Carolina Solid Waste Management Rules, 15A NCAC 13B, Section .1600, et seq. The purpose of this report is to demonstrate that the proposed facility plan modification is in compliance with the applicable permit application requirements.

The Charlotte Motor Speedway Landfill V is owned and operated by BFI Waste Systems of North America, LLC (BFI). The facility is located on Morehead Road, south of Concord, N.C. The facility encompasses approximately 703 acres, of which approximately 679.5 acres is included in the permitted property boundary. The area permitted for landfill disposal includes approximately 328.4 acres and approximately 252.1 acres of this area is constructed. Approximately 56.7 acres of the constructed area has been closed in accordance with NCDENR Rules. The site is generally bordered on the south and west by Rocky River and by Pitts School Road to the east.

This plan discusses the comprehensive development of the facility including the continued operation of the facility in Phase 3 (Cells 2I, 2J, 2K, and 2M), Phase 4 and Phase 5. Existing landfill areas include Cells 1A, 1B, 2A – 2I and 2L. Future landfill development areas are located on property owned by BFI Waste Systems of North America, LLC and include Cells 2J, 2K, 2M and Phases 4 and 5. The facility was originally permitted in 1991 and is currently operating under North Carolina Solid Waste Permit No. 13-04. The most recent Permit to Construct was issued for the Phase 3 area on November 12, 2010.

This plan provides information to demonstrate that this site is acceptable for the use as a municipal solid waste landfill facility. This demonstration is included in the Site Suitability Update, prepared by ESP Associates, P.A., dated May 2004 and included in Appendix A of this plan. Site boring data, depth to groundwater and the geologic conditions of the site subsurface are included in two documents. The most current and comprehensive site hydrogeology information for the Phase 3 area is in the Design Hydrogeologic Report, CMS Landfill V – Phase 3 (Cells 2I – 2K and 2M), Solid Waste Permit # 13-04, prepared by David Garrett and Associates, dated August 2008 and last revised May 2009. The Site Hydrogeology Report for the remainder of the site to be developed is included in the Design Hydrogeologic Study dated December 2003, prepared by ENSR Consulting and Engineering (NC), Inc.

The MSWLF unit is permitted to dispose of household, industrial and commercial solid waste. Hazardous or other banned waste such as yard waste and white goods are not approved for disposal. The facility will serve all populations and geographic territories within the contiguous United States with appropriate Host community approvals. Following approval of this facility plan amendment the site will have a permitted gross capacity of 50,869,000 cubic yards over the entire life of the site.

II. .1617 APPLICATION REQUIREMENTS FOR MSWLF FACILITIES

(e) Permit renewal. A complete application for a permit to construct a lateral expansion or a new MSWLF unit shall contain the following:

(1) A Facility Plan that describes comprehensive development of the MSWLF facility prepared in accordance with Rule .1619 of this Section;

A Facility Plan prepared in accordance with Rule .1619 of this Section is included in this document.

(2) An Engineering Plan that is prepared for the initial phase of landfill development prepared in accordance with Rule .1620 of this Section;

An Engineering Plan prepared for Phase 3 of landfill development has been prepared in accordance with Rule .1620 of this Section. The Permit to Construct for Phase 3 was issued on April 12, 2010.

(3) A Construction Quality Assurance Plan prepared in accordance with Rule .1621 of this Section;

A Construction Quality Assurance (CQA) Plan prepared in accordance with Rule .1621 of this section was included in the Permit to Construct Application for Phase 3 and was approved on April 12, 2010.

(4) An Operations Plan prepared in accordance with Rule .1625 of this Section;

An Operations Plan prepared in accordance with Rule .1625 of this Section was included in the Permit to Construct Application for Phase 3 and was approved on April 12, 2010.

(5) A Closure and Post Closure Plan prepared in accordance with Rule .1629 of this Section; and

A Closure and Post Closure Plan prepared in accordance with Rule .1629 of this Section was included in the Permit to Construct Application for Phase 3 and was approved on April 12, 2010.

(6) A Water Quality Monitoring Plan prepared as set forth in Paragraph (b) of Rule .1623.

A Water Quality Monitoring Plan prepared as set forth in Paragraph (b) of Rule .1623 was included in the Permit to Construct Application for Phase 3 and was approved on April 12, 2010. This existing plan will be updated and revised in conjunction with subsequent phases being developed.

III. .1618 SITE STUDY FOR MSWLF FACILITIES: Regional Characterization Study

A. GENERAL

This Facility Plan Modification does not expand the permitted landfill permit. The siting demonstration is included in the Site Suitability Update, prepared by ESP Associates, P.A., dated May 2004. This report is included in Appendix A of this document.

IV. .1618 SITE STUDY FOR MSWLF FACILITIES: Local Characterization Study

A. GENERAL

This Facility Plan Modification does not expand the permitted landfill permit. The siting demonstration is included in the Site Suitability Update, prepared by ESP Associates, P.A., dated May 2004. This report is included in Appendix A of this document.

V. .1619 FACILITY PLAN

(a) Purpose. As required under Rule .1617 of this Section, a permit applicant shall prepare a facility plan which meets the requirements of this Rule.

(b) Scope.

(1) The facility plan defines comprehensive development of the property proposed for permit or described in the permit of an existing facility. The plan includes a set of drawings and a report which present the long-term, general design concepts related to construction, operation, and closure of the MSWLF unit(s), including leachate management. The scope of the plan spans the active life of the MSWLF unit(s). Additional solid waste management facilities located at the MSWLF facility shall be identified in the plan and shall meet the requirements of this Subchapter. The facility plan defines the waste stream proposed for management at the MSWLF facility. If different types of landfill units or non-disposal facilities are included in the facility design, the plan must describe general waste acceptance procedures.

(2) The areal limits of the MSWLF unit(s), total capacity of the MSWLF unit(s), and the proposed waste stream shall be consistent with the Section's approval set forth:

(A) In accordance with Rule .1618 (a)(1) of this Section for a new facility: or,

(B) In accordance with the current permit for an existing facility applying for permit renewal.

(c) Use of Terms. The terminology used in describing areas of the landfill unit shall be defined in the facility plan and shall be used consistently throughout a permit application. The Section recommends the use of the following terms:

(1) A "phase" is an area constructed with a base liner system that provides no more than approximately five years of operating capacity.

(2) A "cell" is a subdivision of a phase which describes modular or partial construction.

(3) A "subcell" is a subdivision of a cell which describes leachate and storm water management for active or inactive areas of the constructed MSWLF.

(d) Facility Drawings. The facility plan shall include the following drawings:

(1) Site Development. The two drawings which plot site development shall be prepared on a topographic map representative of existing site conditions; the map shall locate the physical features referenced in Rule .1622 of this Section and shall incorporate a survey locating all property boundaries for the proposed landfill facility certified by an individual licensed to practice land surveying in the State of North Carolina.

(A) Landfill units and leachate facilities. This drawing shall delineate the aerial limits of all landfill units and leachate facilities and incorporate the buffer requirements set forth in Subparagraph (b)(3) of Rule .1624.

(B) All facilities. These drawings shall locate all solid waste management facilities and facility infrastructure, including landfill units and leachate facilities.

Facility Drawings show each item required by this Rule. These drawings are found in Section C of this permit application document.

(2) Landfill Construction. All on-site grading activities related to the construction and operation of the MSWLF unit(s) shall be illustrated in facility drawings which:

(A) Delineate the limits of grading, including borrow and stockpile areas;

(B) Define phases of development which do not exceed approximately five years of operating capacity;

(C) Propose base grades for the MSWLF unit(s);

(D) Delineate the location of access roads, sedimentation basins, leachate pipeline and storage or treatment facilities and other structures related to the operation of the MSWLF unit; and

(E) Propose final contours for the MSWLF unit(s) and facility features for closure.

The Facility Drawings show each item required by the Rules.

(3) Landfill Operation. The following information related to the long-term operation of the MSWLF units shall be included in facility drawings;

(A) General grade and flow direction for the drainage layer component of the leachate collection system;

(B) Size, location, and general grade for the leachate piping system, including on-site pipelines to leachate management facilities;

(C) Proposed transitional contours for each phase of development, including operational grades for existing phase(s) and construction grading for the new phase; and

(D) If included in the design, storm water segregation features and details for inactive landfill subcells.

The Facility Drawings show each item required by the Rules.

(e) Facility Report. The facility plan shall include the following information:

(1) Waste stream. A discussion of the characteristics of the wastes received at the facility and facility specific management plans shall incorporate:

(A) The types of waste specified for disposal;

This facility will accept commercial solid waste, household waste, industrial solid waste, Construction and Demolition debris and other non-hazardous waste types allowed by the Solid Waste Regulations. Prohibited wastes will be excluded.

In addition to the waste described above, the facility receives non-hazardous liquid waste for solidification, petroleum contaminated soils for use as an alternative daily cover, automobile shredder residue for use as a solidification agent or to mix with soil for alternative daily cover, and foundary sand for use as an alternative daily cover. Specific operations for these activities are described in the facility Operations Plan.

(B) Average monthly disposal rates and estimated variance;

The site states that the average monthly disposal rate is 4,000 TPD, with an estimated variance of up to 8,000 TPD with appropriate Host community approvals.

(C) The area served by the facility;

This facility will serve all populations and geographic territories within the contiguous United States with appropriate Host community approvals.

(D) Procedures for segregated management at different on-site facilities; and

The general waste stream including household waste, commercial solid waste, industrial solid waste and construction and demolition debris is received at the facility scalehouse, weighed and directed to the disposal area. Other waste streams managed by different facilities on site are segregated as they enter the facility and directed to the appropriate area for handling. The facility follows a waste screening plan and trains employees on proper identification of waste. Detailed procedures for waste screening and random inspections are included in the facility Operations Plan.

(E) Equipment requirements for operation of the MSWLF unit.

The facility currently utilizes the following equipment:

Farm tractor with mower
Steel wheel compactors
Bulldozers
Excavators
Haul trucks
Water truck
Pick-up truck
Pumps

Other equipment will be utilized or substituted when necessary.

(2) Landfill Capacity. An analysis of landfill capacity and soil resources shall be performed.

(A) The data and assumptions used in the analysis shall be:

(i) Consistent with the facility drawings and disposal rates specified in the facility plan; and

(ii) Representative of operational requirements and conditions.

Calculations shown in this section demonstrate that data and assumptions used in the analysis are consistent with the facility drawings and disposal rates in the facility plan; and that they are representative of operational requirements and conditions.

(B) The conclusions shall provide accurate volumetric estimates of:

(i) Total operating capacity;

The total operating capacity of the facility is approximately 50,869,000 cubic yards, based on the facility drawings. The operating capacity includes soil for intermediate and daily cover.

(ii) Operating capacity for each phase of development;

A preliminary estimate of the operating capacity of each phase is:

Total Operating Capacity	**±**	**50,869,000**	**CY**
Operating Capacity - Phases 1-3 (approx.)	**±**	**38,803,000**	**CY**
Operating Capacity - Phase 4 (approx.)	**±**	**7,300,000**	**CY**
Operating Capacity - Phase 5 (approx.)	**±**	**4,766,000**	**CY**

Variations in waste volumes, waste density, and final design could cause phases to last for longer or shorter periods. Final designs will adjust for this variation. In general, phases should not last longer than 5 years each.

(iii) In-Place ratio of waste to soil;

It is projected that daily and intermediate soil cover will be equal to about 4.5 million cubic yards or about 20% of the total remaining airspace volume, however, this volume will vary depending on operations and the use of alternate daily cover materials. Final cover will be equal to about 1,000,000 cubic yards.

(iv) Available soil resources from on-site or specific off-site sources;

Available soil for cover and other uses (i.e. capping, structural fill) is estimated to be approximately 3.4 million cubic yards. This material is located in an off-site borrow area south of Cell 2D. This borrow area is currently active. Other adjacent lands are being evaluated by BFI Waste Systems of North America, LLC for future borrow.

(v) Required quantities of soil for landfill construction, operation, and closure; and

The estimated soil requirements for future landfilling activities is provided below:

Soil for Cell Construction	**=**	**200,000**	**CY**
Soil for Capping Construction	**=**	**1,000,000**	**CY**
Soil for Daily and Intermediate Cover (Based on 20% soil to waste percentage)	**=**	**4,500,000**	**CY**

(vi) The estimated operating life of all MSWLF units in years.

The remaining landfill life will be approximately 15 years, based on projected waste streams. The supporting calculations are based on a potential average waste disposal rate of 4,000 tons/day, 286 days per year and an operational waste density of 1,565 lbs/CY. Some

fluctuations in waste stream are anticipated which may shorten, or extend the operating life of the facility. Each phase will provide approximately five years capacity. Phase sizes may be changed during detail design to match cell capacity to a five year life.

(3) Containment and environmental control systems. A general description of the systems designed for proper landfill operation, system components, and corresponding functions shall be provided.

This landfill facility is designed as a contained landfill system. During landfill development, cell filling, and closure, a liner and leachate collection system will be utilized to assure that all precipitation contacting waste will be collected and managed as leachate. Leachate collected on the liner will be pumped to an existing composite lined surface impoundment. The in-cell leachate collection system is designed to collect and remove leachate from the cell, while assuring leachate head on the liner will not exceed 12 inches.

The leachate storage impoundment has an approximate storage capacity of 2.9 million gallons. The impoundment is also equipped with two floating aerators to introduce oxygen into the leachate and begin the treatment process. A leachate treatment facility is located adjacent to the surface storage impoundment. The treatment facility pumps leachate from the impoundment through a series of automatic monitoring systems to continually monitor discharge water quality. Historically, the aeration has provided sufficient treatment. Additional treatment will be provided, if necessary, to meet the requirements of the Industrial User Pretreatment Permit. A copy of the Industrial User Pretreatment Permit is included in Appendix B of this Plan.

The base liner system will be a composite system of a 24 inch thickness of $\leq 1 \times 10^{-7}$ cm/sec clay liner, covered by a 60 mil HDPE flexible membrane liner. Quality Control and Quality Assurance procedures will be utilized to demonstrate liner construction quality. An alternative liner system consisting of a 18 inch thickness of $\leq 1 \times 10^{-5}$ cm/sec low permeability soil liner plus reinforced geosynthetic clay liner (GCL) overlain by a 60 mil HDPE liner may be used.

The leachate collection and removal system will utilize a permeable soil media above the liner, with a piping network, to assure complete removal of leachate. All components will be sized to adequately manage flows and surges. An alternate to the permeable soil media will be a geocomposite drainage media overlain with native soil cover to protect the 60 mil flexible membrane liner.

Once leachate is removed from the liner, it will be transferred to the leachate storage facility.

Due to the proposed facility modifications, final grades in Cells No. 1A, 1B, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H and 2L will now be higher than originally permitted. Therefore, wall crushing and wall bucking calculations for the leachate pipe in these cells have been re-evaluated to ensure that acceptable factors of safety are maintained. Based on these calculations, the leachate pipes in these existing cells maintain the appropriate factors of safety. The "Evaluation of Loading on HDPE Leachate Pipe" prepared by Bunnell-Lammons Engineering, Inc. is included in Appendix C of this document. The leachate pipe design and evaluation for Phase 4 of the facility will be addressed in the Permit to Construct Application.

(4) Leachate Management. An analysis of the leachate management requirements and plans for the MSWLF facility shall incorporate the information required under this Subparagraph.

(A) The performance of and design concepts for the leachate collection system within active areas of the MSWLF unit and any storm water segregation included in the engineering design shall be described.

The leachate collection system is designed with pipes and filter media to promote leachate drainage, and to assure sustained leachate head on the liner does not exceed 12 inches.

(B) Normal operating conditions. Normal operating conditions shall be defined and must consider:

(i) Average monthly values for leachate generation representative of the landfill's environment and operation using:

(I) empirically derived estimates; or

(II) for landfill expansions, actual leachate generation data from the existing landfill.

Since this is an existing landfill, estimates of actual volume are utilized for determining leachate volume. Historical leachate generation data indicates an average of 4,566 cubic feet per acre per year of leachate collected (2003 data).

(ii) Surge volumes generated by storm events.

Surge volumes are estimated by inserting the 24-hour, 25-year storm event (approximate 6" rainfall event) into the HELP Model manually. Utilization of this technique indicates a maximum daily peak volume of about 6,713 gallons per acre per day at this facility.

(C) Leachate management system. A description of the leachate management system components and their engineered function shall be provided, including:

(i) Leachate pipeline operating capacity;

All piping will be designed to handle the greater of the peak daily flow or the pump capacity feeding these pipes.

(ii) Capacity of the storage and if applicable, the treatment facilities;

The existing leachate lagoon storage capacity is approximately 2.9 million gallons.

(iii) Final disposal plans and applicable discharge limits, including documented prior approval of the waste water treatment plant which may be designated in the plan.

Leachate will be pre-treated in the storage lagoon and the pre-treatment facility located adjacent to the storage lagoon, if necessary, prior to being pumped via force main to the Rocky River Regional Wastewater Treatment Plant for secondary treatment and final disposal. A copy of the Industrial User Pre-Treatment Permit No. 1024 is included in Appendix B of this Report.

(D) A contingency plan shall be prepared for storm surges or other considerations exceeding design parameters for the storage or treatment facilities.

The Industrial User Pre-Treatment Permit allows discharge from the pre-treatment facility at an average rate of 150,000 gallons per day, which far exceeds the daily discharge rate from this facility. This "over capacity" provides a contingency for this site. If necessary, pump and haul will also be utilized to deliver leachate to a POTW.

(5) Special engineering features.

This facility utilizes engineering features shown on the facility drawings. Also, as detail design of the individual phases is completed, other engineering features may be added which enhance the facility operations. One such enhancement is the methane gas collection system.

SUPPORTING DATA & CALCULATIONS

LANDFILL CAPACITY

ASSUMPTIONS:

1. Waste Stream 4,000 tons/day
2. Estimated Waste Density 1,565 lbs/c.y.
3. Total cover soil for operations Final cap + 20%
4. Approximate Remaining Capacity of Site 23,461,000 c.y.

Part One - Five Year Requirements

286 days/year x 4,000 tpd x (2,000 lbs/ton / 1,565 lbs/c.y.)
x 5 years = about 7,310,000 c.y.

∴ Use 7,300,000 c.y. for 5 years capacity required or roughly 1,460,000 c.y. per year.

Part Two - Remaining Facility Life

Remaining Gross Site Capacity	=	23,461,000 c.y.
Soil Cap	=	1,000,000 c.y.
Remaining Capacity	=	22,461,000 c.y.

22,461,000 c.y. ÷ 1,460,000 c.y./year = ±15 years

NOTE: These calculations are based on the maximum waste disposal as allowed in the current permit. Some fluctuations in waste stream are anticipated which could extend the life of the facility to beyond 15 years.

SOIL REQUIREMENTS

Part One - Structural Fill Requirements

Calculated Cut	190,000 c.y.
Calculated Fill including 30% shrinking	(minus) 390,000 c.y.
Clay Liner	(minus) 110,000 c.y.
Potential Borrow Soil on Site	(plus) 3,400,000 c.y.
Net Soil Available	3,090,000 c.y.

Part Two - Cover Requirements

Assume 5:1 waste to soil ratio for daily and intermediate cover

Total Volume of Waste and Cover = ± 22,461,000 c.y.	
Daily & Intermediate Cover = 22,461,000 c.y. x (20%) =	± 4,492,200 c.y.
Final Cover	±1,000,000 c.y.
Drainage Berms on Final Cover	± 400,000 c.y.
Net Soil Cover Required =	± 5,892,200 c.y.

TOTAL SOIL REQUIREMENTS = 3,090,000 c.y. (available) – 5,892,200 c.y. (needed) = 2,802,200 c.y. (deficit)

∴ The site has a soil deficit of 2,802,200 c.y. BFI is in the process of developing additional nearby borrow sources.

VI. REPORT ON SERVICE AREAS, POPULATION SERVED, WASTE RECEIVED, AND EQUIPMENT

(1) The area to be served includes all populations and geographic territories within the contiguous United States with appropriate Host community approvals.

VII. CONCEPTUAL DESIGN PLAN

The project concept utilizes the North Carolina Rules Section .1600. The North Carolina Rules serve as the principal basis of design. The facility will be developed with either a composite liner system of a 24" thick ≤1 x 10^{-7} cm/sec permeability clay liner and a 60 mil High Density Polyethylene (HDPE) flexible membrane liner, or an approved alternative liner system utilizing a geosynthetic clay liner over an 18" thick ≤ 1x10^{-5} cm/sec low permeability soil liner, in lieu of the 24" of ≤1x10^{-7} cm/sec clay liner. These components will be in intimate contact with one another and together will form the composite liner.

A Leachate Collection System (LCS) will be installed on top of the composite liner. This LCS will consist of a network of gravity drain perforated pipes in the low points of the liner and a drainage media over the remainder of liner bottom surface. This drainage media will be designed utilizing the Hydraulic Evaluation of Landfill Performance (HELP) Model to promote drainage over the liner to the LCS drain pipes. The drainage media will prevent the depth of leachate on the composite liner from reaching any depths greater than 12". Historically, this site has utilized a geocomposite drainage media and an on-site native soil material for the protective cover layer. This system is anticipated for future phases although other systems that comply with the North Carolina Rules may also be utilized.

The landfill leachate collection system design will incorporate methods to divert the storm water from the liner surface in a manner to prevent excess leachate production. These methods will be designed so that any precipitation contacting the waste will be treated as leachate, and any precipitation which never contacts the waste will be treated as storm water.

The LCS will utilize individual submersible sideslope riser pumps in the sumps. These will be directed by force main to an on site leachate surface storage impoundment prior to ultimate transport to the POTW for treatment.

The landfill will utilize a fill method which will provide for compaction of the waste to its smallest practicable volume. The waste will be covered daily with either six inches of soil or an approved alternative daily cover. Intermediate lifts in the landfill waste mass will be covered with twelve inches of soil. The landfill facility will then be capped with a Subtitle D type cap system or alternative cap system which restricts precipitation from infiltrating into the waste mass.

The landfill will be designed to maximize the potential waste fill volume of the site. For conceptual purposes, the cover soil requirements were estimated at a soil to waste ratio of approximately one part soil to five parts waste.

The landfill will have a groundwater monitoring system for detection of potential contamination. This system will be based on the site hydrogeology and the facility design. As future cells are constructed, additional downgradient wells will be installed as needed to adequately detect potential contamination. Future groundwater wells will be installed in accordance with the well phasing schedule found in subsequent construction permit applications. The landfill will incorporate drainage devices to assure that there is no run-

on surface water and that run-off surface water will be handled through sediment control basins.

The landfill has a methane gas collection system to effectively manage the gas generated at the facility. The collection system is owned and operated by the facility and has the option to direct to a third party for the beneficial use of the gas.

The landfill facility is sited so that there are 300 foot buffers between the waste and any property line, 500 foot buffer between waste and private residences, 50 feet between any waste and streams, a vertical separation between the waste and groundwater of at least four feet, and a vertical separation between the waste and rock of at least four feet.

Soil for landfill cover will be excavated from adjacent lands owned by BFI Waste Systems of North America, LLC and from other borrow areas to be developed in the future.

The engineering design will be completed to accomplish the following:

1. Protect the water and land resources of the site and adjacent lands.
2. Provide a landfill system with liners and a leachate collection system.
3. Maximize the landfill life.
4. Create an aesthetically pleasing site which is efficient to operate.
5. Properly manage leachate to prevent any environmental damage.
6. Control access to the site.

A set of Facility Design Drawings are included with this application:

Sheet No.	**Title**
-	Title Sheet
1	Index to Drawings and Legend
2	Boundary Survey
3	Existing Topographic Conditions
4	Top of Soil Liner Grading Plan – Conceptual Design
5	Leachate Collection Plan – Conceptual Design
6	Final Grading Plan – Conceptual Design
7	Final Drainage Plan – Conceptual Design
8	Landfill Cross Section A – Conceptual Design
9	Landfill Cross Section B – Conceptual Design
10	Miscellaneous Details
11	Miscellaneous Details
12	Phase 3 Final Grades – Conceptual Design
13	Phase 4 Final Grades – Conceptual Design
14	Phase 5 Final Grades – Conceptual Design

VIII. .1622 LOCATION RESTRICTIONS FOR MSWLF FACILITY SITING

MSWLF units shall comply with the siting criteria set forth in this Rule. In order to demonstrate compliance with specific criteria, documentation or approval by agencies other than the Division of Solid Waste Management may be required. The scope of demonstrations including design and construction performance shall be discussed in a site study and completed in the permit application.

(1) Airport Safety

(a) A new MSWLF unit shall be located no closer than 5,000 feet from any airport runway used only by piston-powered aircraft and no closer than 10,000 feet from any runway used by turbine-powered aircraft.

(b) Owners or operators proposing to site a new MSWLF unit or lateral expansion within a five-mile radius of any airport runway used by turbine-powered or piston-powered aircraft shall notify the affected airport and the Federal Aviation Administration prior to submitting a permit application to the Section.

(c) The permittee of any existing MSWLF unit or a lateral expansion located within 5,000 feet from any airport runway used by only piston-powered aircraft or within 10,000 feet from any runway used by turbine-powered aircraft shall demonstrate that the existing MSWLF unit does not pose a bird hazard to aircraft. The owner or operator shall place the demonstration in the operating record and notify the Section that is has been placed in the operating record.

(d) For purposes of this Paragraph:

(i) "Airport" means a public-use airport open to the public without prior permission and without restrictions within the physical capacities of the available facilities.

(ii) "Bird hazard" means an increase in the likelihood of bird/aircraft collisions that may cause damage to the aircraft or injury to its occupants.

The proposed facility modification is not a new MSWLF unit or lateral expansion.

(2) Floodplains

(a) New MSWLF units, existing MSWLF units, and lateral expansions shall not be located in 100-year floodplains unless the owners or operators demonstrate that the unit will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment.

(b) For purposes of this Paragraph:

(i) "Floodplain" means the lowland and relatively flat areas adjoining inland coastal waters, including flood-prone areas of offshore islands, that are inundated by the 100-year flood.

(ii) "100-year flood" means a flood that has a 1-percent or greater chance of recurring in any given year or a flood of a magnitude equaled or exceeded once in 100 years on the average over a significantly long period.

(iii) "Washout" means the carrying away of solid waste by waters of the base flood.

No portion of the facility improvement is located within any area designated as a 100-year floodplain. The 100-year floodplain boundary is shown in the Facility Plans.

(3) Wetlands

(a) New MSWLF units and lateral expansions shall not be located in wetlands, unless the owner or operator can make the following demonstrations to the Division of Solid Waste:

(i) Where applicable under Section 404 of the Clean Water Act or applicable State wetlands laws, the presumption that a practicable alternative to the proposed landfill facility is available which does not involve wetlands, is clearly rebutted.

(ii) The construction and operation of the MSWLF unit will not:

(A) Cause or contribute to violations of any applicable State water quality standard;

(B) Violate any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act;

(C) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Federal Endangered Species Act of 1973; and

(D) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary.

(iii) The MSWLF unit will not cause or contribute to significant degradation of wetlands. The owner or operator shall demonstrate the integrity of the MSWLF unit and its ability to protect ecological resources by addressing the following factors:

(A) Erosion, stability, and migration potential of native wetland soils, muds and deposits used to support the MSWLF unit;

(B) Erosion, stability, and migration potential of dredged and fill materials used to support the MSWLF unit;

(C) The volume and chemical nature of the waste managed in the MSWLF unit;

(D) Impacts on fish, wildlife, and other aquatic resources and their habitat from release of the solid waste;

(E) The potential effects of catastrophic release of waste to the wetland and the resulting impacts on the environment; and

(F) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.

(iv) To the extent required under Section 404 of the Clean Water Act or applicable State wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable as required by Sub-item (3)(a)(i) of this Rule, then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands); and

(v) Sufficient information is available to make a reasonable determination with respect to these demonstrations.

(b) For purposes of this Item, wetlands means those areas that are defined in 40 CFR 232.2(r).

Jurisdiction wetlands were discussed in the site suitability update, prepared by ESP Associates, P.A., dated May 2004, revised November 2005. This report stated that wetland certifications for future landfill phases would be addressed prior to design and permitting of each phase. This facility plan amendment does not expand the facility outside the previously permitted areas.

(4) Fault Areas

(a) New MSWLF units and lateral expansions shall not be located within 200 feet (60 meters) of a fault that has had displacement in Holocene time unless the owner or operator demonstrates to the Section that an alternative setback distance of less than 200 feet (60 meters) will prevent damage to the structural integrity of the MSWLF unit and will be protective of human health and the environment.

(b) For the purposes of the Item:

(A) "Fault" means a fracture or a zone of fractures in any material along which strata on one side have been displaced with respect to that on the other side.

(B) "Displacement" means the relative movement of any two sides of a fault measured in any direction.

(C) "Holocene" means the most recent epoch of the Quaternary period, extending from the end of the Pleistocene Epoch to the present.

According to the Permit Modification Application Engineering Plan, prepared by Almes & Associates, Inc., dated May 2004, the facility is not located within 200 feet of a fault that has a displacement in the Holocene time. This facility plan modification will not expand the permitted landfill footprint.

(5) Seismic Impact Zones

(a) New MSWLF units and lateral expansions shall not be located in seismic impact zones, unless the owner or operator demonstrates to the Section that all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

(b) For the purposes of this Item:

(i) "Seismic impact zone" means an area with a ten percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 250 years.

(ii) "Maximum horizontal acceleration in lithified earth material" means the maximum expected horizontal acceleration depicted on a seismic hazard map, with a 90 percent or greater probability that the acceleration will not be exceeded in 250 years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.

(iii) "Lithified earth material" means all rock, including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments. This term does not include man-made materials, such as fill, concrete, and asphalt, or unconsolidated earth materials, soil, or regolith lying at or near the earth surface.

Each phase of landfill construction will be designed to resist the maximum horizontal acceleration in lithified earth material for the site.

(6) Unstable Areas

(a) Owners or operators of new MSWLF units, existing MSWLF units, and lateral expansions located in an unstable area shall demonstrate that engineering measures have been incorporated into the MSWLF unit's design to ensure that the integrity of the structural components of the MSWLF unit will not be disrupted. The owner or operator shall consider the following factors, at a minimum, when determining whether an area is unstable:

(i) On-site or local site conditions that may result in significant differential settling;

(ii) On-site or local geologic or geomorphologic features; and

(iii) On-site or local human-made features or events (both surface and subsurface).

(b) For purposes of this Item:

(i) "Unstable area" means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the landfill structural components responsible for preventing releases from a landfill. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and Karst terranes.

(ii) "Structural components" means liners, leachate collection systems, final covers, run-on or run-off systems, and any other component used in the construction and operation of the MSWLF that is necessary for protection of human health and the environment.

(iii) "Poor foundation conditions" means those areas where features exist which indicate that a natural or man-induced event may result in inadequate foundation support for the structural components of an MSWLF unit.

(iv) "Areas susceptible to mass movement" means those areas of influence (i.e., areas characterized as having an active or substantial

possibility of mass movement) where the movement of earth material at, beneath, or adjacent to the MSWLF unit, because of natural or man-induced events, results in the downslope transport of soil and rock material by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, soil fluction, block sliding, and rock fall.

(v) "Karst terrains" means areas where karst topography, with its characteristic surface and subterranean features, is developed as the result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terrains include, but are not limited to, sinkholes, sinking streams, caves, large springs, and blind valleys.

Unstable areas on the site were discussed in the Permit Modification Application Engineering Plan prepared by Almes and Associates, Inc., dated May 2004. According to this report, no unstable areas were found on site.

(7) Cultural Resources. A new MSWLF unit or lateral expansion shall not damage or destroy an archaeological or historical property. The Department of Cultural Resources shall determine archeological or historical significance. To aid in making a determination as to whether the property is of archeological or historical significance, the Department of Cultural Resources may request the owner or operator to perform a site-specific survey which shall be included in the Site Study.

This facility modification shall not expand the landfill footprint beyond the permitted landfill boundary; therefore, impacts to cultural resources are not anticipated. This will be confirmed for each landfill phase development.

(8) State Nature and Historic Preserve. A new MSWLF unit or lateral expansion shall not have an adverse impact on any lands included in the State Nature and Historic Preserve.

This facility modification shall not expand the landfill beyond the permitted landfill boundary; therefore, impacts to lands included in the State Nature and Historic Preserve are not anticipated. This will be confirmed for each landfill phase development.

(9) Water Supply Watersheds

(a) A new MSWLF unit or lateral expansion shall not be located in the critical area of a water supply watershed or in the watershed for a stream segment classified as WS-I, in accordance with the rules codified at 15A NCAC 2B .0200 - "Classifications and Water Quality Standards Applicable To Surface Waters of North Carolina".

The proposed facility plan modification is not a new MSWLF unit or lateral expansion.

(b) Any new MSWLF unit or lateral expansion, which shall discharge leachate to surface waters at the landfill facility and must obtain a National Pollution Discharge Elimination System (NPDES) Permit from the Section of Environmental Management pursuant to Section 402 of the United States Clean Water Act, shall not be located within watersheds classified as WS-II or WS-III, in accordance with the rules codified at 15A NCAC 2B .0200 - "Classifications and Water Quality Standards Applicable To Surface Waters of North Carolina".

The facility will not discharge leachate to surface waters at the landfill facility. All leachate will be transported to the Rocky River Waste Water Treatment Plant for treatment, or pumped and hauled to a POTW for disposal.

(10) Endangered and Threatened Species. A new MSWLF unit or lateral expansion shall not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Federal Endangered Species Act of 1973.

Based on the Site Suitability Update for CMS Landfill V – Lateral Expansion, Phase 2 Expansion (Cells 2F, 2G and 2H) and Phases 3, 4 and 5 will not impact endangered or threatened species or their habitats.

IX. .1623 GEOLOGIC AND HYDROGEOLOGIC INVESTIGATIONS FOR MSWLF FACILITIES

Site hydrogeologic information for the remainder of the site to be developed is included in the reports listed below:

1. Design Hydrogeologic Report, CMS Landfill V – Phase 3 (Cells 2I – 2K and 2L), Solid Waste Permit No. 13-04, prepared by David Garrett and Associates, dated August 2008, last revised May 2009.

2. Design Hydrogeologic Study, dated December 2003, prepared by ENSR Consulting and Engineering (NC), Inc.

X. .1627 CLOSURE AND POST-CLOSURE REQUIREMENTS FOR MSWLF FACILITIES

(a) Purpose. This Rule establishes criteria for the closure of all MSWLF units and subsequent requirements for post-closure compliance. The owner or operator is required to develop specific plans for the MSWLF facility under Rule .1629.

(b) Scope

(1) Closure. Standards are established for the scheduling and documenting closure of all MSWLF units, and designing the cap system. Construction requirements for the cap system incorporate specific requirements from Rule .1624 of this Section.

(2) Post-Closure. Standards are established for the monitoring and maintenance of the MSWLF unit(s) following closure.

(c) Closure criteria

(1) New and existing MSWLF units and lateral expansions shall install a cap system that is designed to minimize infiltration and erosion. The cap system shall be designed and constructed to:

(A) have a permeability less than or equal to the permeability of any base liner system of the in situ subsoils underlaying the landfill, or the permeability specified for the final cover in the effective permit, or a permeability no greater than 1 x 10^{-5} cm/sec, whichever is less;

(B) minimize infiltration through the closed MSWLF by the use of low-permeability barrier that contains a minimum 18 inches of earthen material; and

(C) minimize erosion of the cap system and protect the low-permeability barrier from root penetration by use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.

The CMS Landfill V has a cap system which meets the requirements of this rule. This cap system design will be shown in the Construction Permit Application.

(2) The Section may approve an alternative cap system if the owner or operator can adequately demonstrate the following:

(A) The alternative cap system will achieve an equivalent or greater reduction in infiltration as the low-permeability barrier specified in Subparagraph (1) of this Paragraph; and

(B) The erosion layer will provide equivalent or improved protection as the erosion layer specified in Subparagraph (3) of this Paragraph.

The CMS Landfill V proposes to utilize an alternative cap system. Demonstrations for each alternate cap system have been provided to the Section and copies of approved plans have been placed in the facility operating record.

(3) Construction of the cap system for all MSWLF units shall conform to the requirements set forth in Subparagraphs (b)(8), (b)(9) and (b)(15) of Rule .1624 and the following requirements:

(A) post-settlement surface slopes shall be a minimum of five percent and a maximum of 25 percent;

(B) a gas venting or collection system shall be installed below the low-permeability barrier to minimize pressures exerted on the barrier.

The facility proposes to utilize an alternate cap system with post-settlement sideslopes of 3H to 1V. Stability demonstrations for the alternate cap system will be provided in the Permit to Construct Application.

An active landfill gas extraction system has been installed at the facility. This system will remain in operation after closure to comply with this rule.

(4) Prior to beginning closure of each MSWLF unit as specified in Subparagraph (5) of this Paragraph, an owner or operator shall notify the Section that a notice of the intent to close the unit has been placed in the operating record.

This notice of intent to close a unit will be sent to the Section, and placed in the facility operating record.

(5) The owner or operator shall begin closure activities of each MSWLF unit no later than 30 days after the date on which the MSWLF unit receives the known final receipt of wastes or, if the MSWLF unit has remaining capacity and there is a reasonable likelihood that the MSWLF unit will receive additional wastes, no later than one year after the most recent receipt of wastes. Extension beyond the one-year deadline for beginning closure may be granted by the Section if the owner or operator demonstrates that the MSWLF unit has the capacity to receive additional wastes and the owner or operator has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the unclosed MSWLF unit.

This item will be complied with at the time of MSWLF unit closure.

(6) The owner or operator of all MSWLF units shall complete closure activities of each MSWLF unit in accordance with the closure plan within 180 days following the beginning of closure as specified in Subparagraph (5) of this Paragraph. Extensions of the closure period may be granted by the Section if the owner or operator demonstrates that closure will, of necessity, take longer than 180 days and they have taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed MSWLF unit.

This item will be complied with at the time a MSWLF unit is closed.

(7) Following closure of each MSWLF unit, the owner or operator shall notify the Section that a certification, signed by the project engineer verifying that closure has been completed in accordance with the closure plan, has been placed in the operating record.

The engineer's certifications will be placed in the facility operating record, and the Section will be notified of this.

(8) Recordation

(A) Following closure of all MSWLF units, the owner or operator shall record a notation on the deed to the landfill facility property, or some other instrument that is normally examined during title search, and notify the Section that the notation has been recorded and a copy has been placed in the operating record.

(B) The notation on the deed shall in perpetuity notify and potential purchaser of the property that:

(i) The land has been used as a landfill facility; and

(ii) Its use is restricted under the closure plan approved by the Section.

The notations and language in this section will be affixed to the deed to the property following closure of all MSWLF units.

(9) The owner or operator may request permission from the Section to remove the notation from the deed if all wastes are removed from the facility.

Should all waste be removed from this facility, this request will be made in a timely manner.

(10) Existing MSWLF units. The following criteria shall apply to existing MSWLF units not designed and constructed with a base liner system permitted by the Section.

(A) The existing MSWLF unit shall cease receiving solid waste on or before January 1, 1998.

(B) The Section shall schedule closure of the existing MSWLF unit based on its review of the application submitted in accordance with Paragraph (d) of Rule .1617 and reviewed in accordance with Subparagraph (d) of Rule .1603.

(C) Final contours for the existing MSWLF unit shall be consistent with the capacity requirements necessary to close the unit in accordance with the requirements of this Subparagraph.

Not applicable since all units are designed and constructed with a base liner system.

(d) Post-closure criteria

(1) Following closure of each MSWLF unit, the owner or operator shall conduct post-closure care. Post-closure care shall be conducted for 30 years, expect as provided under Subparagraph (2) of this Paragraph, and consist of at least the following:

(A) Maintaining the integrity and effectiveness of any cap system, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cap system;

(B) Maintaining and operating the leachate collection system in accordance with the requirements in Rules .1624 and .1626. The Section may allow the owner or operator to stop managing leachate if the owner or operator demonstrates that leachate no longer poses a threat to human health and the environment;

(C) Monitoring the ground water and surface water in accordance with the requirements of Rules .1631 through .1637 and maintaining the groundwater monitoring system, if applicable; and monitoring the surface water in accordance with the requirements of Rule .0602; and

(D) Maintaining and operating the gas monitoring system in accordance with the requirements of Rule .1626 of this Section.

During the Post-Closure period, requirements (A), (B), (C) and (D) will be complied with by BFI Waste Systems of North America, LLC, the facility operator.

(2) The length of the post-closure care period may be:

(A) Decreased by the Section if the owner or operator demonstrates that the reduced period is sufficient to protect human health and the environment and this demonstration is approved by the Section; or

(B) Increased by the Section if the Section determines that the lengthened period is necessary to protect human health and the environment.

The time length of Post-Closure will be determined by the Section.

(3) Following completion of the post-closure care period for each MSWLF unit, the owner or operator shall notify the Section that a certification, signed by a registered professional engineer, verifying that post-closure care has been completed in accordance with the post-closure plan, has been placed in the operating record.

This certification will be placed in the facility operating record and notice will be provided to the Section.

XI. .1680 LEACHATE STORAGE REQUIREMENTS

(a) Applicability.

(1) Construction of leachate storage tanks and surface impoundments located at solid waste landfill facilities after October 9, 1993 shall meet the requirements set forth in this Rule.

This rule will be complied with.

(2) Liquid treatment and disposal at a solid waste landfill facility is subject to the requirements of this Subchapter.

This rule will be complied with.

(3) Operation and closure of all leachate storage tanks and surface impoundments shall meet the requirements of this Rule.

This rule will be complied with.

(b) Application requirements. An application for a permit to construct a landfill facility which includes leachate storage facilities shall contain the following:

(1) A description of the liquid to be stored;

(2) The estimated volume of liquid generated and a proposed recordkeeping system to record actual quantities stored;

(3) A schedule for liquid removal;

(4) A description of the final treatment and disposal of the liquid stored;

(5) A description of the liquid storage facility design;

(6) A contingency plan for managing unexpected surges in liquid quantities; and

(7) A closure plan prepared in accordance with Paragraph (f) of this Rule.

Should additional leachate storage structures be constructed at this facility, they will fully comply with this rule.

(c) Aboveground or onground tank requirements.

(1) Tanks may be constructed of concrete, steel, or other material approved by the Section. Tanks shall be supported on a well drained stable foundation which prevents movement, rolling, or settling of the tank.

(A) The exterior surfaces of all aboveground and onground steel storage tanks shall be protected by a primer coat, a bond coat and two or more final coats of paint or have at least an equivalent surface coating system designed to prevent corrosion and deterioration.

(B) The interior of all aboveground and onground tanks shall consist of a material, or shall be lined with a material, resistant to the liquid being stored.

These conditions will be complied with if additional tanks are constructed.

(2) All aboveground and onground tanks shall have a secondary containment system which may consist of dikes, liners, pads, ponds, impoundments, curbs, ditches, sumps, or other systems capable of containing the liquid stored.

(A) The design volume for the secondary containment system shall be 110 percent of the volume of either the largest tank within the containment system or the total volume of all interconnected tanks, whichever is greater.

(B) The secondary containment system shall be constructed of a material compatible with the liquid being stored.

These conditions will be complied with if additional tanks are constructed.

(3) A system shall be designed to contain and remove storm water from the secondary containment area. Provisions shall be included for the removal of any accumulated precipitation and be initiated within 24 hours or when 10 percent of the storage capacity is reached, whichever occurs first. Disposal shall be in compliance with all applicable federal and State regulations.

These conditions will be complied with if additional tanks are constructed.

(4) All aboveground and onground tanks shall be equipped with an overfill prevention system which may include, but not be limited to: level sensors and gauges, high level alarms or automatic shutoff controls. The overfill control equipment shall be inspected weekly by the facility operator to ensure it is in good working order.

These conditions will be complied with if additional tanks are constructed.

(5) The operator of the facility shall inspect the exterior of all tanks for leaks, corrosion, and maintenance deficiencies weekly. Interior inspection of tanks shall be performed according to the Section approved plan. If the inspection reveals a tank or equipment deficiency which could result in failure of the

tank to contain the liquid, remedial measures shall be taken immediately to eliminate the leak or correct the deficiency. Inspection reports shall be maintained and made available to the Section upon request for the lifetime of the liquid storage system.

These conditions will be complied with if additional tanks are constructed.

(6) All uncovered tanks shall have a minimum two feet of freeboard. Odor and vector control shall be practiced when necessary.

These conditions will be complied with if additional tanks are constructed.

(d) Underground tank requirements.

Underground tanks will not be utilized at this facility.

(1) Underground tanks shall be placed a minimum of two feet above the seasonal high ground-water table and a minimum of two feet vertical separation shall be maintained between bedrock and the lowest point of the tank.

Not applicable at this facility.

(2) Tanks may be constructed of fiberglass reinforced plastic, steel that is cathodically protected, steel that is clad with fiberglass, or any other materials approved by the Section.

Not applicable at this facility.

(3) The secondary containment and continuous leak detection system shall be installed in the form of a double-walled tank, designed as an integral structure so that any release from the inner tank is completely contained by the outer shell.

Not applicable at this facility.

(A) The leak detection system shall be monitored at least weekly using methods specified by the operator and approved by the Section.

Not applicable at this facility.

(B) Any tank system vulnerable to corrosion shall be protected from both corrosion of the primary tank interior and the external surface of the outer shell.

(i) All resistant coatings applied to the primary tank interior shall be chemically compatible with the liquid to be stored.

(ii) Cathodic protection systems, where installed, shall be inspected at least weekly by the facility operator and any deficiencies shall be corrected when discovered.

Not applicable at this facility.

(4) All underground tanks shall be equipped with an overfill prevention system which may include, but not be limited to: level sensors and gauges, high level alarms or automatic shutoff controls. The overfill control equipment shall be inspected weekly by the facility operator to ensure it is in good working order.

Not applicable at this facility.

(5) Inspection and leak detection monitoring reports shall be maintained and made available upon request for the lifetime of the liquid storage system.

Not applicable at this facility.

(e) Surface impoundment requirements.

(1) Any surface impoundment shall be constructed so that the bottom elevation of liquid is a minimum of four feet above the seasonal high ground-water table and bedrock.

These conditions will be complied with if additional surface impoundments are constructed.

(2) At a minimum, surface impoundments shall be designed and constructed with a liner system equivalent to the liner system for the landfill unit generating the liquid.

These conditions will be complied with if additional surface impoundments are constructed.

(A) A surface impoundment designed and constructed to store leachate from a new MSWLF unit shall include a composite liner which conforms to the requirements of Rule .1624; or

These conditions will be complied with if additional surface impoundments are constructed.

(B) An alternative liner system which is designed and constructed to achieve at least an equivalent containment efficiency. An equivalence demonstration shall be included in the permit application and shall be approved by the Section.

These conditions will be complied with if additional surface impoundments are constructed.

(3) Construction of the liner system components shall be consistent with the pertinent requirements set forth in Rule .1624(b)(8) and (9); and a construction quality assurance report shall be prepared by the project engineer.

These conditions will be complied with if additional surface impoundments are constructed.

(4) The top liner shall be protected from degradation and damage.

These conditions will be complied with.

(5) A minimum of two feet of freeboard shall be maintained in the surface impoundment. Odor and vector control shall be practiced when necessary.

These conditions will be complied with if additional surface impoundments are constructed.

(6) A ground-water monitoring system shall be installed and sampled in a manner consistent with the ground-water monitoring requirements for MSWLF units as set forth in Rules .1631 through .1637, of this Section, or using an alternative monitoring system approved by the Section.

These conditions will be complied with if additional surface impoundments are constructed.

(7) An operations plan shall be prepared and followed for operation of the surface impoundment.

These conditions will be complied with if additional surface impoundments are constructed.

(f) Closure of leachate storage facilities.

(1) The owner or operator of the liquid storage facility shall prepare a written closure plan for the liquid storage facility and submit the plan with the permit application for the solid waste management facility.

This plan shall be prepared and properly submitted.

(2) The owner or operator shall complete closure activities in accordance with the approved closure plan and within 180 days after liquid collection has ceased.

This condition will be complied with.

(3) At closure, all solid waste shall be removed from the tank or surface impoundment, connecting lines, and any associated secondary containment systems. All solid waste removed shall be properly handled and disposed of according to federal and State requirements. All connecting lines shall be disconnected and securely capped or plugged.

This condition will be complied with.

(A) Underground tanks shall be removed or thoroughly cleaned to remove traces of waste and all accumulated sediments and then filled to capacity with a solid inert material, such as clean sand or concrete slurry. If ground water surrounding the tank is found to be contaminated, the tank and surrounding contaminated soil shall be removed and appropriately disposed. Other corrective actions to remediate the contaminant plume may be required by the Department.

Not applicable at this facility since underground tanks are not utilized.

(B) Accessways to aboveground and onground tanks shall be securely fastened in place to prevent unauthorized access. Tanks shall either be stenciled with the date of permanent closure or removed. The secondary containment system shall be perforated to provide for drainage.

This condition will be complied with.

(C) For surface impoundments, all waste residues, contaminated system components (liners, etc.), contaminated subsoils, structures and equipment contaminated with waste shall be removed and appropriately disposed. If the ground water surrounding the impoundment is contaminated, other corrective actions to remediate a contaminant plume may be required by the Department. If the ground water surrounding the impoundment is found not to be contaminated, the liner system may remain in place if drained, cleaned to remove all traces of waste, and both liners punctured so that drainage is allowed. The impoundment is to be backfilled and regraded to the surrounding topography.

This condition will be complied with.

II. FACILITY DRAWINGS

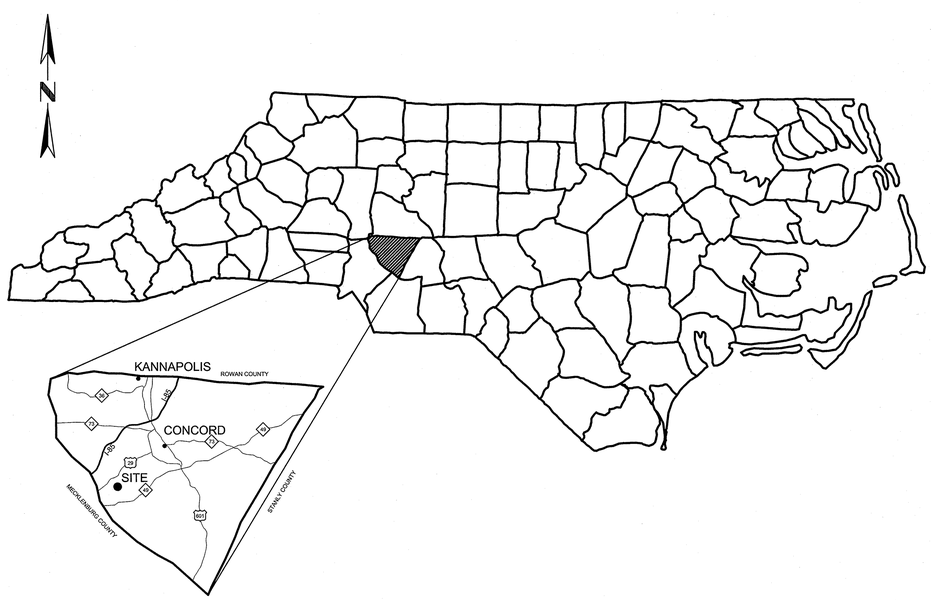
2012 FACILITY PLAN MODIFICATION
CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

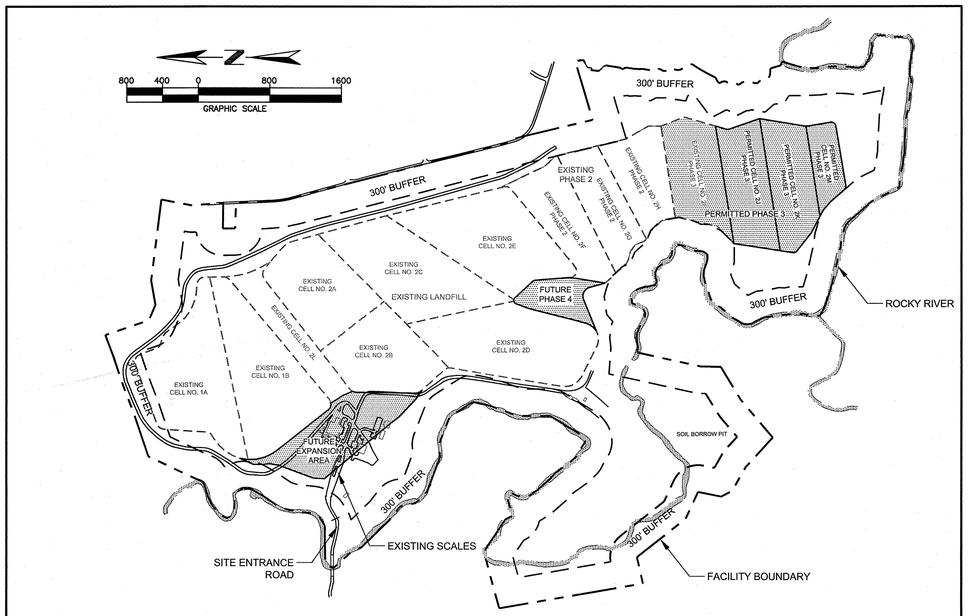
CABARRUS COUNTY, NORTH CAROLINA

APRIL 2012



CABARRUS COUNTY, NORTH CAROLINA

N.T.S



CHARLOTTE MOTOR SPEEDWAY LANDFILL V
SITE PLAN

SCALE: 1" = 800'

REVISION HISTORY

DATE	SHEET NO.

NORTH CAROLINA PROFESSIONAL ENGINEER 15142 H. LOWRY TRIBBLE, JR.

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

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NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE

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CONCORD, NC 28027
PHONE: (704) 782-2004

CMS-FP-TS
4-16-12

EXISTING

- PROPERTY LINE
- UNDISTURBED PROPERTY BUFFER
- STREAM AND WETLAND BUFFER
- EDGE OF CELL
- 2' CONTOUR (102)
- 10' CONTOUR (100)
- UNPAVED ROAD
- PAVED ROAD
- STORM DRAINAGE PIPE
- MANHOLE
- FLOODPLAIN
- JURISDICTIONAL WETLAND
- HEADWALL
- OVERFLOW STRUCTURE
- BUILDING
- TREE LINE
- PIEZOMETER (PZ-1)
- GROUNDWATER MONITORING WELL (MW-19)
- METHANE MONITORING PROBE (MMW-16)
- SURFACE WATER MONITORING POINT (SW-3)
- BENCHMARK
- SANITARY SEWER (SN)
- SOLID LEACHATE PIPE (L)
- PERFORATED LEACHATE PIPE (L)
- LINER PENETRATION ASSEMBLY (LPA)

PROPOSED

- EDGE OF CELL
- 2' CONTOUR (102)
- 10' CONTOUR (100)
- SPOT ELEVATION (100.50)
- STORM DRAINAGE PIPE
- HEADWALL
- OVERFLOW STRUCTURE
- SOLID LEACHATE PIPE (L)
- PERFORATED LEACHATE PIPE (L)
- LEACHATE CLEAN OUT (LCO)
- LEACHATE SUMP
- DITCH CENTERLINE / SIDESLOPE BERM
- DOWNDRAIN PIPE AND RISER
- GROUNDWATER MONITORING WELL (MW-19)
- METHANE MONITORING PROBE (MMW-16)

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2	BOUNDARY SURVEY
3	EXISTING TOPOGRAPHIC CONDITIONS
4	TOP OF SOIL LINER GRADING PLAN - CONCEPTUAL DESIGN
5	LEACHATE COLLECTION PLAN - CONCEPTUAL DESIGN
6	FINAL GRADING PLAN - CONCEPTUAL DESIGN
7	FINAL DRAINAGE PLAN - CONCEPTUAL DESIGN
8	LANDFILL CROSS SECTION A - CONCEPTUAL DESIGN
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10	MISCELLANEOUS DETAILS
11	MISCELLANEOUS DETAILS
12	PHASE 3 FINAL GRADES - CONCEPTUAL DESIGN
13	PHASE 4 FINAL GRADES - CONCEPTUAL DESIGN
14	PHASE 5 FINAL GRADES - CONCEPTUAL DESIGN

NORTH CAROLINA PROFESSIONAL SEAL 15142 ENGINEER H. LOWRY TRIBBLE, JR. 4/16/12

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 4/17/12

INDEX TO DRAWINGS AND LEGEND

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

N.C.Corp. License # C-0813

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

3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-NT	EDIT 4-16-12
SCALE	NOT TO SCALE	SHEET 1 OF 14	
DATE	APRIL 2012		

COMPILED PLAT FOR :

BFI WASTE SYSTEMS OF NORTH AMERICA, INC.

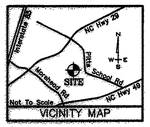
Originally Four Tracts of the CMS Development Corporation Property along Rocky River and Pitts School Road (Deed Book 618 Page 204).
And a Portion of the Evelyn H. Furr Property located along the West side of Loop Run (Deed Book 4328 Page 353)
In the City of Concord, Township No. 2, Cabarrus County, North Carolina
For further reference see Deed Book 2218 Page 291 for Articles of Merger; Deed Book 786 Page 91 for Solid Waste Permit No. 13-04 dated April 2, 1991; and Deed Book 3619 Page 150 for Municipal Solid Waste Landfill Facility Permit No. 13-04 dated January 16, 2002.
This Plat compiled by Thomas J. Fields, PLS-2906, in December 2009

TOTAL AREA = 696.87 Acres ±
(Acreage totaled from deeds listed above)

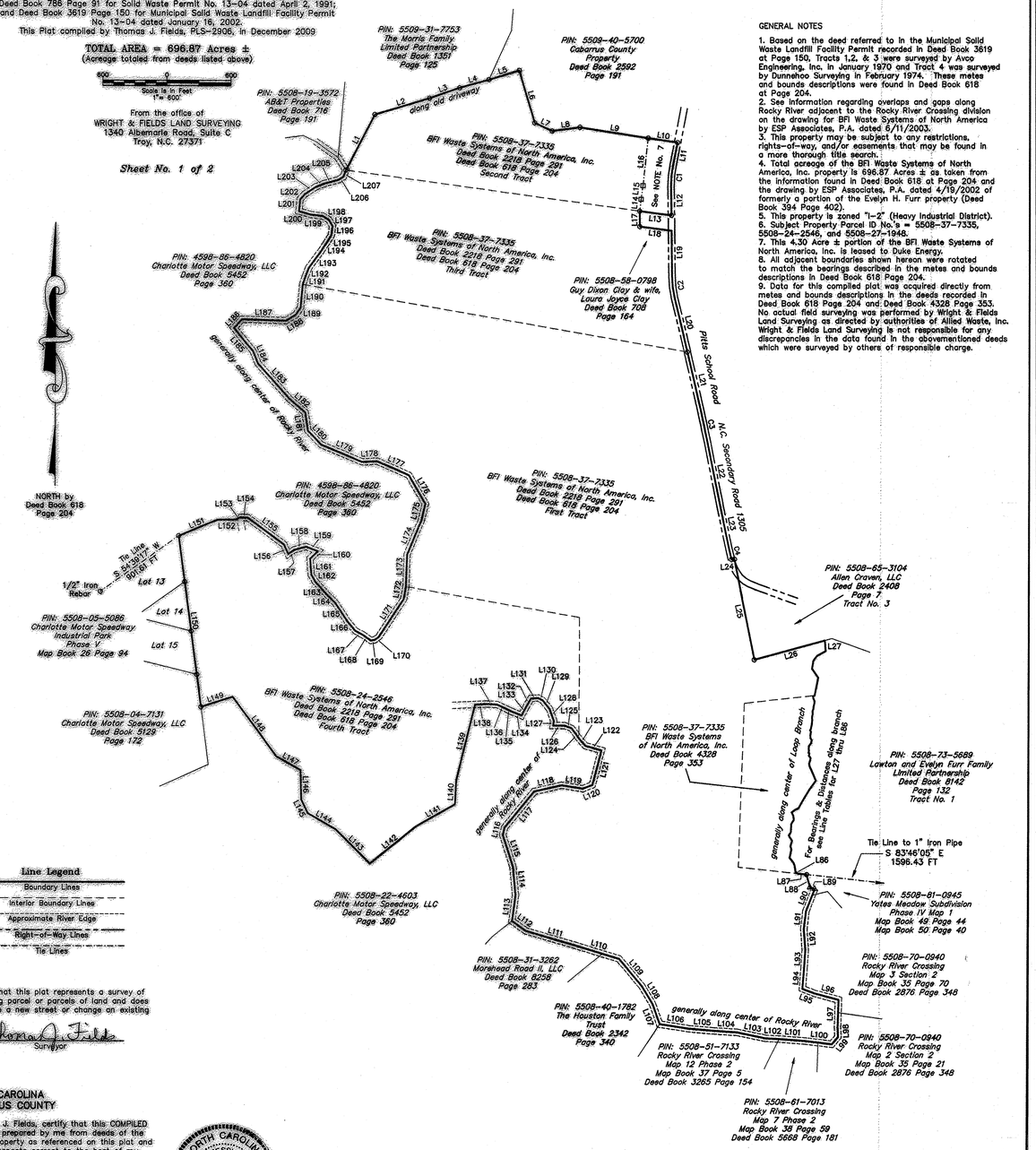
600 0 600
Scale is in Feet
1" = 600'

From the office of
WRIGHT & FIELDS LAND SURVEYING
1340 Albemarle Road, Suite C
Troy, N.C. 27371

Sheet No. 1 of 2



VICINITY MAP



Line Legend

- Boundary Lines
- Interior Boundary Lines
- Approximate River Edge
- Right-of-Way Lines
- Tie Lines

I certify that this plat represents a survey of an existing parcel or parcels of land and does not create a new street or change an existing street.

Thomas J. Fields
Surveyor

NORTH CAROLINA
CABARRUS COUNTY

I, Thomas J. Fields, certify that this COMPILED PLAT was prepared by me from deeds of the subject property as referenced on this plat and is in all respects correct to the best of my knowledge and belief. The ratio of precision for this drawing is incalculable due to each tract being surveyed by different surveyors and at different dates as noted on this plat. This plat is prepared according to G.S. 47-30 as amended. Witness my original signature and official stamp this the 22nd day of December.

Thomas J. Fields
SURVEYOR PLS-2906

NORTH CAROLINA PROFESSIONAL SEAL L-2906 LAND SURVEYOR THOMAS JEFFREY FIELDS

Symbol Legend

- ○ ..... denotes Iron Rods, Iron Pipes, Iron Rebars, spikes, etc.
- ▲ ..... denotes various trees located as property corners.
- ▣ ..... denotes concrete monuments.

I certify that the plat shown hereon is not within the Watershed Protection District or complies with the Watershed Protection District for Cabarrus County and is approved for recordation in the office of the Register of Deeds for Cabarrus County, North Carolina.

Date — Watershed Administrator
Cabarrus Co., N.C.

CABARRUS COUNTY, NORTH CAROLINA

Filed for registration on the_____day of
_____at_____o'clock_____M,
and registered in Book No._____Page_____.

Register of Deeds
or Deputy

GENERAL NOTES

1. Based on the deed referred to in the Municipal Solid Waste Landfill Facility Permit recorded in Deed Book 3619 at Page 150, Tracts 1,2, & 3 were surveyed by Avco Engineering, Inc. in January 1970 and Tract 4 was surveyed by Dunnehoo Surveying in February 1974. These metes and bounds descriptions were found in Deed Book 618 at Page 204.
2. See information regarding overlaps and gaps along Rocky River adjacent to the Rocky River Crossing division on the drawing for BFI Waste Systems of North America by ESP Associates, P.A. dated 6/11/2003.
3. This property may be subject to any restrictions, rights-of-way, and/or easements that may be found in a more thorough title search.
4. Total acreage of the BFI Waste Systems of North America, Inc. property is 696.87 Acres ± as taken from the information found in Deed Book 618 at Page 204 and the drawing by ESP Associates, P.A. dated 4/19/2002 of formerly a portion of the Evelyn H. Furr property (Deed Book 394 Page 402).
5. This property is zoned "I-2" (Heavy Industrial District).
6. Subject Property Parcel ID No.'s = 5508-37-7335, 5508-24-2546, and 5508-27-1945.
7. This 4.30 Acre ± portion of the BFI Waste Systems of North America, Inc. is leased to Duke Energy.
8. All adjacent boundaries shown hereon were rotated to match the bearings described in the metes and bounds descriptions in Deed Book 618 Page 204.
9. Data for this compiled plat was acquired directly from metes and bounds descriptions in the deeds recorded in Deed Book 618 Page 204 and Deed Book 4328 Page 353. No actual field surveying was performed by Wright & Fields Land Surveying as directed by authorities of Allied Waste, Inc. Wright & Fields Land Surveying is not responsible for any discrepancies in the data found in the abovementioned deeds which were surveyed by others of responsible charge.

State of North Carolina
County of Cabarrus

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

Date — Review Officer

Job No. 2009-178

DATA SHEET FOR :

BFI WASTE SYSTEMS OF NORTH AMERICA, INC.

Line and Curve Tables for the perimeter of the property along Rocky River and Pitts School Road
In the City of Concord, Township No. 2, Cabarrus County, North Carolina
This Plat compiled by Thomas J. Fields, PLS-2906, in December 2009

TOTAL AREA = 696.87 Acres ±
(Acreage totaled from deeds listed above)

From the office of
WRIGHT & FIELDS LAND SURVEYING
1340 Albemarle Road, Suite C
Troy, N.C. 27371

Sheet No. 2 of 2

LINE TABLE

LINE	BEARING	DISTANCE
L1	N 27°28'09" E	587.90 FT
L2	N 73°24'08" E	539.11 FT
L3	N 70°53'23" E	299.90 FT
L4	N 74°18'31" E	285.47 FT
L5	N 72°54'38" E	297.83 FT
L6	S 16°28'40" E	512.67 FT
L7	S 65°23'19" E	181.20 FT
L8	N 82°20'56" E	283.00 FT
L9	S 81°09'30" E	648.53 FT
L10	S 81°09'30" E	279.99 FT
L11	S 10°52'30" W	218.08 FT
L12	S 00°35'00" E	270.44 FT
L13	N 82°12'35" W	302.40 FT
L14	S 07°17'08" W	111.49 FT
L15	S 07°54'43" W	129.26 FT
L16	S 06°02'45" W	448.69 FT
L17	S 00°35'00" E	148.71 FT
L18	S 82°12'35" E	302.40 FT
L19	S 00°35'00" E	426.48 FT
L20	S 13°43'00" E	524.83 FT
L21	S 12°56'30" E	570.11 FT
L22	S 11°25'30" E	580.36 FT
L23	S 11°50'00" E	417.37 FT
L24	N 85°40'43" E	28.14 FT
L25	S 11°21'37" E	961.50 FT
L26	N 74°46'04" E	686.36 FT
L27	S 04°55'17" E	100.69 FT
L28	S 61°43'30" W	93.86 FT
L29	S 36°27'00" W	56.98 FT
L30	S 09°16'34" W	76.44 FT
L31	S 35°39'57" E	101.93 FT
L32	S 11°23'44" W	170.12 FT
L33	S 54°51'06" W	16.16 FT
L34	S 04°18'13" E	20.03 FT
L35	S 42°26'31" E	7.00 FT
L36	S 19°56'16" E	20.65 FT
L37	S 03°21'41" W	21.23 FT
L38	S 14°03'45" W	28.21 FT
L39	S 06°37'52" W	7.21 FT
L40	S 06°37'52" W	20.56 FT
L41	S 23°55'37" W	15.62 FT
L42	S 01°20'58" E	16.88 FT
L43	S 01°19'48" E	15.30 FT
L44	S 12°51'56" W	18.67 FT
L45	S 06°35'04" W	14.84 FT
L46	S 03°54'56" E	27.10 FT
L47	S 08°55'08" W	32.80 FT
L48	S 11°00'37" W	30.00 FT
L49	S 09°00'33" W	17.73 FT
L50	S 29°53'02" W	13.05 FT
L51	S 26°18'49" E	17.50 FT
L52	S 09°19'47" W	30.86 FT
L53	S 00°11'49" E	29.19 FT
L54	S 37°19'47" E	21.41 FT
L55	S 14°20'40" W	27.46 FT
L56	S 36°29'17" W	33.51 FT
L57	S 02°08'01" W	21.87 FT
L58	S 03°29'32" E	23.59 FT
L59	S 11°13'07" W	19.20 FT
L60	S 65°58'43" E	8.79 FT
L61	S 08°36'11" W	24.45 FT
L62	S 36°07'49" E	26.32 FT
L63	S 13°22'11" W	56.67 FT
L64	S 10°29'30" E	23.14 FT
L65	S 23°48'56" E	75.06 FT
L66	S 23°19'47" E	70.70 FT
L67	S 35°07'22" W	102.93 FT
L68	S 31°23'51" W	107.84 FT
L69	S 29°12'54" W	95.60 FT

LINE TABLE

LINE	BEARING	DISTANCE
L70	S 66°17'11" W	33.93 FT
L71	S 55°25'24" W	40.08 FT
L72	S 25°40'51" E	35.19 FT
L73	S 08°41'18" E	36.87 FT
L74	S 30°59'22" W	48.85 FT
L75	S 01°39'20" W	77.74 FT
L76	S 35°28'13" W	32.68 FT
L77	S 24°09'59" E	19.56 FT
L78	S 33°27'50" E	39.83 FT
L79	S 14°51'31" W	52.58 FT
L80	S 14°04'26" E	34.38 FT
L81	S 12°15'21" W	77.44 FT
L82	S 39°14'49" E	57.64 FT
L83	S 19°30'55" E	31.11 FT
L84	S 09°18'39" E	28.02 FT
L85	S 07°16'19" E	27.97 FT
L86	S 54°32'59" E	31.20 FT
L87	S 83°46'05" E	80.83 FT
L88	S 15°32'21" E	122.89 FT
L89	S 72°07'58" E	46.22 FT
L90	S 21°20'24" W	225.05 FT
L91	S 06°26'09" W	169.64 FT
L92	S 04°18'03" E	199.02 FT
L93	S 03°26'47" W	158.70 FT
L94	S 04°25'09" W	201.09 FT
L95	S 68°43'22" E	117.21 FT
L96	S 75°12'15" E	237.09 FT
L97	S 01°36'15" W	257.42 FT
L98	S 02°28'49" E	87.72 FT
L99	S 39°15'24" W	89.64 FT
L100	N 83°16'14" W	261.60 FT
L101	N 85°35'20" W	241.42 FT
L102	N 87°20'12" W	123.94 FT
L103	N 78°22'53" W	272.67 FT
L104	N 86°27'05" W	219.90 FT
L105	N 85°05'15" W	234.26 FT
L106	N 81°14'28" W	277.35 FT
L107	N 19°58'58" W	196.75 FT
L108	N 30°59'27" W	196.43 FT
L109	N 40°07'36" W	336.28 FT
L110	N 73°24'33" W	436.25 FT
L111	N 73°57'49" W	476.11 FT
L112	N 54°28'09" W	163.57 FT
L113	N 07°49'59" E	247.07 FT
L114	N 08°47'56" W	262.75 FT
L115	N 17°56'42" W	314.85 FT
L116	N 14°12'08" E	70.60 FT
L117	N 39°32'30" E	436.11 FT
L118	N 76°49'56" E	263.47 FT
L119	S 80°57'52" E	202.23 FT
L120	N 68°07'10" E	97.11 FT
L121	N 14°15'44" E	335.00 FT
L122	N 74°26'57" W	154.51 FT
L123	N 41°46'38" W	108.32 FT
L124	N 31°12'05" W	27.45 FT
L125	N 69°49'20" W	71.02 FT
L126	N 89°45'17" W	105.78 FT
L127	N 07°24'20" E	43.23 FT
L128	N 19°14'57" W	118.19 FT
L129	N 38°30'26" W	102.61 FT
L130	N 60°52'24" W	48.03 FT
L131	S 86°28'05" W	69.67 FT
L132	S 29°24'10" W	103.71 FT
L133	S 27°28'12" W	80.06 FT
L134	N 67°55'19" W	103.75 FT
L135	N 63°27'49" W	39.42 FT
L136	N 64°46'50" W	109.66 FT
L137	N 88°26'07" W	100.01 FT
L138	S 87°46'01" W	107.21 FT

LINE TABLE

LINE	BEARING	DISTANCE
L139	S 13°52'55" W	725.77 FT
L140	S 02°58'39" W	231.15 FT
L141	S 60°27'22" W	426.73 FT
L142	S 51°00'44" W	550.15 FT
L143	N 45°02'27" W	449.97 FT
L144	N 59°58'34" W	304.67 FT
L145	N 25°25'14" W	140.22 FT
L146	N 01°35'00" W	276.37 FT
L147	N 60°42'41" W	262.05 FT
L148	N 36°31'04" W	692.95 FT
L149	S 72°11'25" W	313.58 FT
L150	N 07°31'13" W	1619.28 FT
L151	N 67°41'20" E	396.00 FT
L152	N 88°59'24" E	170.20 FT
L153	N 61°56'13" E	42.77 FT
L154	S 87°57'35" E	72.75 FT
L155	S 53°50'40" E	422.28 FT
L156	S 23°53'32" E	97.63 FT
L157	N 55°19'53" E	69.35 FT
L158	N 74°55'27" E	114.96 FT
L159	S 69°14'32" E	118.05 FT
L160	S 45°45'17" W	100.94 FT
L161	S 03°53'26" E	152.69 FT
L162	S 30°15'15" E	73.67 FT
L163	S 42°24'49" E	175.35 FT
L164	S 46°00'32" E	99.99 FT
L165	S 32°57'42" E	203.96 FT
L166	S 40°14'26" E	117.18 FT
L167	S 61°52'33" E	77.41 FT
L168	S 54°52'46" E	93.76 FT
L169	N 79°47'19" E	35.09 FT
L170	N 55°26'53" E	46.09 FT
L171	N 33°40'04" E	425.70 FT
L172	N 10°10'28" E	121.53 FT
L173	N 02°08'48" E	301.67 FT
L174	N 22°39'00" E	337.95 FT
L175	N 13°22'12" E	166.38 FT
L176	N 30°09'00" W	309.03 FT
L177	N 66°14'43" W	325.99 FT
L178	S 87°12'00" W	142.27 FT
L179	N 67°11'44" W	418.59 FT
L180	N 43°49'47" W	180.69 FT
L181	N 08°38'24" W	171.71 FT
L182	N 49°11'39" W	193.49 FT
L183	N 41°42'37" W	445.78 FT
L184	N 22°04'03" W	125.25 FT
L185	N 40°06'20" W	279.56 FT
L186	N 43°19'36" E	109.16 FT
L187	S 88°22'53" E	415.00 FT
L188	N 59°30'28" E	107.69 FT
L189	N 33°44'51" E	82.77 FT
L190	N 04°51'18" E	216.91 FT
L191	N 16°52'02" E	80.26 FT
L192	N 21°26'29" E	86.11 FT
L193	N 36°11'20" E	197.01 FT
L194	N 33°40'33" E	77.44 FT
L195	N 32°30'16" E	93.78 FT
L196	N 07°16'08" E	88.98 FT
L197	N 29°53'50" W	65.87 FT
L198	N 57°36'10" W	67.85 FT
L199	N 83°22'43" W	113.22 FT
L200	N 74°00'59" W	117.14 FT
L201	N 06°18'53" E	112.46 FT
L202	N 41°23'37" E	63.70 FT
L203	N 56°20'44" E	123.21 FT
L204	N 68°14'57" E	83.57 FT
L205	N 74°38'15" E	139.98 FT
L206	N 58°07'28" E	55.02 FT
L207	N 19°29'02" E	66.25 FT

CURVE TABLE

CURVE	CHORD BEARING	CHORD	RADIUS	ARC
C1	S 05°08'45" W	199.00 FT	996.74 FT	199.33 FT
C2	S 07°09'00" E	198.68 FT	868.70 FT	199.12 FT
C3	S 12°11'00" E	299.97 FT	11332.57 FT	299.98 FT
C4	S 12°59'01" E	119.04 FT	2964.64 FT	119.05 FT

Thomas J. Fields

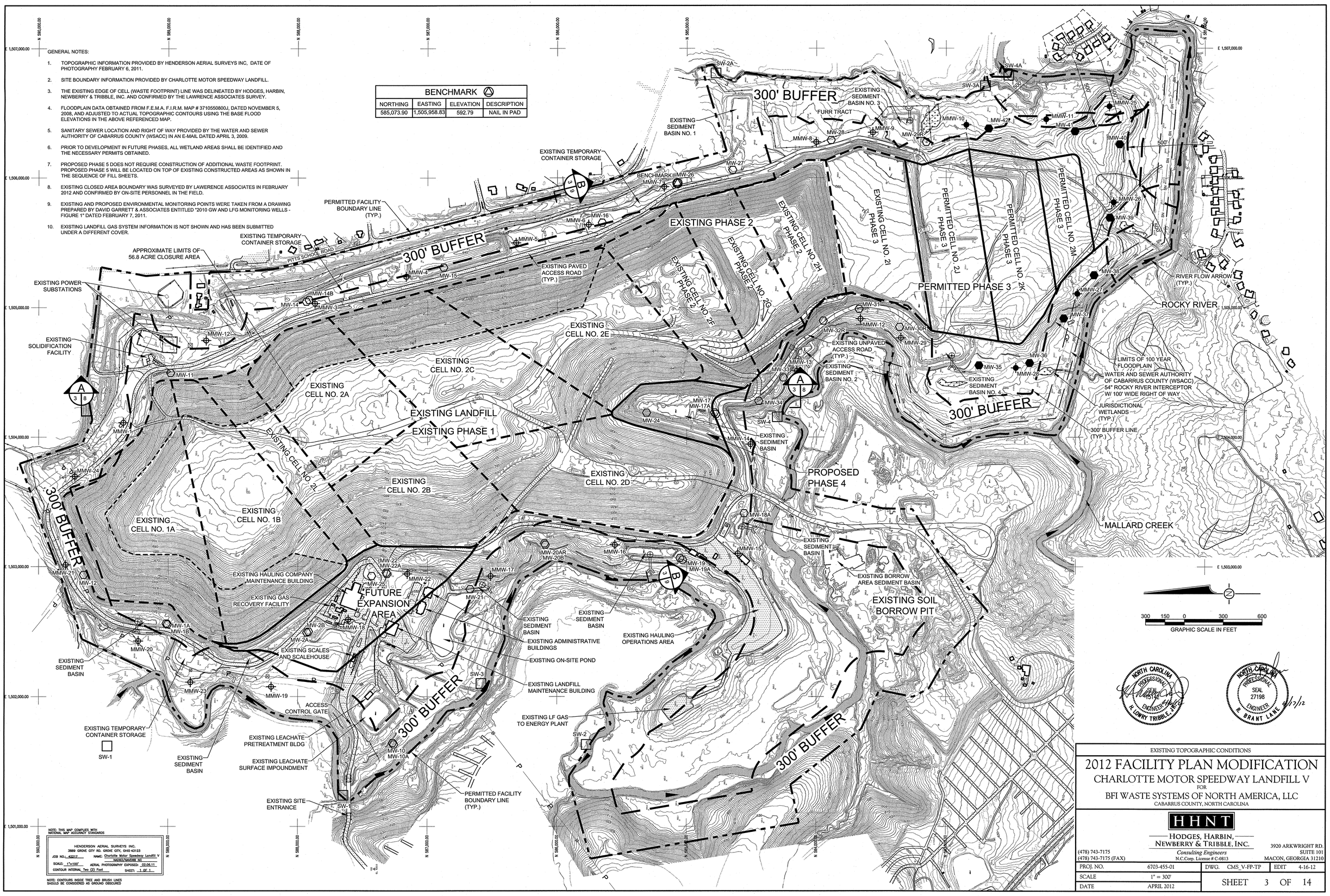
NORTH CAROLINA PROFESSIONAL SEAL L-2906 LAND SURVEYOR THOMAS JEFFREY FIELDS

Job No. 2009-178

GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION PROVIDED BY HENDERSON AERIAL SURVEYS INC, DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.
2. SITE BOUNDARY INFORMATION PROVIDED BY CHARLOTTE MOTOR SPEEDWAY LANDFILL.
3. THE EXISTING EDGE OF CELL (WASTE FOOTPRINT) LINE WAS DELINEATED BY HODGES, HARBIN, NEWBERRY & TRIBBLE, INC. AND CONFIRMED BY THE LAWRENCE ASSOCIATES SURVEY.
4. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
5. SANITARY SEWER LOCATION AND RIGHT OF WAY PROVIDED BY THE WATER AND SEWER AUTHORITY OF CABARRUS COUNTY (WSACC) IN AN E-MAIL DATED APRIL 3, 2009.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. PROPOSED PHASE 5 DOES NOT REQUIRE CONSTRUCTION OF ADDITIONAL WASTE FOOTPRINT. PROPOSED PHASE 5 WILL BE LOCATED ON TOP OF EXISTING CONSTRUCTED AREAS AS SHOWN IN THE SEQUENCE OF FILL SHEETS.
8. EXISTING CLOSED AREA BOUNDARY WAS SURVEYED BY LAWERENCE ASSOCIATES IN FEBRUARY 2012 AND CONFIRMED BY ON-SITE PERSONNEL IN THE FIELD.
9. EXISTING AND PROPOSED ENVIRONMENTAL MONITORING POINTS WERE TAKEN FROM A DRAWING PREPARED BY DAVID GARRETT & ASSOCIATES ENTITLED "2010 GW AND LFG MONITORING WELLS - FIGURE 1" DATED FEBRUARY 7, 2011.
10. EXISTING LANDFILL GAS SYSTEM INFORMATION IS NOT SHOWN AND HAS BEEN SUBMITTED UNDER A DIFFERENT COVER.

BENCHMARK			
NORTHING	EASTING	ELEVATION	DESCRIPTION
585,073.90	1,505,958.83	592.79	NAIL IN PAD



NOTE: THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

HENDERSON AERIAL SURVEYS INC.
3589 GROVE CITY RD. GROVE CITY, OHIO 43123
JOB NO.: 62217 NAME: Charlotte Motor Speedway Landfill V NAD83/NAVD88 NC
SCALE: 1"=100' AERIAL PHOTOGRAPHY EXPOSED: 02.06.11
CONTOUR INTERVAL Two (2) Foot SHEET: 1 OF 1

NOTE: CONTOURS INSIDE TREE AND BRUSH LINES SHOULD BE CONSIDERED AS GROUND OBSCURED

EXISTING TOPOGRAPHIC CONDITIONS

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT
HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
Consulting Engineers
N.C.Corp. License # C-0813
(478) 743-7175
(478) 743-7175 (FAX)
3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-TP	EDIT 4-16-12
SCALE	1" = 300'	SHEET 3 OF 14	
DATE	APRIL 2012		

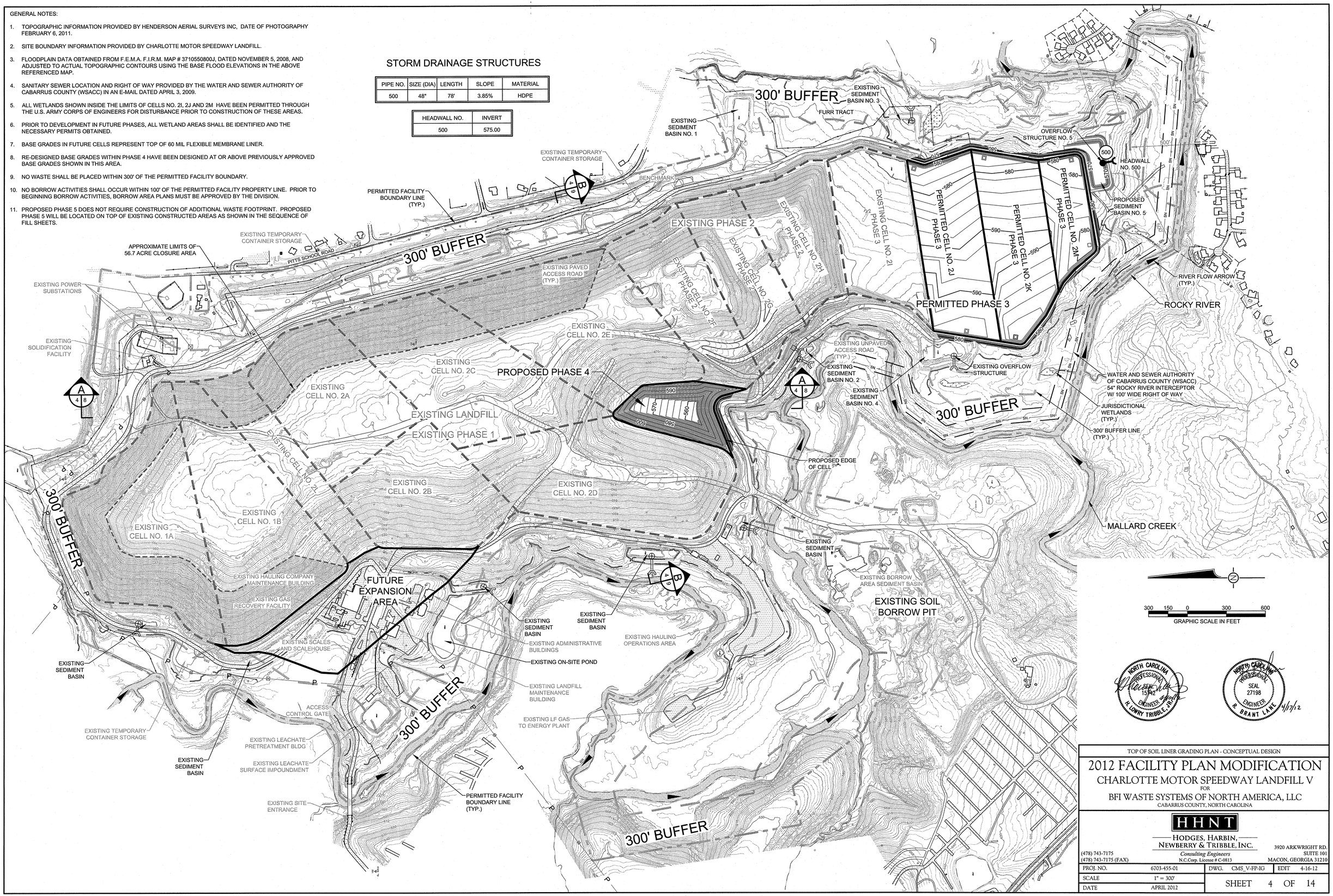
GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION PROVIDED BY HENDERSON AERIAL SURVEYS INC, DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.
2. SITE BOUNDARY INFORMATION PROVIDED BY CHARLOTTE MOTOR SPEEDWAY LANDFILL.
3. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
4. SANITARY SEWER LOCATION AND RIGHT OF WAY PROVIDED BY THE WATER AND SEWER AUTHORITY OF CABARRUS COUNTY (WSACC) IN AN E-MAIL DATED APRIL 3, 2009.
5. ALL WETLANDS SHOWN INSIDE THE LIMITS OF CELLS NO. 2I, 2J AND 2M HAVE BEEN PERMITTED THROUGH THE U.S. ARMY CORPS OF ENGINEERS FOR DISTURBANCE PRIOR TO CONSTRUCTION OF THESE AREAS.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. BASE GRADES IN FUTURE CELLS REPRESENT TOP OF 60 MIL FLEXIBLE MEMBRANE LINER.
8. RE-DESIGNED BASE GRADES WITHIN PHASE 4 HAVE BEEN DESIGNED AT OR ABOVE PREVIOUSLY APPROVED BASE GRADES SHOWN IN THIS AREA.
9. NO WASTE SHALL BE PLACED WITHIN 300' OF THE PERMITTED FACILITY BOUNDARY.
10. NO BORROW ACTIVITIES SHALL OCCUR WITHIN 100' OF THE PERMITTED FACILITY PROPERTY LINE. PRIOR TO BEGINNING BORROW ACTIVITIES, BORROW AREA PLANS MUST BE APPROVED BY THE DIVISION.
11. PROPOSED PHASE 5 DOES NOT REQUIRE CONSTRUCTION OF ADDITIONAL WASTE FOOTPRINT. PROPOSED PHASE 5 WILL BE LOCATED ON TOP OF EXISTING CONSTRUCTED AREAS AS SHOWN IN THE SEQUENCE OF FILL SHEETS.

STORM DRAINAGE STRUCTURES

PIPE NO.	SIZE (DIA)	LENGTH	SLOPE	MATERIAL
500	48"	78'	3.85%	HDPE

HEADWALL NO.	INVERT
500	575.00



NORTH CAROLINA PROFESSIONAL SEAL 15742 ENGINEER H. LOWRY TRIBBLE, JR.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 4/17/12

TOP OF SOIL LINER GRADING PLAN - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

N.C.Corp. License # C-0813

(478) 743-7175
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SUITE 101
MACON, GEORGIA 31210

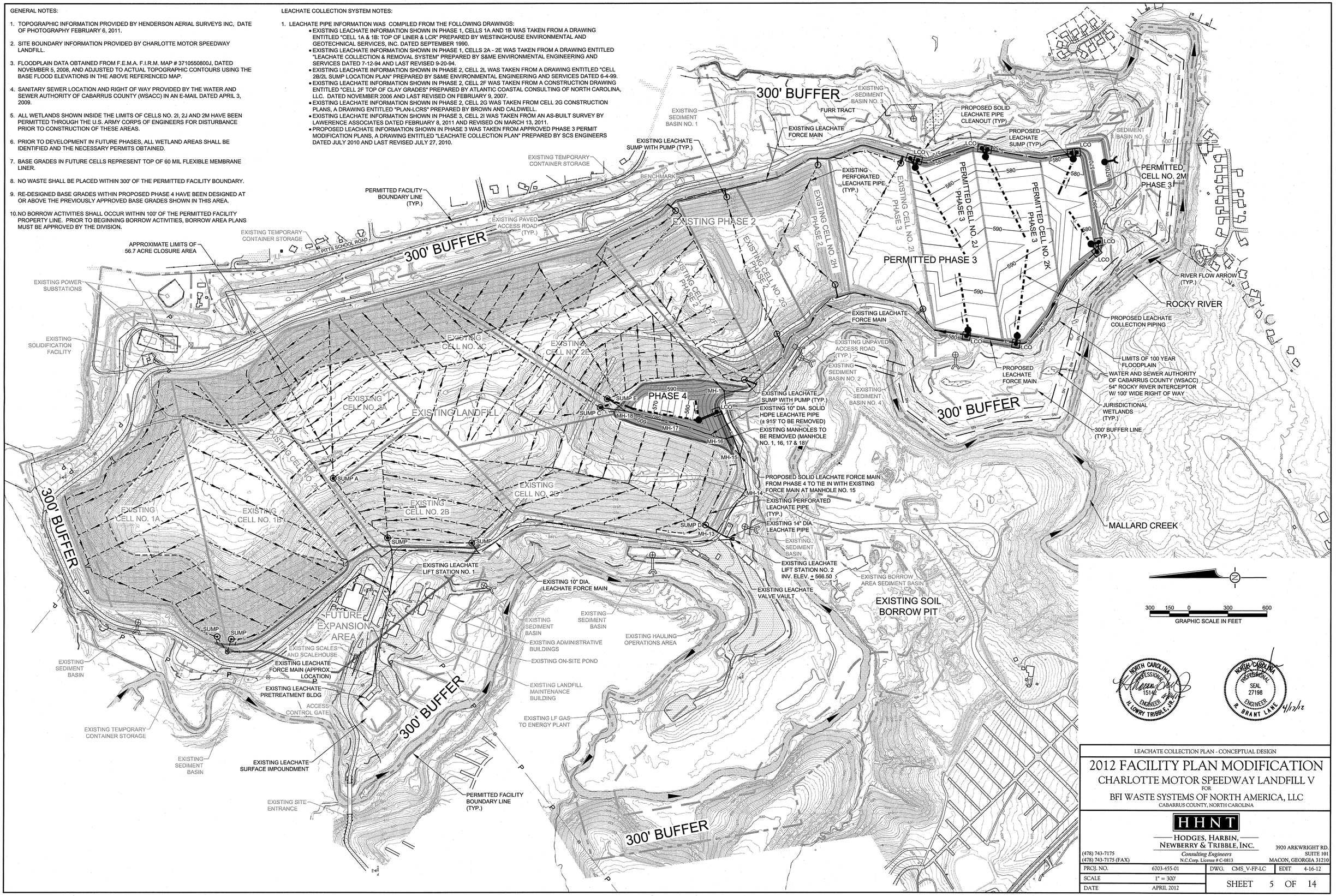
PROJ. NO.	6703-455-01	DWG. CMS_V-FP-IG	EDIT 4-16-12
SCALE	1" = 300'	SHEET 4 OF 14	
DATE	APRIL 2012		

GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION PROVIDED BY HENDERSON AERIAL SURVEYS INC, DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.
2. SITE BOUNDARY INFORMATION PROVIDED BY CHARLOTTE MOTOR SPEEDWAY LANDFILL.
3. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
4. SANITARY SEWER LOCATION AND RIGHT OF WAY PROVIDED BY THE WATER AND SEWER AUTHORITY OF CABARRUS COUNTY (WSACC) IN AN E-MAIL DATED APRIL 3, 2009.
5. ALL WETLANDS SHOWN INSIDE THE LIMITS OF CELLS NO. 2I, 2J AND 2M HAVE BEEN PERMITTED THROUGH THE U.S. ARMY CORPS OF ENGINEERS FOR DISTURBANCE PRIOR TO CONSTRUCTION OF THESE AREAS.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. BASE GRADES IN FUTURE CELLS REPRESENT TOP OF 60 MIL FLEXIBLE MEMBRANE LINER.
8. NO WASTE SHALL BE PLACED WITHIN 300' OF THE PERMITTED FACILITY BOUNDARY.
9. RE-DESIGNED BASE GRADES WITHIN PROPOSED PHASE 4 HAVE BEEN DESIGNED AT OR ABOVE THE PREVIOUSLY APPROVED BASE GRADES SHOWN IN THIS AREA.
10. NO BORROW ACTIVITIES SHALL OCCUR WITHIN 100' OF THE PERMITTED FACILITY PROPERTY LINE. PRIOR TO BEGINNING BORROW ACTIVITIES, BORROW AREA PLANS MUST BE APPROVED BY THE DIVISION.

LEACHATE COLLECTION SYSTEM NOTES:

1. LEACHATE PIPE INFORMATION WAS COMPILED FROM THE FOLLOWING DRAWINGS:
   - EXISTING LEACHATE INFORMATION SHOWN IN PHASE 1, CELLS 1A AND 1B WAS TAKEN FROM A DRAWING ENTITLED "CELL 1A & 1B: TOP OF LINER & LCR" PREPARED BY WESTINGHOUSE ENVIRONMENTAL AND GEOTECHNICAL SERVICES, INC. DATED SEPTEMBER 1990.
   - EXISTING LEACHATE INFORMATION SHOWN IN PHASE 1, CELLS 2A - 2E WAS TAKEN FROM A DRAWING ENTITLED "LEACHATE COLLECTION & REMOVAL SYSTEM" PREPARED BY S&ME ENVIRONMENTAL ENGINEERING AND SERVICES DATED 7-12-94 AND LAST REVISED 9-20-94.
   - EXISTING LEACHATE INFORMATION SHOWN IN PHASE 2, CELL 2L WAS TAKEN FROM A DRAWING ENTITLED "CELL 2B/2L SUMP LOCATION PLAN" PREPARED BY S&ME ENVIRONMENTAL ENGINEERING AND SERVICES DATED 6-4-99.
   - EXISTING LEACHATE INFORMATION SHOWN IN PHASE 2, CELL 2F WAS TAKEN FROM A CONSTRUCTION DRAWING ENTITLED "CELL 2F TOP OF CLAY GRADES" PREPARED BY ATLANTIC COASTAL CONSULTING OF NORTH CAROLINA, LLC. DATED NOVEMBER 2006 AND LAST REVISED ON FEBRUARY 9, 2007.
   - EXISTING LEACHATE INFORMATION SHOWN IN PHASE 2, CELL 2G WAS TAKEN FROM CELL 2G CONSTRUCTION PLANS, A DRAWING ENTITLED "PLAN-LCRS" PREPARED BY BROWN AND CALDWELL.
   - EXISTING LEACHATE INFORMATION SHOWN IN PHASE 3, CELL 2I WAS TAKEN FROM AN AS-BUILT SURVEY BY LAWERENCE ASSOCIATES DATED FEBRUARY 8, 2011 AND REVISED ON MARCH 13, 2011.
   - PROPOSED LEACHATE INFORMATION SHOWN IN PHASE 3 WAS TAKEN FROM APPROVED PHASE 3 PERMIT MODIFICATION PLANS, A DRAWING ENTITLED "LEACHATE COLLECTION PLAN" PREPARED BY SCS ENGINEERS DATED JULY 2010 AND LAST REVISED JULY 27, 2010.



NORTH CAROLINA PROFESSIONAL SEAL 15142 ENGINEER H. LOWRY TRIBBLE, JR.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 4/17/12

LEACHATE COLLECTION PLAN - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

N.C.Corp. License # C-0813

(478) 743-7175
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3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-LC	EDIT 4-16-12
SCALE	1" = 300'	SHEET 5 OF 14	
DATE	APRIL 2012		

GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION PROVIDED BY HENDERSON AERIAL SURVEYS INC, DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.
2. SITE BOUNDARY INFORMATION PROVIDED BY CHARLOTTE MOTOR SPEEDWAY LANDFILL.
3. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
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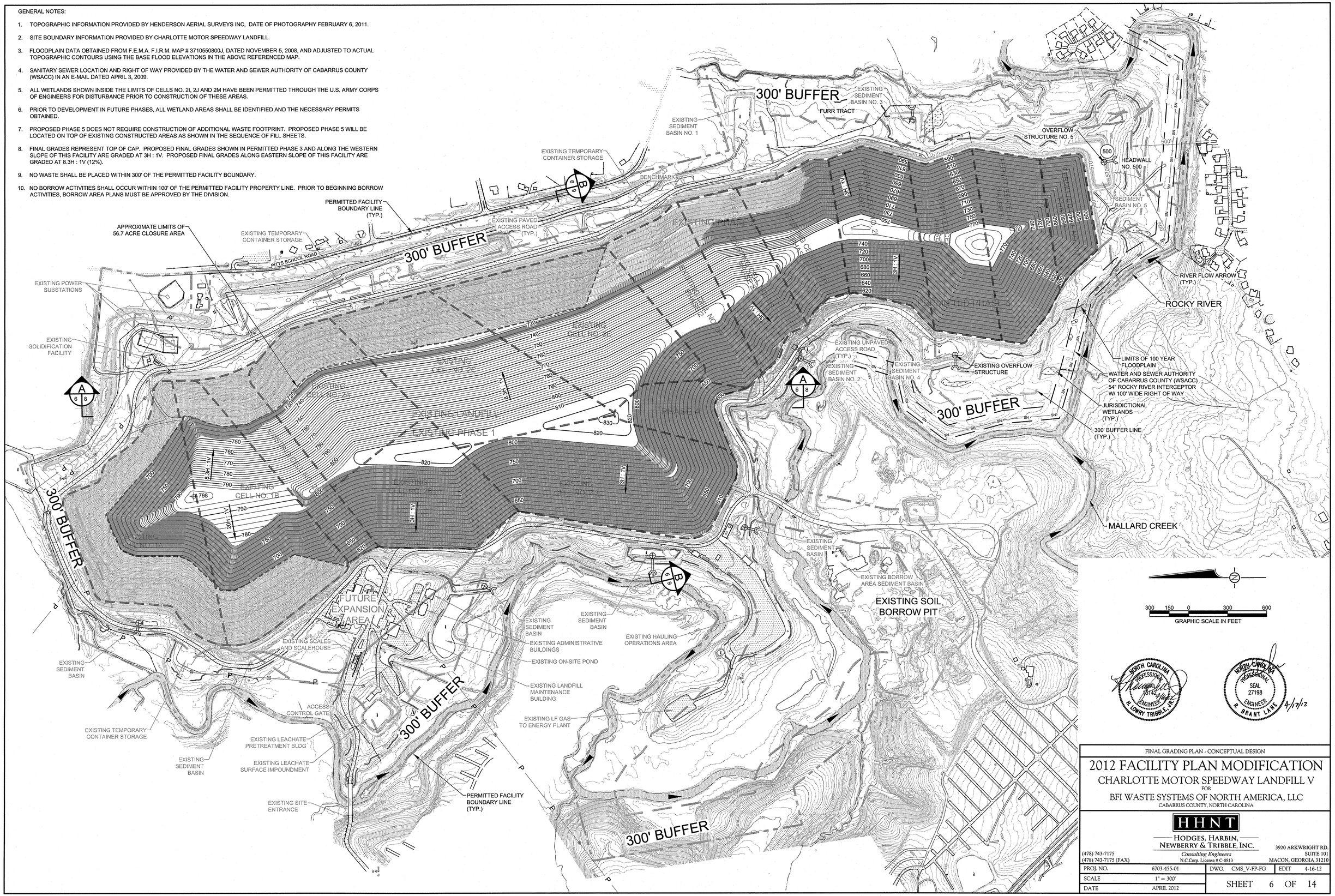
5. ALL WETLANDS SHOWN INSIDE THE LIMITS OF CELLS NO. 2I, 2J AND 2M HAVE BEEN PERMITTED THROUGH THE U.S. ARMY CORPS OF ENGINEERS FOR DISTURBANCE PRIOR TO CONSTRUCTION OF THESE AREAS.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. PROPOSED PHASE 5 DOES NOT REQUIRE CONSTRUCTION OF ADDITIONAL WASTE FOOTPRINT. PROPOSED PHASE 5 WILL BE LOCATED ON TOP OF EXISTING CONSTRUCTED AREAS AS SHOWN IN THE SEQUENCE OF FILL SHEETS.
8. FINAL GRADES REPRESENT TOP OF CAP. PROPOSED FINAL GRADES SHOWN IN PERMITTED PHASE 3 AND ALONG THE WESTERN SLOPE OF THIS FACILITY ARE GRADED AT 3H : 1V. PROPOSED FINAL GRADES ALONG EASTERN SLOPE OF THIS FACILITY ARE GRADED AT 8.3H : 1V (12%).
9. NO WASTE SHALL BE PLACED WITHIN 300' OF THE PERMITTED FACILITY BOUNDARY.
10. NO BORROW ACTIVITIES SHALL OCCUR WITHIN 100' OF THE PERMITTED FACILITY PROPERTY LINE. PRIOR TO BEGINNING BORROW ACTIVITIES, BORROW AREA PLANS MUST BE APPROVED BY THE DIVISION.



FINAL GRADING PLAN - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

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3920 ARKWRIGHT RD.

SUITE 101

MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-FG	EDIT 4-16-12
SCALE	1" = 300'	SHEET 6 OF 14	
DATE	APRIL 2012		

GENERAL NOTES:

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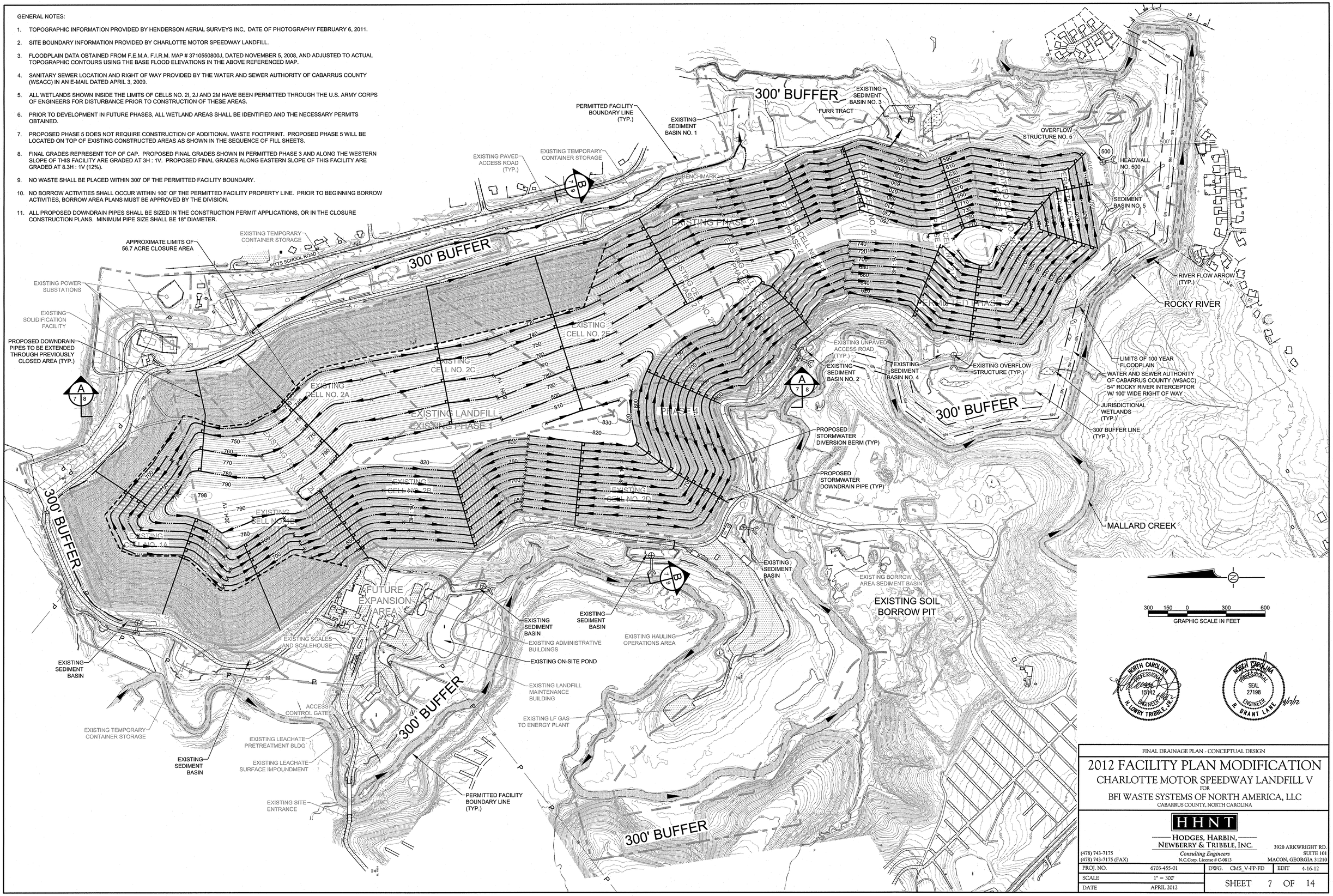
8. FINAL GRADES REPRESENT TOP OF CAP. PROPOSED FINAL GRADES SHOWN IN PERMITTED PHASE 3 AND ALONG THE WESTERN SLOPE OF THIS FACILITY ARE GRADED AT 3H : 1V. PROPOSED FINAL GRADES ALONG EASTERN SLOPE OF THIS FACILITY ARE GRADED AT 8.3H : 1V (12%).
9. NO WASTE SHALL BE PLACED WITHIN 300' OF THE PERMITTED FACILITY BOUNDARY.
10. NO BORROW ACTIVITIES SHALL OCCUR WITHIN 100' OF THE PERMITTED FACILITY PROPERTY LINE. PRIOR TO BEGINNING BORROW ACTIVITIES, BORROW AREA PLANS MUST BE APPROVED BY THE DIVISION.
11. ALL PROPOSED DOWNDRAIN PIPES SHALL BE SIZED IN THE CONSTRUCTION PERMIT APPLICATIONS, OR IN THE CLOSURE CONSTRUCTION PLANS. MINIMUM PIPE SIZE SHALL BE 18" DIAMETER.



FINAL DRAINAGE PLAN - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

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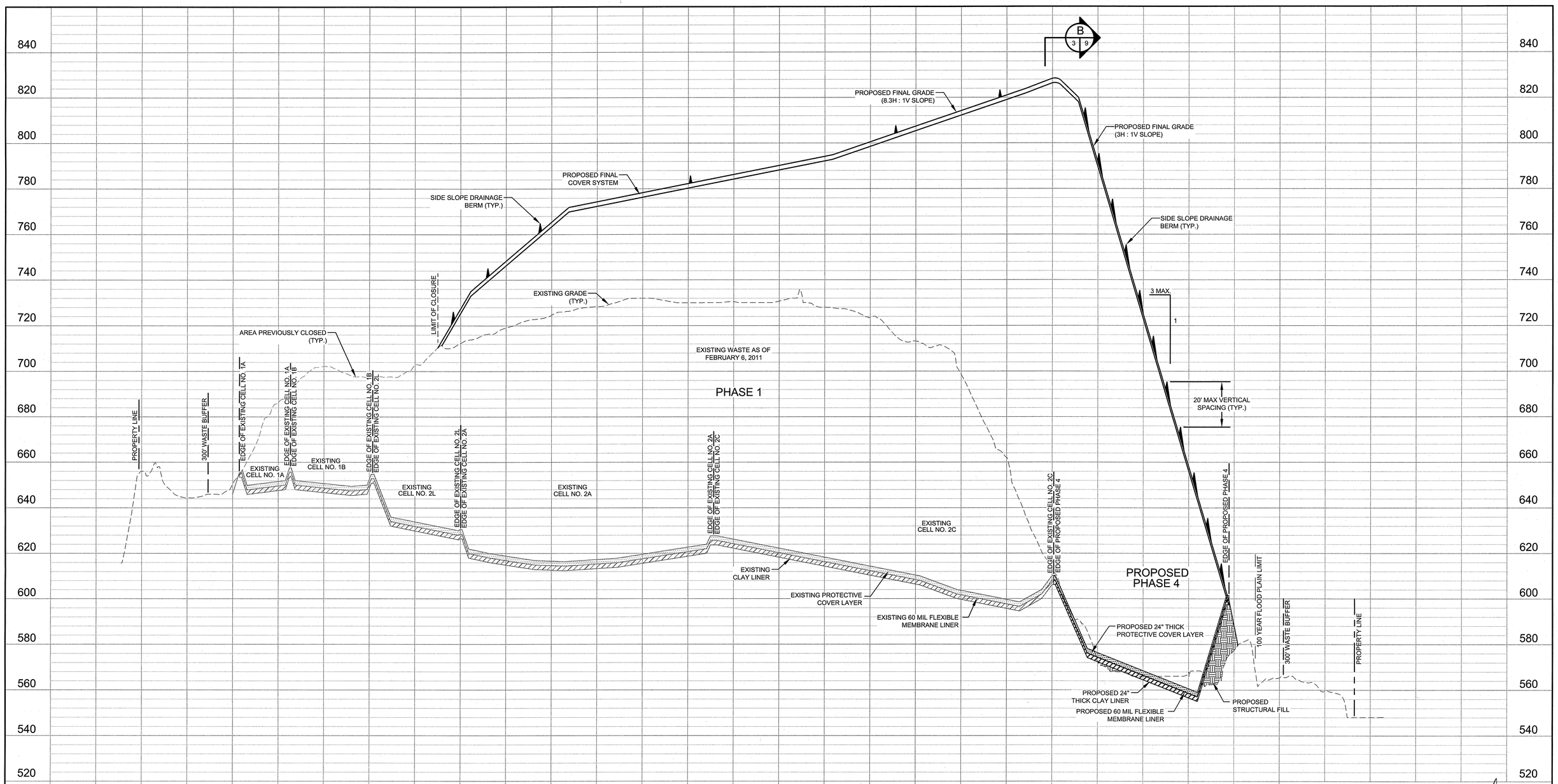
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-FD	EDIT 4-16-12
SCALE	1" = 300'	SHEET 7 OF 14	
DATE	APRIL 2012		



CROSS SECTION - A

200 100 0 200 400
GRAPHIC HORIZONTAL SCALE IN FEET

20 10 0 20 40
GRAPHIC VERTICAL SCALE IN FEET

NOTE:
1. LEACHATE COLLECTION PIPES ARE NOT SHOWN FOR CLARITY.
2. EXISTING GRADE ELEVATIONS TAKEN FROM AERIAL SURVEY PREPARED BY HENDERSON AERIAL SURVEYS, INC. DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.

NORTH CAROLINA PROFESSIONAL SEAL 15142 ENGINEER H. LOWRY TRIBBLE, JR. 4/16/12

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 4/17/12

LANDFILL CROSS SECTION A - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V
FOR
BFI WASTE SYSTEMS OF NORTH AMERICA, LLC
CABARRUS COUNTY, NORTH CAROLINA

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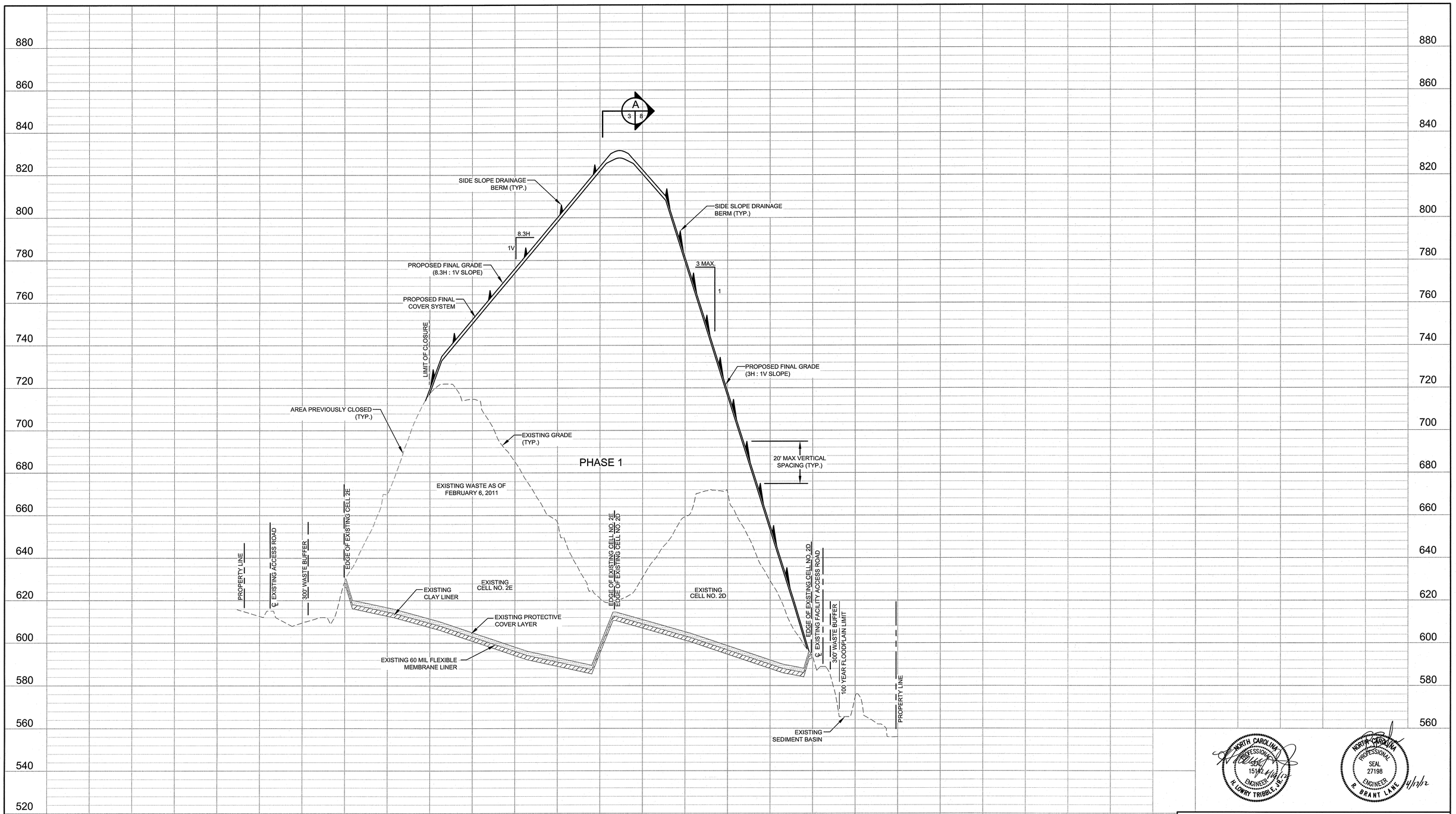
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-XST-A	EDIT 4-16-12
SCALE	HOR: 1"=200' ; VERT: 1"=20'	SHEET 8 OF 14	
DATE	APRIL 2012		



CROSS SECTION - B

200 100 0 200 400
GRAPHIC HORIZONTAL SCALE IN FEET

20 10 0 20 40
GRAPHIC VERTICAL SCALE IN FEET

NOTE:
1. LEACHATE COLLECTION PIPES ARE NOT SHOWN FOR CLARITY.
2. EXISTING GRADE ELEVATIONS TAKEN FROM AERIAL SURVEY PREPARED BY HENDERSON AERIAL SURVEYS, INC. DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.

NORTH CAROLINA PROFESSIONAL SEAL 15142 ENGINEER H. LOWRY TRIBBLE, JR. 4/16/12

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 4/12/12

LANDFILL CROSS SECTION B - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V
FOR
BFI WASTE SYSTEMS OF NORTH AMERICA, LLC
CABARRUS COUNTY, NORTH CAROLINA

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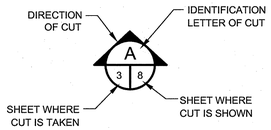
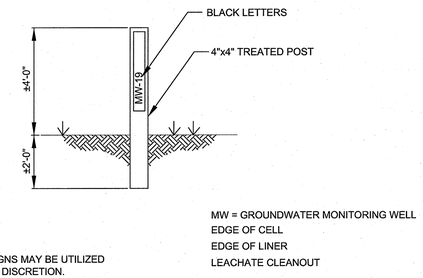
SCALE	HOR: 1"=200' ; VERT: 1"=20'	SHEET 9 OF 14	
DATE	APRIL 2012		

1



EXAMPLE - SECTION SYMBOL

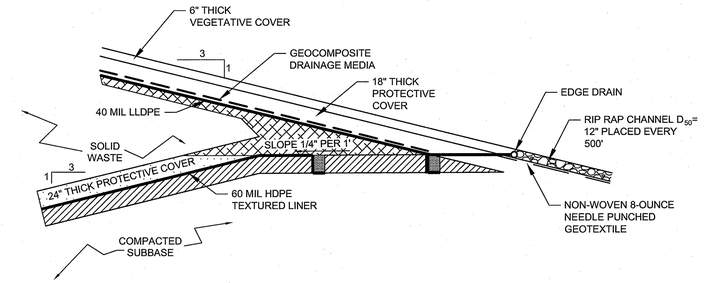
2



NOTE: OTHER MARKER DESIGNS MAY BE UTILIZED AT THE OPERATOR'S DISCRETION.

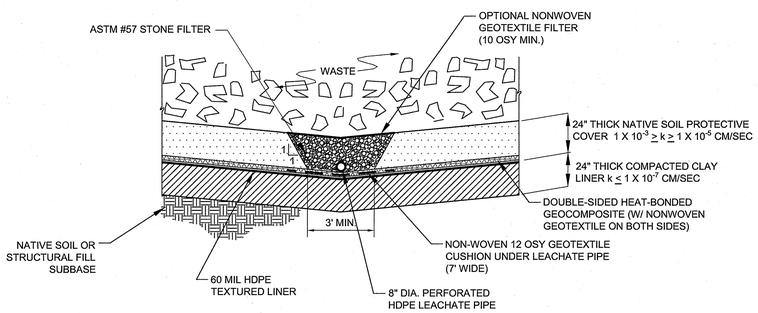
MARKER POST

3



FINAL CLOSURE SECTION AT ANCHOR TRENCH

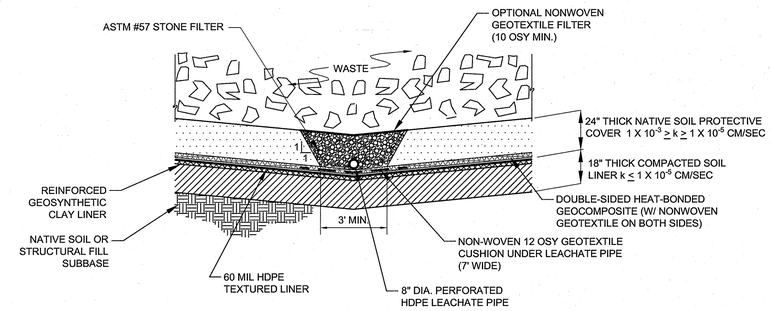
4



LEACHATE COLLECTION PIPE WITH BASE LINER SYSTEM

(SECTION LOOKING UP THE CELL)

5



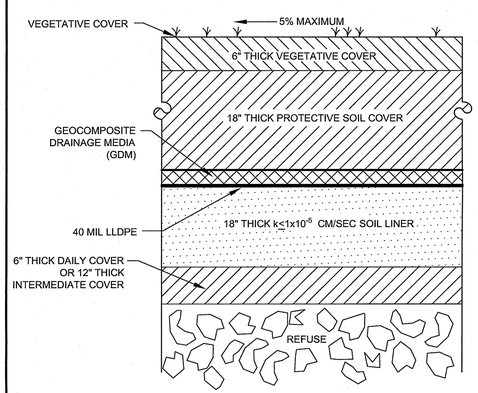
LEACHATE COLLECTION PIPE WITH ALTERNATE BASE LINER SYSTEM

(SECTION LOOKING UP THE CELL)

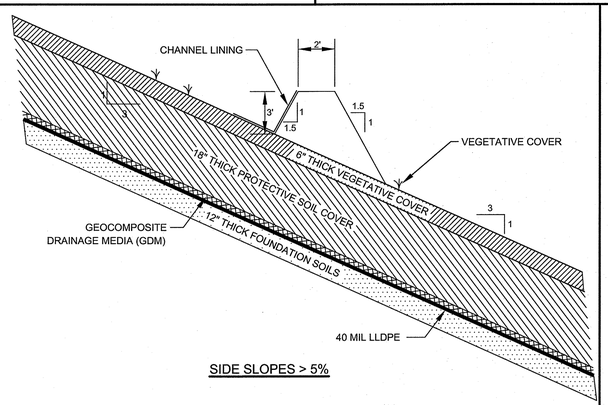
6

NO DETAIL

7



LANDFILL CAP (5% SLOPE)

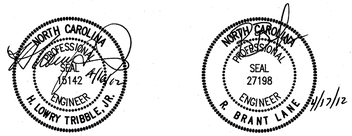


SIDE SLOPES > 5%

FINAL CLOSURE SECTION

8

NO DETAIL



MISCELLANEOUS DETAILS

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

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SUITE 101
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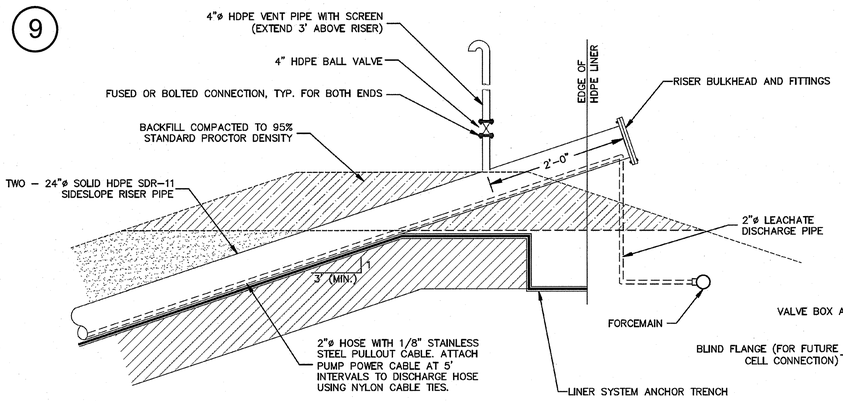
SCALE	NOT TO SCALE	SHEET 10 OF 14	
DATE	APRIL 2012		

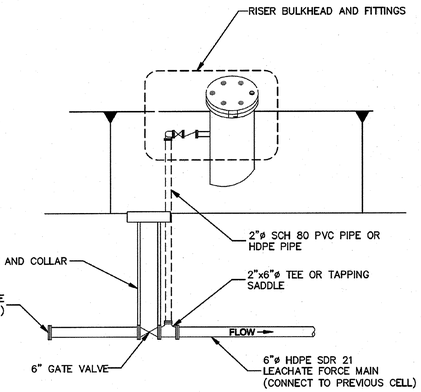
9



NOTE

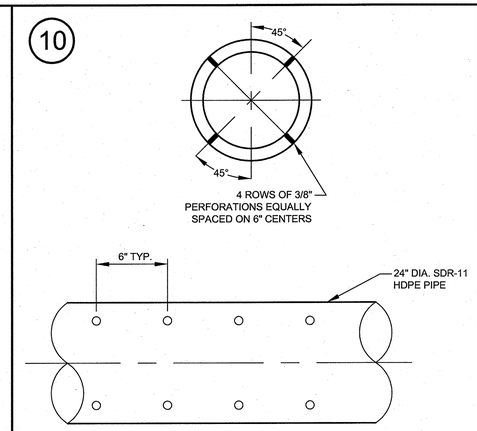
1. PLACE "CONFINED SPACE" LABEL ON LID.

LEACHATE RISER VAULT PROFILE



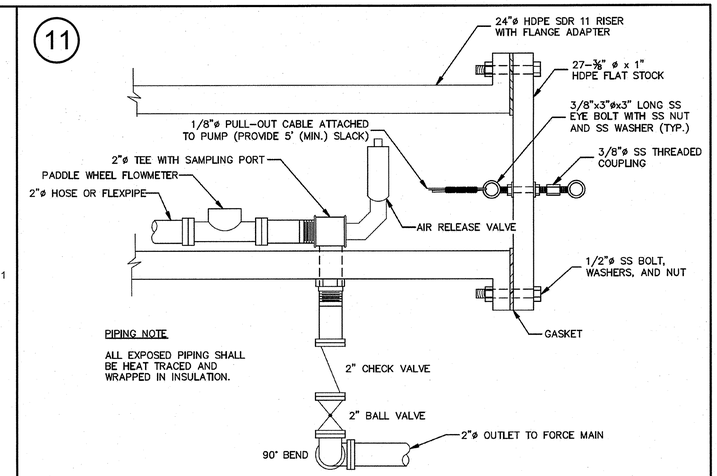
LEACHATE RISER VAULT SECTION

10



24" DIA. SDR-11 HDPE PERFORATED SUMP HOUSING DETAIL

11

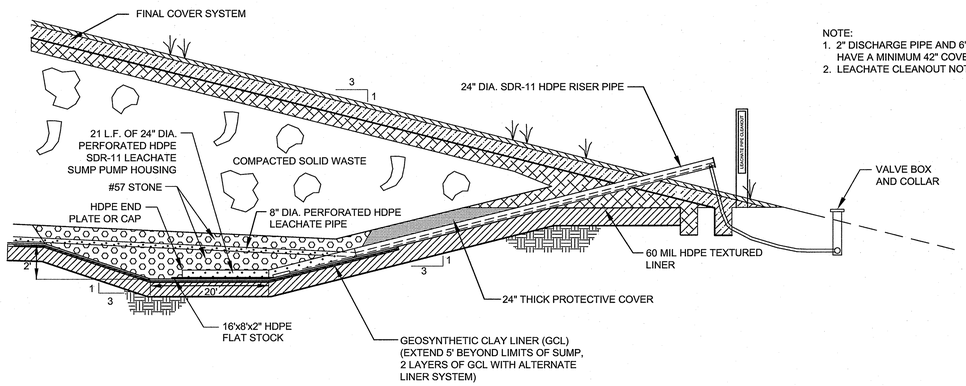


PIPING NOTE

ALL EXPOSED PIPING SHALL BE HEAT TRACED AND WRAPPED IN INSULATION.

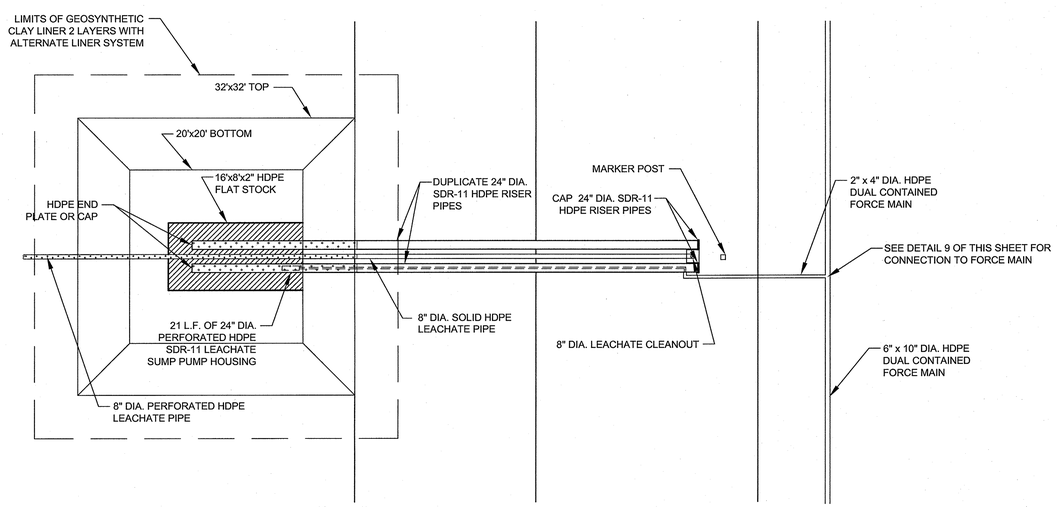
RISER BULKHEAD AND FITTINGS

12



NOTE:
1. 2" DISCHARGE PIPE AND 6" FORCE MAIN SHALL HAVE A MINIMUM 42" COVER
2. LEACHATE CLEANOUT NOT SHOWN FOR CLARITY

SECTION A

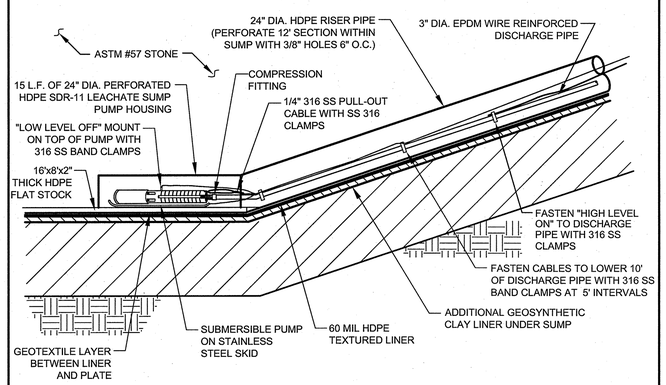


PLAN VIEW

NOTE: ENTIRE SUMP SHALL BE FILLED WITH ASTM #57 GRAVEL

LEACHATE SUMP ASSEMBLY

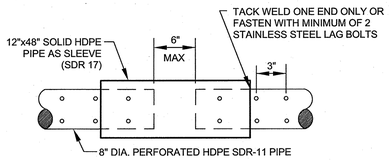
13



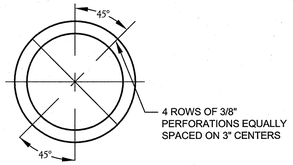
LEACHATE SUMP PUMP

14

NOTE: USE 8"x48" SOLID HDPE PIPE AS SLEEVE (SDR 17) FOR 4" DIA. PERFORATED HDPE SDR-11 PIPE.

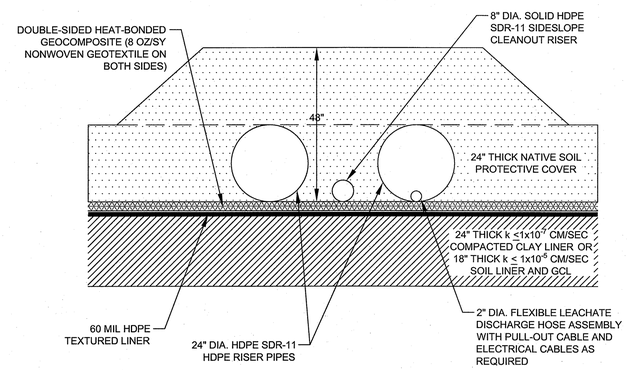


CONNECTION SLEEVE DETAIL



4" & 8" DIA. PERFORATED HDPE PIPE (SDR 11)

15



LEACHATE SIDESLOPE RISER SECTION

NORTH CAROLINA PROFESSIONAL SEAL 15142 ENGINEER H. LOWRY TRIBBLE, JR.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE 4/17/12

MISCELLANEOUS DETAILS

2012 FACILITY PLAN MODIFICATION

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PROJ. NO.	6703-455-01	DWG. CMS_V-FP-11-D2	EDIT 4-16-12
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DATE	APRIL 2012		

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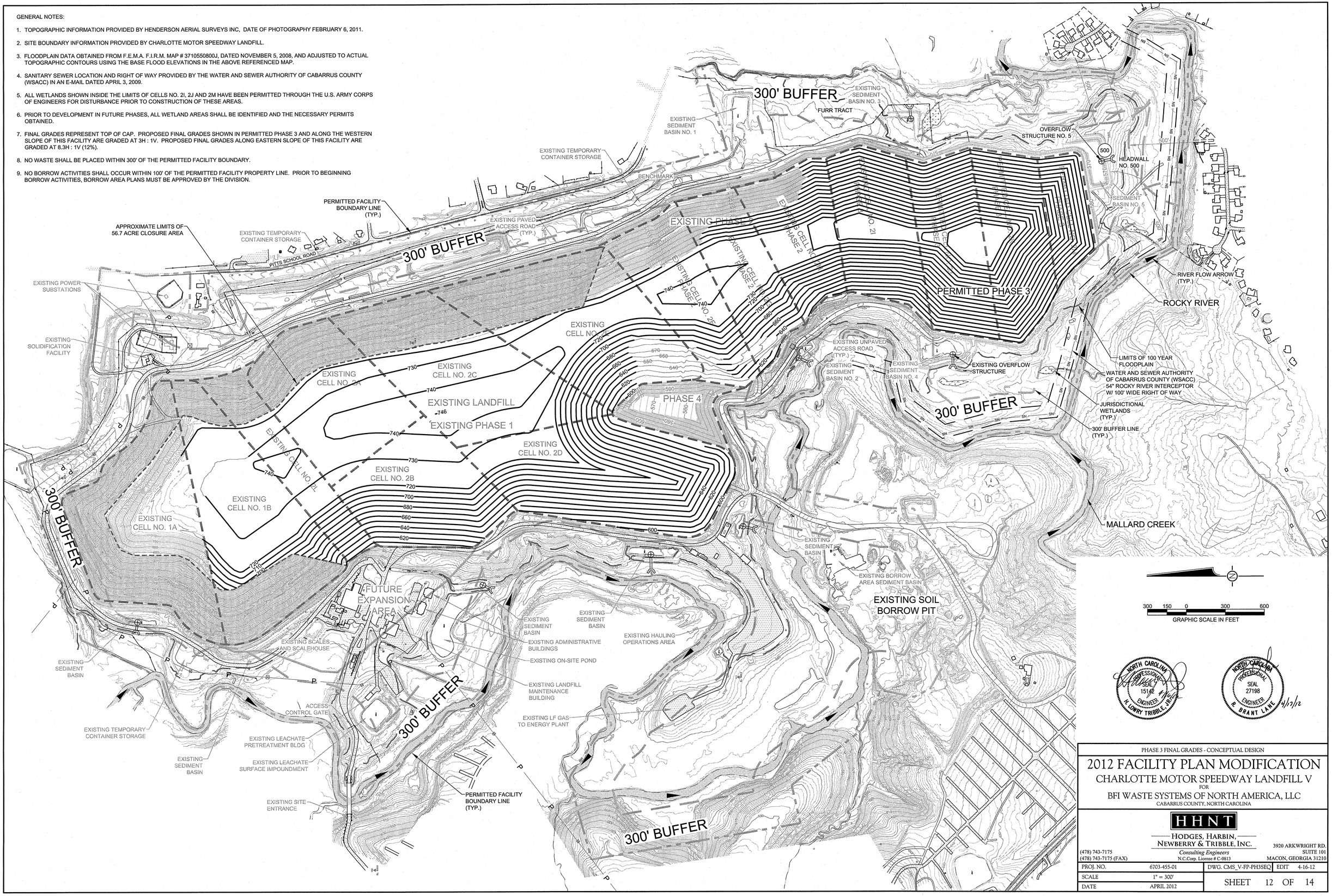
3. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
4. SANITARY SEWER LOCATION AND RIGHT OF WAY PROVIDED BY THE WATER AND SEWER AUTHORITY OF CABARRUS COUNTY (WSACC) IN AN E-MAIL DATED APRIL 3, 2009.
5. ALL WETLANDS SHOWN INSIDE THE LIMITS OF CELLS NO. 2I, 2J AND 2M HAVE BEEN PERMITTED THROUGH THE U.S. ARMY CORPS OF ENGINEERS FOR DISTURBANCE PRIOR TO CONSTRUCTION OF THESE AREAS.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. FINAL GRADES REPRESENT TOP OF CAP. PROPOSED FINAL GRADES SHOWN IN PERMITTED PHASE 3 AND ALONG THE WESTERN SLOPE OF THIS FACILITY ARE GRADED AT 3H : 1V. PROPOSED FINAL GRADES ALONG EASTERN SLOPE OF THIS FACILITY ARE GRADED AT 8.3H : 1V (12%).
8. NO WASTE SHALL BE PLACED WITHIN 300' OF THE PERMITTED FACILITY BOUNDARY.
9. NO BORROW ACTIVITIES SHALL OCCUR WITHIN 100' OF THE PERMITTED FACILITY PROPERTY LINE. PRIOR TO BEGINNING BORROW ACTIVITIES, BORROW AREA PLANS MUST BE APPROVED BY THE DIVISION.



PHASE 3 FINAL GRADES - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

N.C.Corp. License # C-0813

(478) 743-7175

(478) 743-7175 (FAX)

3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-PH3SEQ	EDIT 4-16-12
SCALE	1" = 300'	SHEET 12 OF 14	
DATE	APRIL 2012		

GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION PROVIDED BY HENDERSON AERIAL SURVEYS INC, DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.
2. SITE BOUNDARY INFORMATION PROVIDED BY CHARLOTTE MOTOR SPEEDWAY LANDFILL.
3. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
4. SANITARY SEWER LOCATION AND RIGHT OF WAY PROVIDED BY THE WATER AND SEWER AUTHORITY OF CABARRUS COUNTY (WSACC) IN AN E-MAIL DATED APRIL 3, 2009.
5. ALL WETLANDS SHOWN INSIDE THE LIMITS OF CELLS NO. 2I, 2J AND 2M HAVE BEEN PERMITTED THROUGH THE U.S. ARMY CORPS OF ENGINEERS FOR DISTURBANCE PRIOR TO CONSTRUCTION OF THESE AREAS.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. FINAL GRADES REPRESENT TOP OF CAP. PROPOSED FINAL GRADES SHOWN IN PERMITTED PHASE 3 AND ALONG THE WESTERN SLOPE OF THIS FACILITY ARE GRADED AT 3H : 1V. PROPOSED FINAL GRADES ALONG EASTERN SLOPE OF THIS FACILITY ARE GRADED AT 8.3H : 1V (12%).
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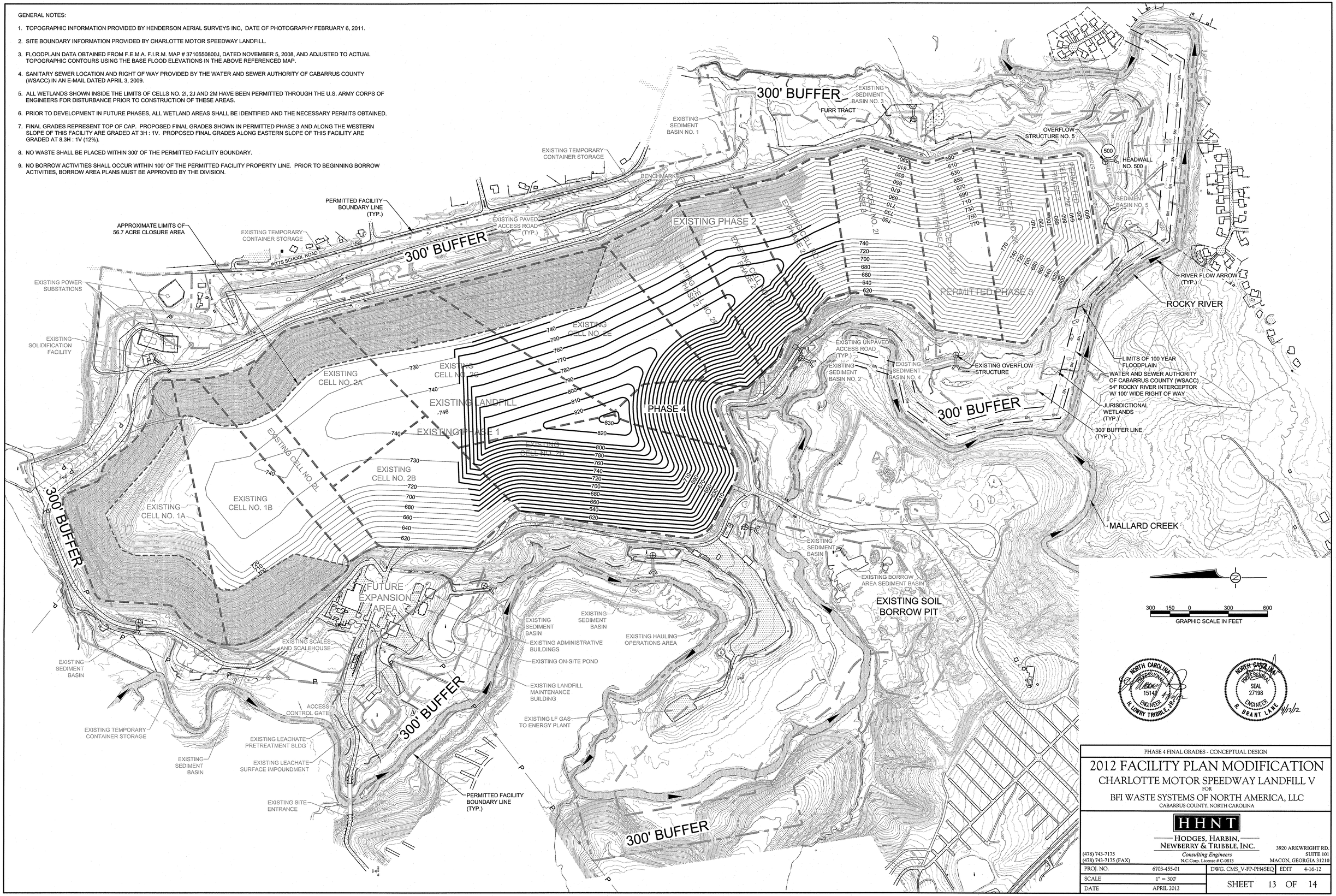


NORTH CAROLINA PROFESSIONAL ENGINEER 15142 H. LOWRY TRIBBLE, JR.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANG

9/13/12

PHASE 4 FINAL GRADES - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

N.C.Corp. License # C-0813

(478) 743-7175

(478) 743-7175 (FAX)

3920 ARKWRIGHT RD.

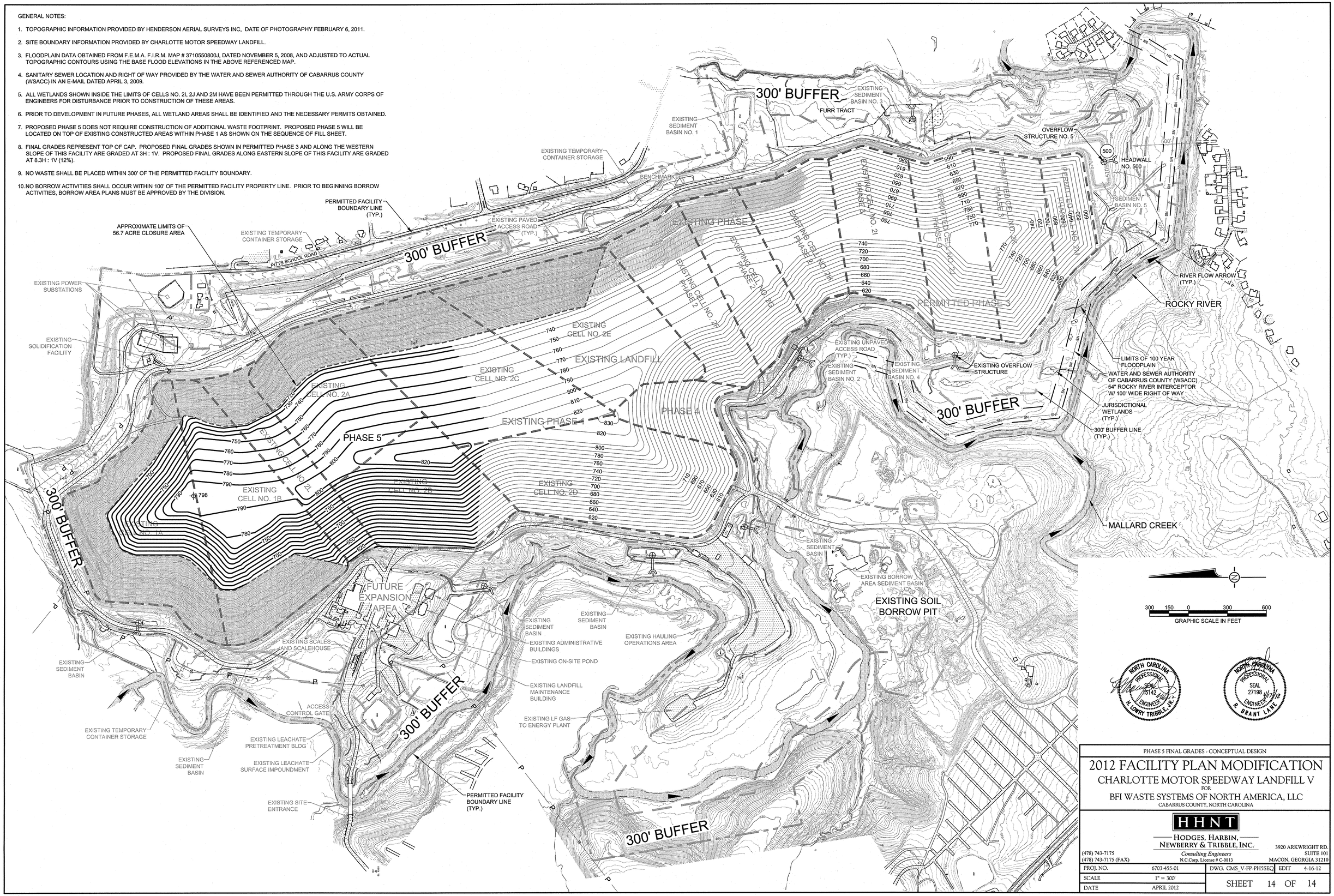
SUITE 101

MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-PH4SEQ	EDIT 4-16-12
SCALE	1" = 300'	SHEET 13 OF 14	
DATE	APRIL 2012		

GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION PROVIDED BY HENDERSON AERIAL SURVEYS INC, DATE OF PHOTOGRAPHY FEBRUARY 6, 2011.
2. SITE BOUNDARY INFORMATION PROVIDED BY CHARLOTTE MOTOR SPEEDWAY LANDFILL.
3. FLOODPLAIN DATA OBTAINED FROM F.E.M.A. F.I.R.M. MAP # 3710550800J, DATED NOVEMBER 5, 2008, AND ADJUSTED TO ACTUAL TOPOGRAPHIC CONTOURS USING THE BASE FLOOD ELEVATIONS IN THE ABOVE REFERENCED MAP.
4. SANITARY SEWER LOCATION AND RIGHT OF WAY PROVIDED BY THE WATER AND SEWER AUTHORITY OF CABARRUS COUNTY (WSACC) IN AN E-MAIL DATED APRIL 3, 2009.
5. ALL WETLANDS SHOWN INSIDE THE LIMITS OF CELLS NO. 2I, 2J AND 2M HAVE BEEN PERMITTED THROUGH THE U.S. ARMY CORPS OF ENGINEERS FOR DISTURBANCE PRIOR TO CONSTRUCTION OF THESE AREAS.
6. PRIOR TO DEVELOPMENT IN FUTURE PHASES, ALL WETLAND AREAS SHALL BE IDENTIFIED AND THE NECESSARY PERMITS OBTAINED.
7. PROPOSED PHASE 5 DOES NOT REQUIRE CONSTRUCTION OF ADDITIONAL WASTE FOOTPRINT. PROPOSED PHASE 5 WILL BE LOCATED ON TOP OF EXISTING CONSTRUCTED AREAS WITHIN PHASE 1 AS SHOWN ON THE SEQUENCE OF FILL SHEET.
8. FINAL GRADES REPRESENT TOP OF CAP. PROPOSED FINAL GRADES SHOWN IN PERMITTED PHASE 3 AND ALONG THE WESTERN SLOPE OF THIS FACILITY ARE GRADED AT 3H : 1V. PROPOSED FINAL GRADES ALONG EASTERN SLOPE OF THIS FACILITY ARE GRADED AT 8.3H : 1V (12%).
9. NO WASTE SHALL BE PLACED WITHIN 300' OF THE PERMITTED FACILITY BOUNDARY.
10. NO BORROW ACTIVITIES SHALL OCCUR WITHIN 100' OF THE PERMITTED FACILITY PROPERTY LINE. PRIOR TO BEGINNING BORROW ACTIVITIES, BORROW AREA PLANS MUST BE APPROVED BY THE DIVISION.



NORTH CAROLINA PROFESSIONAL SEAL 15142 ENGINEER H. LOWRY TRIBBLE, JR.

NORTH CAROLINA PROFESSIONAL SEAL 27198 ENGINEER R. BRANT LANE

PHASE 5 FINAL GRADES - CONCEPTUAL DESIGN

2012 FACILITY PLAN MODIFICATION

CHARLOTTE MOTOR SPEEDWAY LANDFILL V

FOR

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

CABARRUS COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

Consulting Engineers

N.C.Corp. License # C-0813

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3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

PROJ. NO.	6703-455-01	DWG. CMS_V-FP-PH5SEQ	EDIT 4-16-12
SCALE	1" = 300'	SHEET 14 OF 14	
DATE	APRIL 2012		

APPENDIX

A. SITE SUITABILITY UPDATE

SITE SUITABILITY UPDATE

BFI WASTE SYSTEMS OF NORTH AMERICA, INC. CMS LANDFILL V – LATERAL EXPANSION PHASE 2 EXPANSION (CELLS 2F, 2G & 2H) AND PHASES 3, 4 & 5

This Site Suitability Update has been prepared in accordance with the State of North Carolina, Department of Environment and Natural Resources, Division of Waste Management, Rule.1618 of the North Carolina Administrative Code (NCAC), Title 15A, Chapter 13, Subchapter 13B.

This Plan has been prepared on behalf of:

BFI Waste Systems of North America, Inc.
5105 Morehead Road
Concord, North Carolina 28027

This Plan has been prepared by:

ESP Associates, P.A.
372 Crompton St.
Charlotte, North Carolina 28273

ESP ESP ASSOCIATES, P.A.
engineering • surveying • planning

May 2004
Revised November 2005 per NCDENR Comments

11-17-05

ESP Associates, P.A.
engineering • surveying • planning

May 6, 2004

State of North Carolina
Department of Environment & Natural Resources
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

ATTENTION: Ms. Sheri Coghill

Reference: **SITE SUITABILITY UPDATE – CMS LANDFILL V**
SOLID WASTE PERMIT NO. 13-04
Concord, North Carolina

Ms. Coghill:

On behalf of BFI Waste Systems of North America, Inc. (BFI), ESP Associates, P.A. (ESP) is submitting herewith a Site Suitability Update for the CMS Landfill V Facility (Permit No. 13-04) located in Concord, North Carolina. As you requested via e-mail on March 31, 2004, the Site Suitability Update is being submitted separately from the Application for Permit to Construct for the lateral expansions. This update has been prepared in accordance with the Division of Waste Management Rule .1618.

If you should have any questions or require additional information following review of the attached Site Suitability Update, please contact me at (704) 504-1015.

Sincerely,

ESP Associates, P.A.

NORTH CAROLINA PROFESSIONAL ENGINEER 20770 DAVID W. WASIELA

David W. Wasiela, P.E.
Project Engineer
NC Registration No. 20770

5-6-04

Cc: Mr. Mike Gurley – BFI
City of Concord

P.O. Box 7030, Charlotte, NC 28241, (704) 583-4949 Fax (704) 583-4950
www.espassociates.com

SITE SUITABILITY UPDATE
CMS LANDFILL V
PHASE 2 EXPANSION (CELLS 2F, 2G & 2H), PHASE 3, PHASE 4 AND PHASE 5

Introduction

BFI Waste Systems of North America, Inc. is proposing a lateral expansion of the existing CMS Landfill V (Permit No. 13-04) to include a Phase 2 Expansion, Phase 3, Phase 4 and Phase 5. An approximately 21-acre parcel of land was purchased along the southeastern portion of the existing municipal solid waste landfill facility to serve as buffer area and not be developed as a landfill unit. The proposed waste boundary in this area shifts 300 feet east from the previously permitted boundary so that now the proposed edge of waste boundary is the previous facility boundary. A copy of the property boundary survey performed by ESP Associates, P.A. (Revised ALTA / ACSM Boundary Adjustment between BFI Waste Systems & Evelyn H. Furr dated 4/19/02) for the purchased buffer area is included in Appendix 1 for reference.

The original Site Suitability Report for this facility (prepared by Soil & Materials Engineers and Westinghouse Environmental Services) was approved on April 1, 1989 and a subsequent Transition Plan prepared by S&ME, Inc. was submitted April 5, 1994 to update Site Suitability information. The previously submitted Site Suitability Studies included all areas for proposed landfill development with the exception of the approximately 21-acres of property purchased from Evelyn H. Furr. Therefore, the areas of focus for this Site Suitability Update are the additional property purchased along the east side of the Phase 2 Expansion and Phase 3 and location restrictions for edge of waste boundary and wetlands / endangered species studies for proposed Phase 4 and Phase 5.

Possible impacts to the 100-yr floodplain as well as wetland certifications for development of Phases 4 and 5 shall be addressed prior to design and permitting of those phases. The Corp of Engineers' wetlands certification will expire (certification is only valid for 5 years) prior to design of these phases and the 100-yr floodplain may be revised. Impacts to the 100-yr floodplain require approval from the City of Concord in accordance with the Unified Development Ordinance. The City of Concord Unified Development Ordinance stipulates all conditions and design parameters that must be addressed for impacts to the 100-yr floodplain.

Site Hydrogeologic Report

Subsurface characterization information including soil types, groundwater information and bedrock information for this facility is included in the Design Hydrogeologic Study submitted to the Division of Waste Management by ENSR Consulting and Engineering (NC), Inc. dated December 2003. Based on the results of the Design Hydrogeologic Study, the proposed facility expansions are suitable for development of a municipal solid waste landfill in accordance with Division of Waste Management Rule .1623 (a).

Site Suitability Plan

A copy of the Site Development Plan – All Facilities (Sheet FC-2) is included in Appendix 2 to illustrate compliance with the siting requirements of the Division of Waste Management Rule .1618. This plan contains the following information:

- The proposed waste boundary will not be within 500 feet of a private residence.
- A minimum 300-foot buffer shall be maintained between the waste boundary and the facility property boundary.
- Landfill development shall not fill or adversely impact wetland areas.
- Landfill development shall not affect the flow or storage capacity of the 100-year floodplain.
- An existing sanitary sewer line is located along the creek at the eastern property boundary. The location and easement are shown on the plan.
- Proposed development is contiguous to the existing landfill operations

Regional Characterization Study

A Regional Characterization Map including all areas within a 2-mile radius of the facility boundary was prepared in accordance with the Division of Waste Management Rule .1618 (c) (1) and is included in Appendix 3. This map was prepared utilizing the most recent Cabarrus County, North Carolina Geographical Information System information available. This map illustrates the following:

- General topography for the mapped area
- Landfill Facility Boundary
- There are no recorded Public Water Supply Wells or Surface Water intakes within the limits of this map
- Residential Subdivisions
- Waste Transportation Routes
- No public use airports or runways are within the limits of this map

Local Characterization Study

A Local Characterization Map including all areas within 2,000 feet of the facility boundary was prepared in accordance with the Division of Waste Management Rule .1618 (c) (2) and is included in Appendix 4. This map was prepared utilizing the most recent Cabarrus County, North Carolina Geographical Information System information available. This map illustrates the following:

- The entire property proposed for the Facility
- On-site easements
- Location of private residences and schools
- Location of industrial parks and commercial buildings
- There are no potable wells within the limits of this map (County Water)
- There are no registered historic sites within the limits of this map
- General topography
- 100-yr floodplain
- Rivers and creeks

Wetlands and Endangered Species

A jurisdiction wetland delineation and endangered / threatened species study was performed by AMEC, Inc for the newly purchased buffer property. The field work was performed in the summer of 2003 and the report is dated August 15, 2003. The results of the study reaffirm that endangered or threatened species or habitats are not present within the property boundaries. Jurisdictional wetlands were delineated along a drainage feature traversing west to east within the property boundaries and along an existing creek that forms the property boundary. The jurisdictional wetland areas along the drainage feature were flagged in the field by AMEC, Inc. and surveyed by ESP Associates, P.A. The limits of the jurisdictional wetlands are shown on the Site Development Plan included in Appendix 2. A complete copy of the report prepared by AMEC, Inc. is included in Appendix 5 for reference.

Based on the previously described field work, reporting and surveying, development of the Phase 2 Expansion (Cells 2F, 2G and 2H), Phase 3, Phase 4 and Phase 5 will not impact endangered or threatened species or their habitats or adversely impact jurisdictional wetland areas.

Land Use and Zoning

Following acquisition of the additional buffer property, the City of Concord annexed the entire property (approximately 21-acres) into the City Limits of Concord with a zoning designation of I-2 (Heavy Industrial District). This designation is consistent with the remainder of the site and allows the development of a solid waste landfill in accordance with the City of Concord Unified Development Ordinance. A complete copy of the Rezoning Application as adopted by the City of Concord is included in Appendix 6 for reference. Furthermore, a copy of the Franchise Agreement between the City of Concord and BFI Waste Systems of North America, Inc. is included in Appendix 7 for local government approval purposes.

APPENDIX

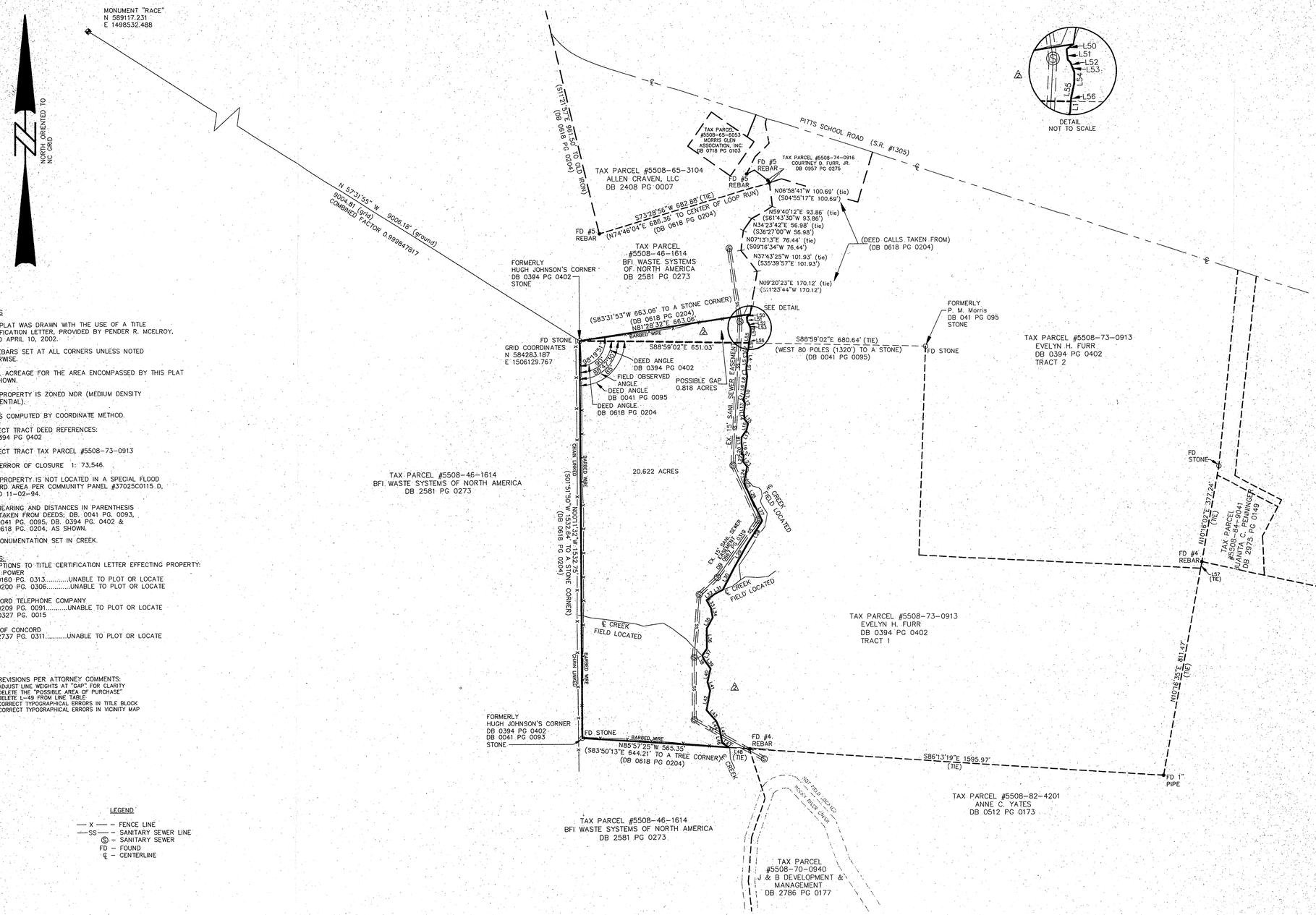
APPENDIX 1	**Furr Property Survey**
APPENDIX 2	**Site Development Plan – All Facilities**
APPENDIX 3	**Regional Characterization Map**
APPENDIX 4	**Local Characterization Map**
APPENDIX 5	**Wetland / Endangered Species Study**
APPENDIX 6	**Rezoning Application**
APPENDIX 7	**Franchise Agreement**

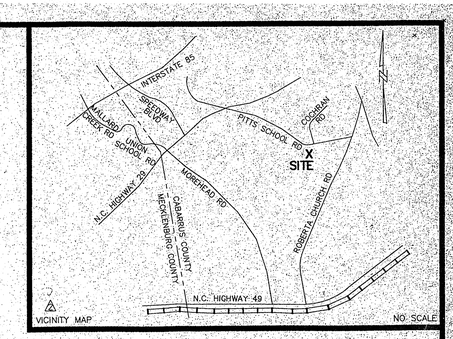
APPENDIX 1

FURR PROPERTY SURVEY

This drawing and/or the design shown are the property of ESP Associates, P.A. The reproduction, alteration, copying or other use of this drawing without their written consent is prohibited and any infringement will be subject to legal action.

ESP Associates, P.A.





NOTES

THIS PLAT WAS DRAWN WITH THE USE OF A TITLE CERTIFICATION LETTER, PROVIDED BY PENDER R. MCELROY, DATED APRIL 10, 2002.

#5 REBARS SET AT ALL CORNERS UNLESS NOTED OTHERWISE.

TOTAL ACREAGE FOR THE AREA ENCOMPASSED BY THIS PLAT AS SHOWN.

THIS PROPERTY IS ZONED MDR (MEDIUM DENSITY RESIDENTIAL).

AREAS COMPUTED BY COORDINATE METHOD.

SUBJECT TRACT DEED REFERENCES:
DB 0394 PG 0402

SUBJECT TRACT TAX PARCEL #5508-73-0913

RAW ERROR OF CLOSURE 1: 73,546.

THIS PROPERTY IS NOT LOCATED IN A SPECIAL FLOOD HAZARD AREA PER COMMUNITY PANEL #37025C0115 D, DATED 11-02-94.

ALL BEARING AND DISTANCES IN PARENTHESIS ARE TAKEN FROM DEEDS; DB. 0041 PG. 0093, DB. 0041 PG. 0095, DB. 0394 PG. 0402 & DB. 0618 PG. 0204, AS SHOWN.

NO MONUMENTATION SET IN CREEK.

NOTES:
EXCEPTIONS TO TITLE CERTIFICATION LETTER EFFECTING PROPERTY:
DUKE POWER
DB. 0160 PG. 0313.....UNABLE TO PLOT OR LOCATE
DB. 0200 PG. 0306.....UNABLE TO PLOT OR LOCATE

CONCORD TELEPHONE COMPANY
DB. 0209 PG. 0091.....UNABLE TO PLOT OR LOCATE
DB. 0327 PG. 0015

CITY OF CONCORD
DB. 2737 PG. 0311.....UNABLE TO PLOT OR LOCATE

△2 REVISIONS PER ATTORNEY COMMENTS:
ADJUST LINE WEIGHTS AT "GAP" FOR CLARITY
DELETE THE "POSSIBLE AREA OF PURCHASE"
DELETE L-49 FROM LINE TABLE
CORRECT TYPOGRAPHICAL ERRORS IN TITLE BLOCK
CORRECT TYPOGRAPHICAL ERRORS IN VICINITY MAP

LEGEND

— X — — FENCE LINE
—SS— — SANITARY SEWER LINE
Ⓢ — SANITARY SEWER
FD — FOUND
℄ — CENTERLINE

△2 LINE TABLE

LINE	LENGTH	BEARING
L1	20.56'	S04°30'22"W
L2	15.62'	S21°48'07"W
L3	16.88'	S03°28'26"E
L4	15.30'	S03°27'18"E
L5	18.67'	S10°44'26"W
L6	14.84'	S04°27'34"W
L7	27.10'	S06°02'26"E
L8	32.80'	S06°47'38"W
L9	30.00'	S08°53'07"W
L10	17.73'	S06°53'03"W
L11	13.05'	S27°45'32"W
L12	17.50'	S28°26'19"E
L13	30.86'	S07°12'17"W
L14	29.19'	S02°19'19"E
L15	21.41'	S39°27'17"E
L16	27.46'	S12°13'10"W
L17	33.51'	S34°21'47"W
L18	21.87'	S00°00'31"W
L19	23.59'	S05°37'02"E
L20	19.20'	S09°05'37"W
L21	8.79'	S68°06'13"E
L22	24.45'	S06°28'41"W
L23	26.32'	S38°15'19"E
L24	56.67'	S11°14'41"W
L25	23.14'	S12°37'00"E
L26	75.06'	S25°56'25"E
L27	70.70'	S25°27'12"E
L28	102.93'	S32°59'52"W
L29	107.84'	S29°16'21"W
L30	95.60'	S27°05'24"W
L31	33.93'	S64°09'41"W
L32	40.08'	S53°17'54"W
L33	35.19'	S27°48'21"E
L34	36.87'	S10°48'48"E
L35	48.85'	S28°51'52"W
L36	77.74'	S00°28'10"E
L37	32.68'	S33°20'43"W
L38	19.56'	S26°17'29"E
L39	39.83'	S35°35'20"E
L40	52.58'	S12°44'01"W
L41	34.38'	S16°11'56"E
L42	77.44'	S10°07'51"W
L43	57.64'	S41°22'19"E
L44	31.11'	S21°38'25"E
L45	28.02'	S11°27'09"E
L46	27.97'	S09°23'49"E
L47	28.20'	S56°40'29"E
L48	180.83'	S85°57'25"E
L50	16.16'	S52°43'36"W
L51	20.03'	S06°25'43"E
L52	7.00'	S44°34'01"E
L53	20.65'	S22°03'46"E
L54	21.23'	S01°14'11"W
L55	28.21'	S11°56'15"W
L56	7.21'	S04°30'22"W
L57	25.58'	N10°16'35"E

NORTH CAROLINA PROFESSIONAL SEAL L-3846 LAND SURVEYOR DAVID A. WEIRICH

I, David A. Weirich, N. C. P. L. S. certify that this map, drawn from an actual field survey under my direction, meets and/or exceeds the Minimum Standards set forth in the manual of Practice for Land Surveying in North Carolina. Title References regarding the adjoining properties are subject to information provided by local County Government. Subject tract title research for retracement of Boundary Lines only, and not intended to certify title.

David A. Weirich
L-3846

NO.	DATE	REVISION	BY
2	4/25/02	ATTORNEY COMMENTS (SEE NOTES)	EPC
1	4/23/02	REVISE LINE TABLE BEARINGS	WCC

REVISED ALTA/ACSM BOUNDARY ADJUSTMENT BETWEEN BFI WASTE SYSTEMS & EVELYN H. FURR
LOCATED IN TOWNSHIP No. 2
CABARRUS COUNTY
NORTH CAROLINA

PROJECT NO QC23
SCALE 1"=200'
DATE 4/19/02
DRAWN BY EPC/WCC
CHECKED BY DAW
DRAWING NO QC23-ALTA.dwg
___ OF ___ SHT

BFI WASTE SYSTEMS OF NORTH AMERICA, INC.
5105 MOREHEAD RD.
CONCORD, NORTH CAROLINA 28027
704-782-2004

ESP ASSOCIATES, P.A.
engineering•surveying•planning
10915 Southern Loop Boulevard
Pineville, NC 28134 (704) 583-4949

APPENDIX 2

SITE DEVELOPMENT PLAN – ALL FACILITIES

NOTES:

PROPOSED LEACHATE FORCE MAIN INFORMATION PROVIDED BY ALMES & ASSOCIATES, INC.

EXISTING TOPOGRAPHY SUPPLIED BY CHAS. H. SELLS, INC. DATED APRIL 12, 2003

FLOODPLAIN INFORMATION OBTAINED FROM F.E.M.A. F.I.R.M. MAP DATED NOV. 2, 1994

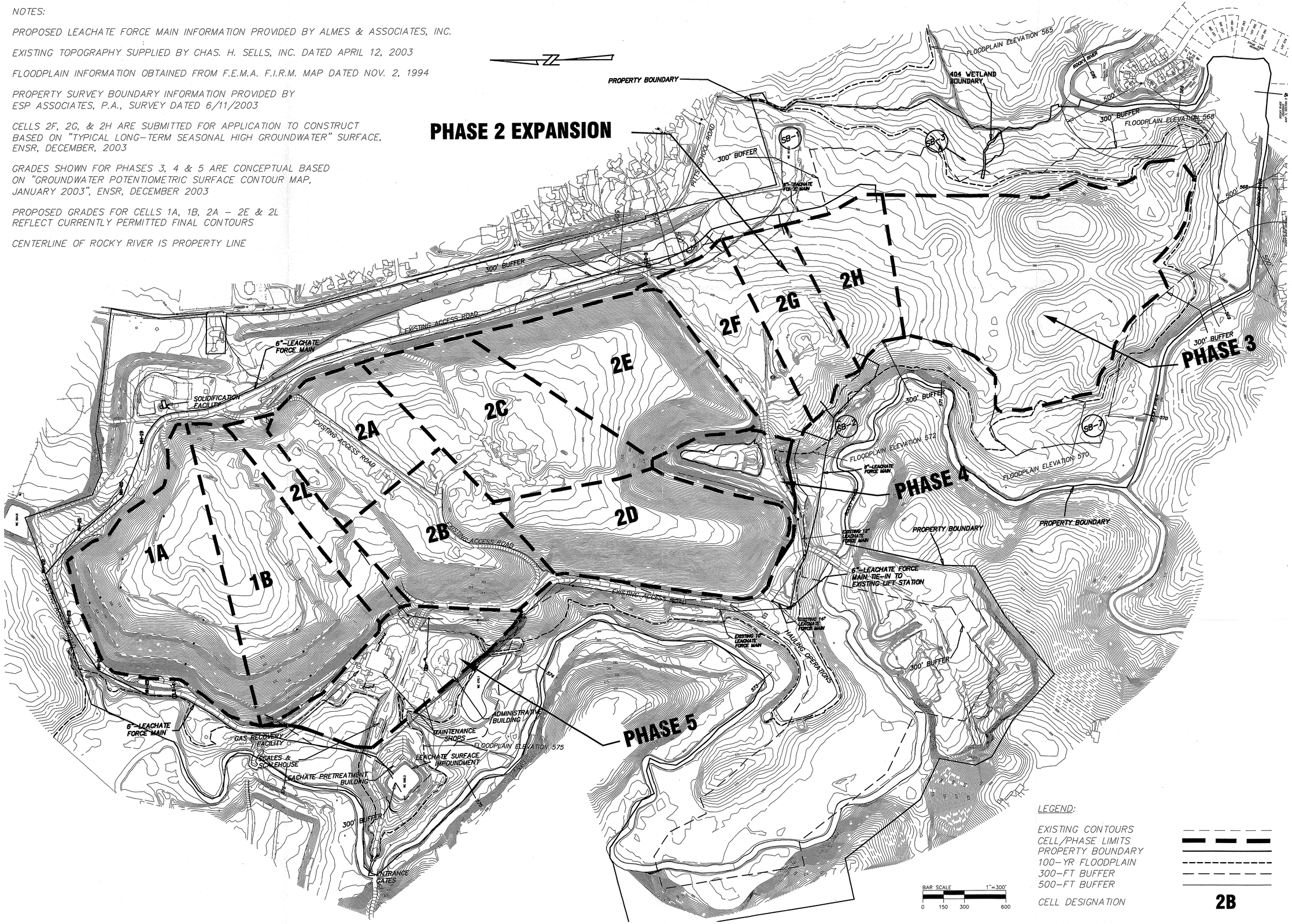
PROPERTY SURVEY BOUNDARY INFORMATION PROVIDED BY ESP ASSOCIATES, P.A., SURVEY DATED 6/11/2003

CELLS 2F, 2G, & 2H ARE SUBMITTED FOR APPLICATION TO CONSTRUCT BASED ON "TYPICAL LONG-TERM SEASONAL HIGH GROUNDWATER" SURFACE, ENSR, DECEMBER, 2003

GRADES SHOWN FOR PHASES 3, 4 & 5 ARE CONCEPTUAL BASED ON "GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR MAP, JANUARY 2003", ENSR, DECEMBER 2003

PROPOSED GRADES FOR CELLS 1A, 1B, 2A – 2E & 2L REFLECT CURRENTLY PERMITTED FINAL CONTOURS

CENTERLINE OF ROCKY RIVER IS PROPERTY LINE



LEGEND:

EXISTING CONTOURS
CELL/PHASE LIMITS
PROPERTY BOUNDARY
100-YR FLOODPLAIN
300-FT BUFFER
500-FT BUFFER

CELL DESIGNATION **2B**

ESP Associates, P.A.
engineering • surveying • planning
P.O. Box 7478 • Charlotte, NC 28241
10915 Stallings Lane, Suite B
Pineville, NC 28134
(704) 583-0949 • Fax: (704) 583-4950
www.espassociates.com

CLIENT: BFI WASTE SYSTEMS OF NORTH AMERICA, INC.
P.O. BOX 219
PINEVILLE, N.C. 28134

SHEET TITLE: SITE DEVELOPMENT PLAN ALL FACILITIES

PROJECT: CMS LANDFILL V
CONCORD, N.C. CABARRUS CO., N.C.

PROFESSIONAL ENGINEER SEAL — NORTH CAROLINA — WILLIAM C. MAGNESS — 019435

NO.	DATE	REVISION	BY

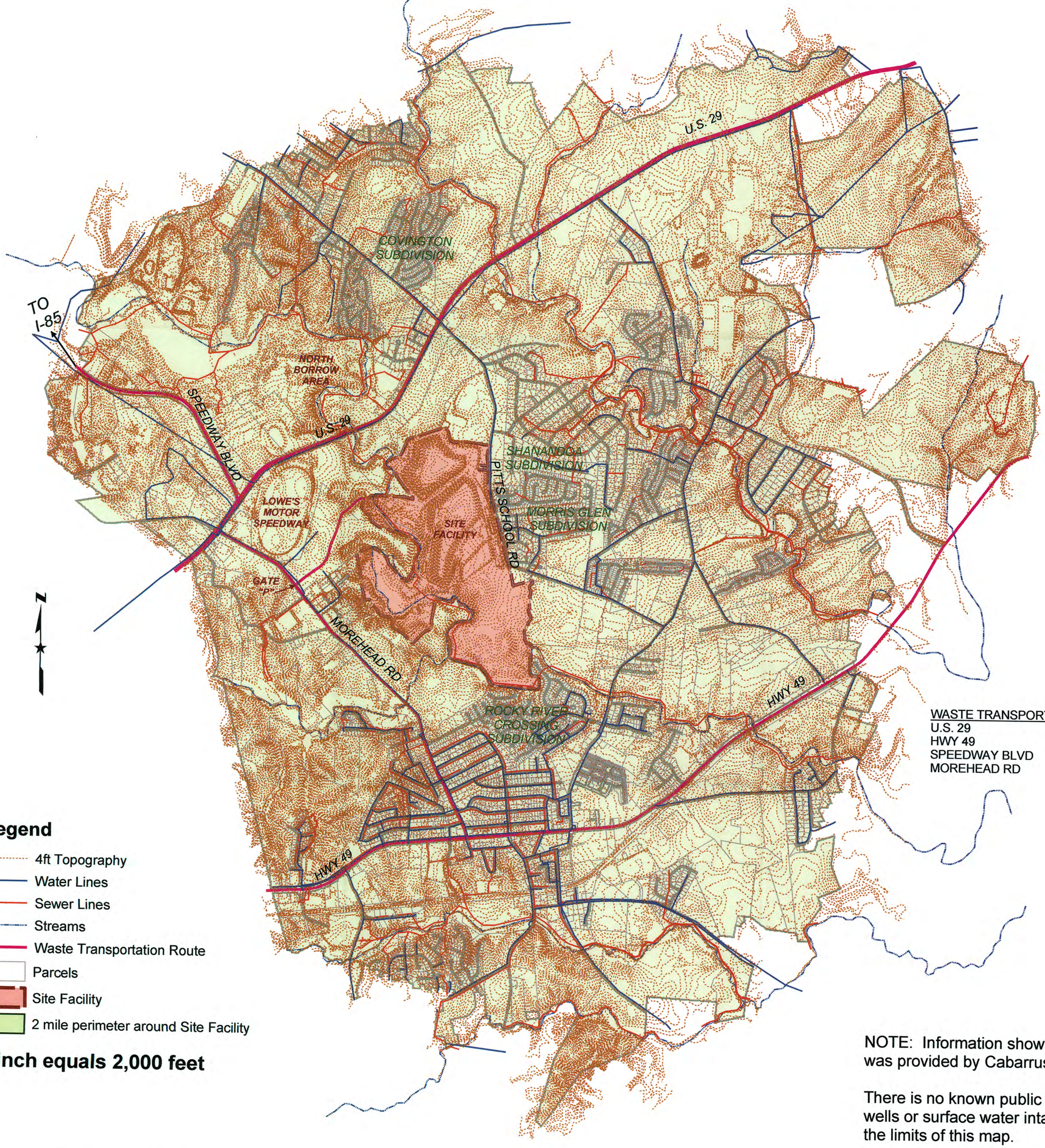
PROJECT NO. RC23
SCALE 1"=300'
DATE 4/21/04
DRAWN BY MAG
CHECKED BY DWW

FC-2 OF SHT

APPENDIX 3

REGIONAL CHARACTERIZATION MAP

Regional Characterization Plan



WASTE TRANSPORTATION ROUTES:
U.S. 29
HWY 49
SPEEDWAY BLVD
MOREHEAD RD

Legend

- 4ft Topography
- Water Lines
- Sewer Lines
- Streams
- Waste Transportation Route
- Parcels
- Site Facility
- 2 mile perimeter around Site Facility

1 inch equals 2,000 feet

NOTE: Information shown on this map was provided by Cabarrus County GIS.

There is no known public water supply wells or surface water intakes within the limits of this map.

APPENDIX 4

LOCAL CHARACTERIZATION MAP

Local Characterization Plan

APPENDIX 5

WETLAND / ENDANGERED SPECIES STUDY

August 15, 2003

CMS Landfill
c/o ESP Associates, P.A.
372 Crompton Street
Charlotte, North Carolina 28273

Attention: Mr. David Wieshela, P.E.
Project Engineer

Reference: **Jurisdictional Wetlands Delineation**
CMS Landfill Project
Concord, North Carolina
AMEC Project No.

Dear Mr. Wieshela:

AMEC, Inc., is pleased to present the attached Jurisdictional Wetland Delineation Report for the above-referenced site in Cabarrus County, North Carolina. The wetland delineation was performed in accordance with AMEC Proposal No., dated June, 2003.

Waters of the United States located on the subject property are limited to one side property line stream that has been historically impacted by discharge and utility easements. This activity has resulted in a Rosgen Stream C which has signs of both vertical and lateral migration..

The jurisdictional limits should be verified by the U.S. Army Corps of Engineers (USACOE). After USACOE approval, the delineated boundaries should be surveyed and platted by a registered land surveyor, employed by the client. The surveyor should establish meets and bounds of the jurisdictional streams, ponds and wetlands, and tie them, ultimately, to an established property corner. Upon completion of the map, we will forward the final survey of waters and wetlands of the U.S. to the USACOE for final jurisdictional determination.

The remaining two tracts investigated, the old stormwater basin, and the ditch adjacent to the office building, were determined to be non-jurisdictional and therefore not subject to federal and state

404/401 Regulations. Please consider this statement as the findings by AMEC, Inc. for the reference tracts.

AMEC, Inc. also conducted a Threatened and Endangered Species Study for all of the above referenced tracts. After consultation with the Natural Heritage Program and the U.S. Fish and Wildlife Service, no known or documented sitings of state or federal threatened, endangered, or species of concern were found to exist within the property boundaries. Also, the site reconnaissance did not reveal any evidence of such flora or fauna existing in the observed habitat.

We hope this report meets your needs. We look forward to working with you in the future, and if you have any questions or if we can be of further assistance, please feel free to call.

Sincerely,

AMEC, Inc.

M. Todd Ball
Senior Consultant

Jurisdictional Wetlands Delineation Report

CMS Landfill
Cabarrus County, North Carolina
AMEC Project No.

Prepared for:

Allied Waste – Atlantic Division
5105 Morhead Rd.
Concord, North Carolina 28027

Prepared By:

AMEC, Inc.
200 South Old Statesville Rd.
Huntersville, North Carolina 8241-7668

August, 2003

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Figure 2 – USGS Topographic Map
Figure 3 – Field Map of Estimated Wetland Delineation

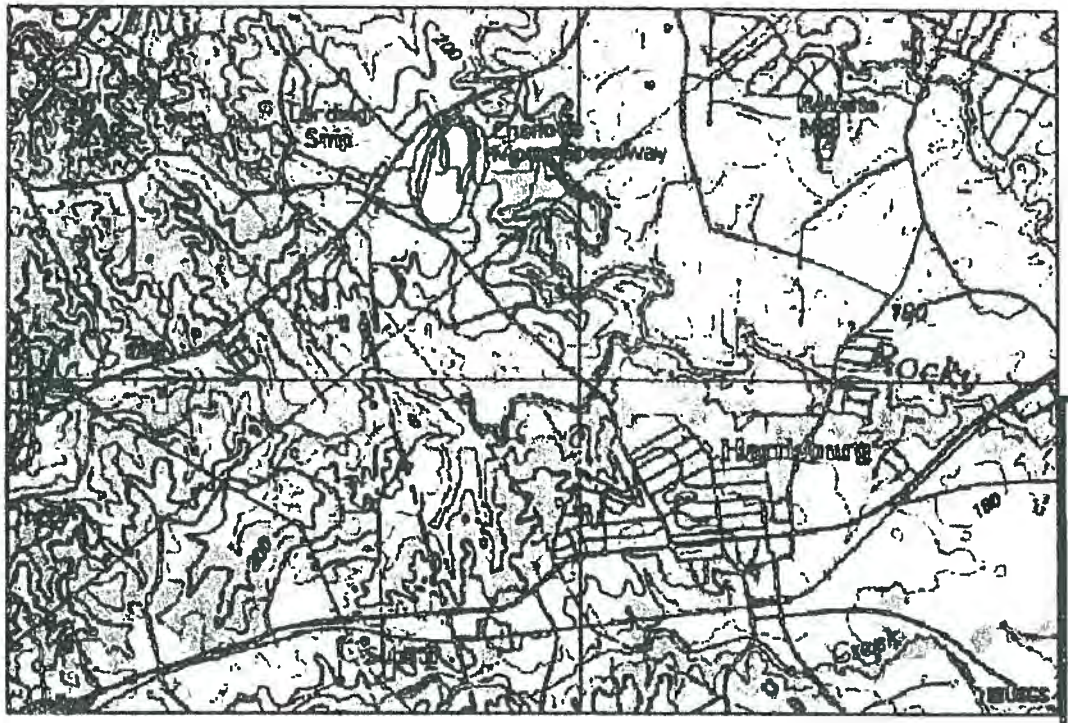
1.0 Introduction

This report presents the findings of the jurisdictional wetlands delineation recently performed on the CMS Landfill Property, located south of Lowes Motor Speedway, on the west side of Concord, Cabarrus County, North Carolina. The property is comprised of all or portions of several separate, but adjoining tracts, and when completely assembled, totals approximately 75 acres.

The irregularly shaped subject property is comprised of both mature and mid-growth woodland. Smaller portions of the property are comprised of mid-to-late stage successional growth. An unnamed tributary, eventually flowing southeast to the Rocky River, runs adjacent to the east side of the property.

The opinions included herein are based on the information obtained during the study and our professional experience. The report is based on the observations made on the dates noted and using the procedures described herein, within the subject property outlined on the enclosed figures. If additional information becomes available, we request the opportunity to review the information, reassess the potential environmental concerns and modify our conclusions and recommendations, if appropriate.

Because property borders were not clearly marked, AMEC limited the evaluation to areas assumed to be within the property borders. Although we are fairly certain that the entire property was included within our study, it is possible that areas may not have been completely delineated. Therefore, AMEC requests the opportunity to revisit the site upon completion of the formal boundary survey and confirm that all areas have been adequately addressed.



SCALE

1000 FT 0 1000 FT

NEWTON QUADRANGLE
NORTH CAROLINA, 1970

VICINITY MAP

DRAWING NAME: CMS LANDFILL	DATE: [illegible]
SCALE: 1 INCH = 1,000 FEET	

PREPARED FOR:
ALLIED WASTE – ATLANTIC REGION
CONCORD, NORTH CAROLINA

PREPARED BY: [illegible]	FIGURE: FIGURE 1

2.0 Scope of Services

At the request of CMS Landfill, AMEC has performed a wetland delineation and assessment of the subject property. The scope of services includes the following:

1) Assessment and documentation of site conditions as to the presence and/or absence of wetland areas, using the three-parameter approach (hydric soils, hydrophytic vegetation and wetland hydrology) set forth in the 1987 USACOE Wetland Delineation Manual.

2) Identification and marking of any upland/wetland boundaries with sequentially numbered pink flags;

3) Identification and similar marking of any waterways and ponds, considered to be waters of the United States under the jurisdiction of the U.S. Army Corps of Engineers (USACOE), or isolated waters and wetlands under the jurisdiction of the North Carolina Department of Environment and Natural Resources (NCDENR);

4) Preparation of a report, including a map of the estimated wetlands, streams and ponds (collectively referred to as waters of the U.S.) and data forms that document the physical characteristics of sample points as to the presence or absence of the three wetland components; and

4) Verification of wetland/upland boundaries with the USACOE. Upon the authorization of CMS Landfill, AMEC will provide the USACOE with a map of the estimated onsite jurisdictional boundaries, and all supporting information. Following the USACOE's verification of the delineation, AMEC will submit a survey map

(prepared by a surveying firm employed by CMS Landfill) of the jurisdictional boundary to the USACOE for review and final jurisdictional determination.

3.0 Study Method

An AMEC Wetland Professional performed an on-site wetland delineation of the subject property on August 15, 2003. During the site visit, all areas that are considered wetlands were identified and marked as described above. In addition, all waterways considered "waters of the United States" or "waters of North Carolina" were identified and similarly marked. Routine wetland delineation sampling was conducted at selected locations throughout the subject property to determine the presence or absence of wetlands.

3.1 Wetland Components

AMEC utilized the currently accepted methods of wetland determination described in the 1987 United States Army Corps of Engineers Manual for Identifying and Delineating Wetland Areas ("The Manual"). The Manual states that under normal circumstances, an area must demonstrate the presence of three components to be declared a jurisdictional wetland: 1) hydrophytic vegetation, 2) hydric soils and 3) wetland hydrology.

3.2 Methodology Used

3.2.1 Overview

Prior to the August, 2003 site visit, AMEC personnel reviewed available supporting information including the Cabarrus Mills, NC quadrangle, dated 1991, having the standard 1:24000 scale. An additional elevation contour map that had been obtained from the Cabarrus County topographic map database, having a scale of 1" = 300', was also examined. In addition, the appropriate FEMA

Floodplain map, tax parcel information provided by Allied Waste, USDA Soil Survey of Cabarrus County, USDA publication Hydric Soils of the United States (1991), and U.S. Fish and Wildlife Service (FWS) publication National List of Plant Species That Occur in Wetlands (1996), were reviewed. The purpose of reviewing this supporting information was to characterize drainage, soils and vegetation on the subject property.

Based on review of the maps, the topographic high point of approximately 730 feet Mean Sea Level (MSL), is located on the west side of the property. The onsite topographic low point of just less than 700 feet MSL is located along the stream, which flows south along the east side of the subject property. A smaller ephemeral streams flow into the central stream from the western portions of the subject property. All of these features present throughout the property are considered perennial, and are subject to USACOE regulation.

Review of the soil survey does not identify any potentially hydric soils on the subject property, except Chewacla loam, located within and adjacent to the streams. The soil survey identifies the stream as a single-line perennial stream, and all other onsite streams as intermittent.

Following review of the above-referenced materials, AMEC personnel visited the subject property and conducted routine wetland delineation sampling, and marked any upland/wetland boundaries observed on-site with sequentially numbered flags. In addition, any waterways and ponds observed on-site considered to be jurisdictional waters of the U.S. or N.C. were similarly marked with sequentially numbered flags. Certain streams and drainage features were evaluated using the N.C. Department of Water Quality's (NCDWQ) Stream Classification Form. This form provides for the distinction of intermittent streams from ephemeral stormwater channels based upon a numeric classification. The classification results from field observation of geomorphic, hydrologic and biologic characteristics of the drainage feature. Examples of these characteristics include the presence or absence of a pool/riffle sequence, recent alluvial deposits, periphyton and macrobenthos, etc.

Routine wetland determinations involve simple, rapidly applied methods that result in sufficient qualitative data for making a wetland determination. Samples were collected at five representative observation points on the subject property. AMEC did not conduct routine wetland delineation sampling within the topographically higher portions of the site as visual inspection of these areas identified a dominance of non-hydrophytic plants, non-hydric soils and a lack of wetland hydrology.

3.2.2 Sampling Methods

In accordance with the three component approach to identifying wetland areas, soils, hydrology and vegetation were simultaneously characterized at each observation point (sample location). The collected field data were then utilized to make a routine wetland determination. When all three components tested positive, a wetland designation was assigned. The specific testing conducted at each sample location was as follows:

a. Vegetation

Vegetation in each stratum was examined at each sample location. Herbaceous vegetation and saplings and shrubs were examined within a 5 ft. radius. Trees and woody vines were examined within a 30 ft. radius. Dominant plant species were identified in each stratum. The wetland indicator status for each dominant plant was recorded using the 1996 FWS publication National List of Plant Species That Occur in Wetlands. Where greater than 50% of the dominant species were identified as OBL, FAC (excluding FAC-) or FACW (including FACW- and FACW+), the sample location was considered to have hydrophytic vegetation.

b. Soils

Excavations with a Dutch auger were made by hand to a depth of approximately 16 inches at each sample location. Soil below the A horizon was examined at a depth of 12 to 16 inches and compared to the following hydric soil indicators:

- Gleying (gray coloring)
- Matrix chroma of 2 or less in both mottled and unmottled mineral soils
- High organic content in the upper layers
- Organic streaking (sandy soils)
- Iron and manganese concretions

Soil colors were evaluated using Munsell Soil Color Charts. Additional soil characteristics including texture, soil series and drainage class were also examined at each sample location.

c. Hydrology

Each sample location was examined for indicators of wetland hydrology, especially inundation, soil saturation of the upper 16 inches, drift lines, drainage patterns, watermarks and sediment deposits.

Upland/wetland boundaries were determined by proceeding away from the wetlands toward uplands and noting any changes in soil, vegetation and hydrology. The boundaries of any wetland areas identified on-site were flagged at the locations where hydrophytic vegetation and/or hydric soils gave way to non-hydrophytic vegetation and/or non-hydric soils.

4.0 Delineation Results

On August 15, 2003, an AMEC Wetlands Professional conducted the jurisdictional delineation. The approximate field delineation of waters and wetlands of the U.S. and N.C. on the subject property is presented on the attached plat.

Based on AMEC's assessment of on-site conditions, the following jurisdictional waters were identified on the subject property:

1. Stream 1 – an apparent 2nd order channel originating north of the property which is perennial, and likely flows year-round.

A smaller intermittent stream is also located on the property. This feature was distinguished from perennial channels using the N.C. Department of Water Quality's (NCDWQ) Stream Classification Form, as described earlier in this report.

Based on AMEC's assessment of on-site conditions, one wetland area was identified on the subject property.

1. Wetland Area 1 – This small wetland area is located on the floodplain of the centrally-located stream. The area is comprised of a mixture of mature hardwood trees and dense herbaceous growth, Much of the area was inundated during the time of inspection.

4.1 Site Vegetation

The subject property is comprised of vacant woodland and pasture. A mix of hardwoods, pines and cedars, with light to moderate underbrush dominate the majority of the wooded areas. There are no abandoned dwellings or structures located on the property. Portions of the property are dominated by mid-to-late stage successional vegetation.

The overstory of the majority of the site is vegetated with both pine and hardwood deciduous species such as Northern red oak (*Quecus rubra*), white oak (*Quercus alba*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), black cherry (*Prunus serotina*), Sycamore

(*Plantanus occidentalis*) and dogwood (*Cornus florida*). Evergreen species include loblolly pine (*Pinus* taeda), short leaf pine (*Pinus echinata*) and eastern red cedar (*Juniperus virginiana*).

A mixture of saplings and shrubs dominates the understory. Dominant understory species include flowering dogwood, Chinese privet (*Ligustrum sinese*), sweetgum, red maple, loblolly pine, box elder (*Acer negundo*), American elm, American holly (*Ilex opaca*), red cedar, green briar (*Smilax rotundifolia*), and grape (*Vitis rotundifolia*).

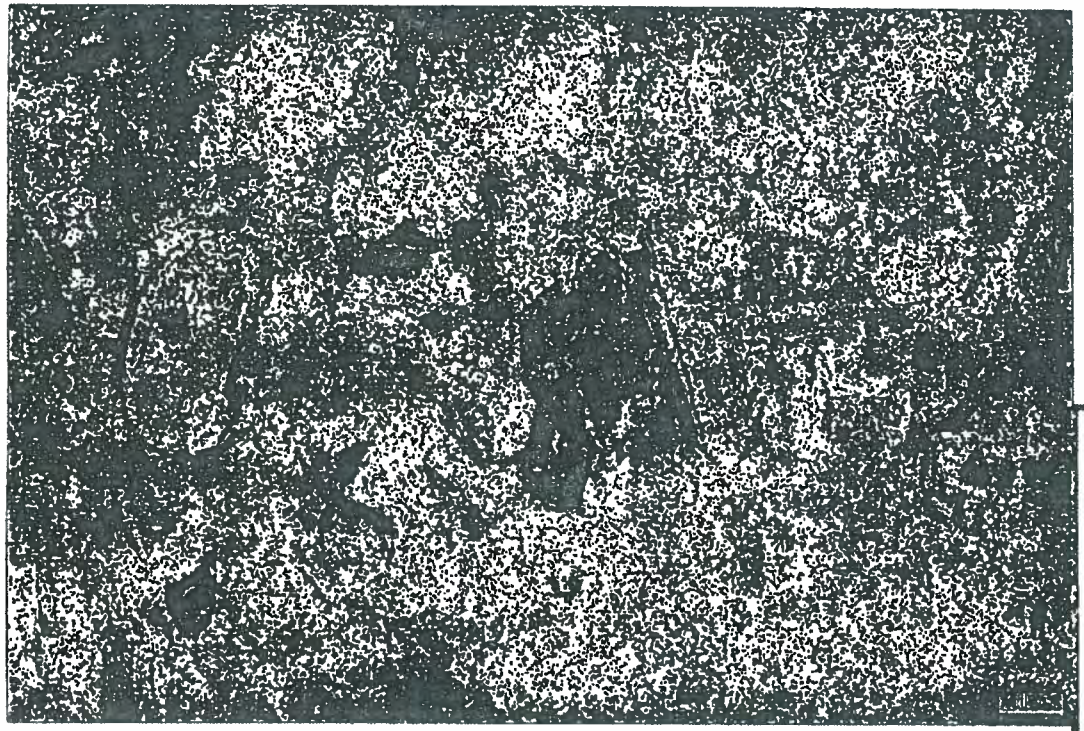
The herbaceous layer is dominated by a variety of seedlings including most of those listed above, as well as poison ivy (*Toxicodendron radicans*), Japanese honeysuckle (*Lonicera japonica*), swamp rose (*Rosa palustris*), Christmas fern (*Polystichum acrostichoides*), blackberry (*Rubus allegheniensis*) and green briar.

Streamside and wetland areas contain an overstory comprised primarily of red maple, sweetgum, ironwood (*Carpinus carolinea*), river birch (*Betula nigra*), green ash (*Fraxinus carolinea*), box elder (*Acer negundo*) and yellow poplar (*Liriodendron tulipifera*). The herbaceous layer is comprised of black berry, swamp rose, soft rush (*Juncus effusus*) and various canary grasses.

4.2 Site Soils

Based on review of the USDA Soil Survey of Cabarrus County, the dominant soils throughout the subject property are mapped as follows:

- Chewacla Sandy Loam, frequently flooded: (4) – a somewhat poorly drained, moderately permeable soil, mapped adjacent to the onsite stream and its associated floodplain. Chewacla soils are typically located within floodplains along drainageways. Chewacla soils are listed in the USDA publication Hydric Soils of the United States.



SCALE

1000 FT 0 1000 FT

NEWTON QUADRANGLE
NORTH CAROLINA, 1970

AERIAL PHOTO

DRAWING NAME: CMS LANDFILL	DATE: 00-15-2003
SCALE: 1 INCH = 1,000 FEET	DTR / BTR / CF

PREPARED FOR:

ALLIED WASTE – ATLANTIC REGION
CONCORD, NORTH CAROLINA

PREPARED BY: [illegible]	FIGURE: FIGURE 2

- Cecil Sandy Clay Loam, 8-15 percent slopes, eroded (31D2) – well-drained and moderately-permeable soils typically located on ridges dissected by drainageways. On the subject property, an area of Cecil soil is located on either side of the centrally-located stream and its associated floodplain.

- Cecil Sandy Clay Loam, 2-8 percent slopes, eroded (31B2) – Other than the degree of slope, this soil is identical to the Cecil mapping unit identified above. On the subject property, this soil is located on high ridge west of the centrally-located stream.

5.0 Recommendations

5.1 Permitting Considerations

The following section lists various permit scenarios associated with development of the subject property:

- Placement of fill material within greater than 1/10 acre of wetlands or greater than 150 linear feet of stream requires a written water quality certification from the Division of Water Quality. Placement of fill material within greater than 1/10 acre of wetlands or greater than 300 linear feet of stream (with habitat for fish and wildlife) requires an Individual Permit from the USACOE, along with the water quality certification. While isolated waters and wetlands are not regulated by the USACOE, all waters and wetlands, both isolated and adjacent are regulated by NCDENR.

- Both perennial and intermittent watercourses are subject to jurisdiction. In order to avoid obtaining an Individual Water Quality Certification, project-wide impacts to wetlands must be less than 1/10 acre, and with respect to stream impacts, less than 150 linear feet.

- The Nationwide Permit No. 39, available for industrial, commercial and residential development from the USACOE, has a threshold of 1/2 acre of wetlands (greater than 1/10 acre requires mitigation), and up to 300 linear feet of stream with habitat (aquatically-significant). It does not, however, authorize some types of fill emplacement within the 100-year floodplain.

- The time constraints for the respective permit types are 2-4 months for a Nationwide Permit, and 6-12 months for an Individual Permit.

- Mitigation is required for impacts exceeding 1/10 acre of wetlands or 150 linear feet of stream. Onsite preservation/restoration of stream resources is a possible avenue for mitigation credit. In addition, the Wetland Restoration Program (WRP) or other Mitigation Banks would provide adequate mitigation for the project. The Division of Water Quality requires stream mitigation at a 1:1 ratio for restoration. Any wetland impacts will require mitigation of 2:1 from both the Division of Water Quality and the USACOE for restoration. Preservation credits can range from 4:1 to 10:1. Acceptable forms of compensatory mitigation are (in order of preference):

  Restoration: the return of a degraded or previously impacted stream to a more natural state, or the re-establishment of wetland hydrology and vegetation in an area where it previously existed.

  Creation: the construction of a wetland or stream in an area where wetlands did not exist in the recent past.

  Enhancement: increasing one or more of the functions of an existing stream or wetland by manipulation of vegetation or hydrology.

  Preservation: protection of streams or wetlands through purchase, donation or conveyance of a conservation easement to an appropriate government or non-profit agency for management.

- Each agency prefers that mitigation be "onsite" and "in-kind", meaning that restoration or creation of similar waters onsite should first be considered. Offsite options, or payment into an approved mitigation are also viable options. Stream restoration costs vary from $125 to $300 per linear foot. Wetland restoration credits range from $12,000 to $24,000 per acre.

5.2 Delineation Verification

The flagged jurisdictional areas described in Section 4.0 and presented on the Field Map of Estimated Wetland Delineation attached to this report should be verified by the USACOE, then surveyed and platted by a registered land surveyor. The surveyor should establish meets and bounds of the jurisdictional stream channels and tie them, ultimately, to an established property corner. The surveyor should then provide the map to AMEC. This final survey, depicting the surveyed wetland area, will be forwarded by AMEC to the USACOE in Asheville, North Carolina for review and final jurisdictional determination.

6.0 Sole Use Statement

All materials and information used for this project were obtained by AMEC. The resulting report is provided for the sole use of CMS Landfill on the project for which it was prepared. Use of this report by any third parties will be at such party's sole risk, and AMEC disclaims any liability for any use or reliance by third parties. Additional reports, naming another party or parties, as addressee(s) or otherwise entitling the party or parties to rely on the report may be requested in writing by CMS Landfill. Such a request for additional addressees shall include the name and addresses of the additional addressees. AMEC, Inc. shall have sole discretion in approving client's request for issuance of reports to additional addressees. The additional addressees' use and reliance on the report will be subject to the same rights, obligations and limitations identified in the Agreement for Services between AMEC and CMS Landfill. However, the total liability of AMEC to all addressees

Jurisdictional Wetland Delineation, shall be limited to the remedies and amounts as provided in the contract for Services as a single contract.

The additional addressees' use and reliance on the report shall signify the additional addressees' agreement to be bound by the proposal and contract that make up the agreement between AMEC, Inc., and ESP Associates, P.A.. AMEC may require an additional fee for each report issued to an addressee other than Allied Waste.

Hydrophytic Vegetation

The list of hydrophytic (wetland) plants is very broad and includes perhaps 90 percent of all species occurring in the Coastal Plain and lower Piedmont (National List of Plant Species That Occur in Wetlands: Reed, 1988). "Hydrophytic vegetation is prevalent in an area when dominant plant species comprising the plant community are typically adapted for life in saturated soil conditions" (The Manual, 1987). A plant species is considered to be "typically adapted" when it is normally or commonly suited to given environmental conditions. The governing environmental condition for hydrophytic vegetation is hydric soils resulting from periodic inundation or saturation by surface water or groundwater.

The 1987 manual states that if greater than 51% of the dominant vegetation within the community is facultative (FAC), facultative wet (FACW), or obligate (OBL), the vegetation community is considered hydrophytic. Table I: Plant Indicator Status Categories, describes the criteria used to categorize plant species for the purpose of wetland identification.

Table 1: Plant Indicator Status*

Indicator Category	Indicator Symbol	Definition
Obligate Wetland Plants	OBL	Plants that occur almost always (estimated probability >99%) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1%) in non wetlands. Examples: *Spartina aterniflora, Taxicodium distichum.*

Facultative Wetland Plants	FACW	Plants that occur usually (estimated probability >67% to 99%) in wetlands, but also occur (estimated probability 1% to 67%) in nonwetlands. Examples: *Fraxinus pennsylvanica, Cornus stolonifera.*
Facultative Plants	FAC	Plants with a similar likelihood (estimated probability 33% to 66%) of occurring in both wetlands and nonwetlands. Examples: *Gleditsia triacanthos, Smilax rotundifolia.*
Facultative Upland Plants	FACU	Plants that occur sometimes (estimated probability 1% to <33%) in wetlands, but occur more often (estimated probability >67% to 99%) in nonwetlands. Examples: *Quercus rubra, Potentilla arguta.*
Obligate Upland Plants	UPL	Plants that occur rarely (estimated probability <1%) in wetlands, but occur almost always (estimated probability >99%) in nonwetlands under natural conditions. Examples: *Pinus echinata, Bromus mollis.*

* Categories were originally developed and defined by the USFWS National Wetlands Inventory and subsequently modified by the National Plant List Panel. The three facultative categories are subdivided by (+) and (-) modifiers.

Source: The ACOE Manual, 1987

Hydric Soils

The second requirement for a determination of jurisdiction is hydric soils. According to the 1987 Corps of Engineers Manual:

> "The unique characteristics of hydric soils result from the influence of periodic or permanent inundation or soil saturation for sufficient duration to effect anaerobic conditions. Prolonged anaerobic soil conditions lead to a reducing environment, thereby lowering the soil redox potential. The result is chemical reduction of some soil components (e.g. iron and manganese oxides), which leads to development of soil colors and other physical characteristics that usually are indicative of hydric soils."

Hydric soils are classified into two broad categories: organic and mineral. Organic soils develop under continuous saturated or inundated conditions. Organic soils are generally known as peats or mucks and contain more than 50% of the organic soil material in the upper 32 inches. Organic soils are nearly always hydric.

Mineral hydric soils are soils that are periodically saturated for sufficient duration to produce physical and chemical properties indicative of a reducing environment. They are usually gray and/or mottled immediately below the surface (examined to a depth of 16 inches) or they have thick dark-colored surface layers overlying a mottled subsurface horizon.

Although the hydric soils result from periodic saturation or inundation, the presence of the hydric soil component does not necessarily demonstrate the presence of the hydrology component. Positive indicators of hydrology must be visible and confirmed before the hydrology component can be confirmed.

Hydrology

Wetland hydrology encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface (usually to a depth of 12") at some time during the growing season. Areas with evident characteristics of wetland hydrology are typically those where the presence of water has an overriding influence on soils and vegetation due to anaerobic and reducing conditions.

Recorded data can be utilized to determine hydrologic conditions. Recorded data include, but are not limited to, stream, lake and tidal gage data, flood predictions and historical records. Use of such information is limited by availability and commonly limited to areas adjacent to streams, lakes and tidal areas.

Field data is more typically utilized because hydrologic indicators observed on-site can be assessed quickly, and although some of the indicators do not necessarily indicate that hydrological events occurred during the growing season, they do provide evidence that inundation and/or saturation has occurred at sometime. Primary hydrologic indicators include, visual observation of inundation, soil saturation, watermarks (stains observed on woody vegetation or other fixed objects), drift lines (deposition of debris in a distinct line indicating the extent of a flood event), sediment deposits (typically observed on low-lying plants indicating the minimum inundation level) and drainage patterns (evidence of flowing water through an area). Secondary hydrologic indicators include oxidized root channels, water-stained leaves and local soil survey information.

Traditionally, wetlands are thought to require standing water or at least have very moist soil conditions at the surface. However, the determining factor of minimal hydrologic conditions is generally met by groundwater and not surface water with this wetland definition.

APPENDIX 6

REZONING APPLICATION

City of Concord

Application for Rezoning (Zoning Amendment)

(Please type or use black ink)

1. Applicant Name: ESP Associates, P.A.
2. Applicant Address: PO Box 7030
3. Applicant City: Charlotte State: NC Zip Code: 28241
4. Applicant Telephone: Home: (704) ~~583-4949~~ Work: (980) 721-0186
5. Name and address of owner (if different from applicant): BFI Waste Systems of North America 5105 Morehead Road, Concord, NC 28027
6. Location of Subject Property: Township No. 2 Cabarrus County
   (a) Street address: N/A in the vicinity of Pitts School Road and as described per Exhibit "A"
   (b) Cabarrus County P.I.N. #: ~~(formerly) #5508730913 (see attached legal~~ desc.)
7. Area of Subject Property (acres or square feet): 20 Acres±
8. Zoning Classification: Current: MDR (Cabarrus Co.) Proposed: I - 2 (City of Concord)
9. Existing Land Use: Undeveloped
10. Surrounding Land Use: North: I-2 Existing Landfill South: I-2 Existing Landfill
    East: Undeveloped MDR West: I-2 Existing Landfill
11. Reason(s) for Requesting a Rezoning (Zoning Amendment): Concurrent w/tandem annexation, petition BFI will utilize this 21.44 acre site as a buffer in conjunction with existing BFI-CMS Landfill site. (State waste management law requires that entire site be zoned same.)
12. Has a preapplication meeting, with a staff member, been held: Yes or No: NO

Staff Member's Signature: [signature] GEN. MGR Date: 4/24/03

TIMOTHY SCHOTSCH

Required Attachments/Submittals

1. Typed metes and bounds description of the property (or portion of property to be rezoned. A property deed is sufficient, provided that the deed describes only the property requested for rezoning. See Attached Exhibit "
2. Cabarrus County Land Records print-out of names and addresses of all immediately adjacent property owners, including any directly across a street. SEE ATTACHED EXHIBIT "B"
3. If application is for a conditional use district, attach a completed "Application for Conditional Use District" with this form.

Certification

I hereby acknowledge and say that the information contained herein and herewith is true and that this application shall not be scheduled for official consideration until all of the required contents are submitted in proper form to the City of Concord Planning Department. It is understood by the undersigned that while this application will be carefully reviewed and considered, the burden of proving the need for the proposed amendment rests with the applicant.

Signature of Applicant: [signature] GEN. MANAGER Date: 4/24/03

TIMOTHY SCHOTSCH

Staff Use Only:

Fee: $_____ Received by: _____ Date: _____

The application fee is nonrefundable

EXHIBIT A

Lying and being in No. 2 Township, Cabarrus County, North Carolina, and beginning at a stone marking a corner of the property, now or formerly, of BFI Waste Systems of North America as described in the deed recorded in Book 2581 at page 273 in the Cabarrus County Registry, said beginning point having North Carolina grid coordinates N 584283.187 E 1506129.767, said beginning point being located South 57° 31' 55" East 9,006.18 feet (ground measurement) from NCGS Monument "RACE" having NC grid coordinates of N 589117.231 E 1498532.488, and running thence with the line of said property, now or formerly, of BFI Waste Systems of North America North 81° 28' 32" East 663.06 feet to a point in the centerline of a creek; thence with the centerline of said creek the following calls and distances: (1) South 52° 43' 36" West 16.16 feet, (2) South 6° 25' 43" East 20.03 feet, (3) South 44° 34' 1" East 7 feet, (4) South 22° 3' 46" East 20.65 feet, (5) South 1° 14' 11" West 21.23 feet, (6) South 11° 56' 15" West 28.21 feet, (7) South 4° 30' 22" West 7.21 feet, (8) South 4° 30' 22" West 20.56 feet, (9) South 21° 48' 7" West 15.62 feet, (10) South 3° 28' 26" East 16.88 feet, (11) South 3° 27' 18" East 15.3 feet, (12) South 10° 44' 26" West 18.67 feet, (13) South 4° 27' 34" West 14.84 feet, (14) South 6° 2' 26" East 27.1 feet, (15) South 6° 47' 38" West 32.8 feet, (16) South 8° 53' 7" West 30 feet, (17) South 6° 53' 3" West 17.73 feet, (18) South 27° 45' 32" West 13.05 feet, (19) South 28° 26' 19" East 17.5 feet, (20) South 7° 12' 17" West 30.86 feet, (21) South 2° 19' 19" East 29.19 feet, (22) South 39° 27' 17" East 21.41 feet, (23) South 12° 13' 10" West 27.46 feet, (24) South 34° 21' 47" West 33.51 feet, (25) South 0° 0' 31" West 21.87 feet, (26) South 5° 37' 2" East 23.59 feet, (27) South 9° 5' 37" West 19.2 feet, (28) South 68° 6' 13" East 8.79 feet, (29) South 6° 28' 41" West 24.45 feet and (30) South 38° 15' 19" East 26.32 feet to a point; thence leaving the centerline of the creek and along the westerly side of the creek the following calls and distances: (1) South 11° 14' 41" West 56.67 feet, (2) South 12° 37' East 23.14 feet, (3) South 25° 56' 25" East 75.06 feet, (4) South 25° 27' 17" East 70.7 feet, (5) South 32° 59' 52" West 102.93 feet, (6) South 29° 16' 21" West 107.84 feet and (7) South 27° 5' 24" West 95.6 feet to a point in the centerline of said creek; thence along the centerline of said creek the following calls and distances: (1) South 64° 9' 41" West 33.93 feet, (2) South 53° 17' 54" West 40.08 feet, (3) South 27° 48' 21" East 35.19 feet, (4) South 10° 48' 48" East 36.87 feet, (5) South 28° 51' 52" West 48.85 feet, (6) South 0° 28' 10" East 77.74 feet, (7) South 33° 20' 43" West 32.68 feet, (8) South 26° 17' 29" East 19.56 feet, (9) South 35° 35' 20" East 39.83 feet, (10) South 12° 44' 1" West 52.58 feet, (11) South 16° 11' 56" East 34.38 feet, (12) South 10° 7' 51" West 77.44 feet, (13) South 41° 22' 19" East 57.64 feet, (14) South 21° 38' 25" East 31.11 feet, (15) South 11° 27' 9" East 28.02 feet, (16) South 9° 23' 49" East 27.97 feet and (17) South 56° 40' 29" East 31.2 feet to a point in the line of property, now or formerly, of BFI Waste Systems of America as described in the deed recorded in Book 2581 at page 273 in the Cabarrus County Registry; thence with the line of said property, now or formerly, of BFI Waste Systems of North America two calls and distances as follows: (1) North 85° 57' 25" West 565.35 feet to a stone and (2) North 0° 11' 32" West 1,532.75 feet to the point and place of beginning. Said parcel of land contains 21.44 acres and is more particularly shown on the plat of survey entitled "BFI Waste Systems of North America, Inc." dated April 19, 2002 prepared by David A. Weirich, North Carolina Professional Land Surveyor, of ESP Associates, P.A., Pineville, NC, Project No. QC23.

CABARRUS COUNTY
FILED
02/20/2003 3:16 PM
LINDA F. MCABEE
Register Of Deeds
By. _____ Deputy/Asst.
EXCISE TAX $2323.00

Excise Tax $2,323.00 | Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. 5508-73-0913
Verified by _____ County on the ____ day of _____, 20__
by _____

Mail after recording to Pender R. McElroy, James, McElroy & Diehl, P.A., 600 S. College Street, Charlotte, NC 28202

This instrument was prepared by Johnston, Allison & Hord, P.A. (RCH)

Brief Description for the index: 21.44 acres, Township No. 2, Cabarrus County

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 20th day of February, 2003, by and between

GRANTOR	GRANTEE
Evelyn H. Furr (by and through her attorney-in-fact, Wayne M. Furr)	BFI Waste Systems of North America, Inc. Mailing Address: 5105 Morehead Road Concord, NC 28027

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g., corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in Township No. 2, Cabarrus County, North Carolina and more particularly described as follows:

See attached Exhibit A

The property hereinabove described was acquired by Grantor by instrument recorded in Book , Page .

JAH:272902 v1
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23

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.

Title to the property hereinabove described is subject to the following exceptions:

Those exceptions outlined on Exhibit B which is attached hereto and incorporated herein by reference.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

_____
(Corporate Name)

By: _____
President

ATTEST:

_____
Secretary (Corporate Seal)

Evelyn H. Furr

By: Wayne M. Furr (SEAL)
Wayne M. Furr, Attorney-in-Fact

_____ (SEAL)

SEAL-STAMP

LINDA S. WATTS NOTARY PUBLIC

NORTH CAROLINA, Cabarrus County.

I, the undersigned, a Notary Public of the County and State aforesaid, certify that Wayne M. Furr, attorney-in-fact for Evelyn H. Furr, Grantor, personally appeared before me this day and being by me duly sworn, says that he executed the foregoing and annexed instrument for and in behalf of the said Evelyn H. Furr, and that his authority to execute and acknowledge said instrument is contained in an instrument duly executed, acknowledged and recorded in the Office of the Register of Deeds for Cabarrus County, North Carolina on the 14th day of February, 2002, and that this instrument was executed under and by virtue of the authority given by said instrument granting him power of attorney and that said instrument is recorded in Book 3668 at Page 155 in the said Cabarrus Public Registry, that the said Wayne M. Furr acknowledged the due execution of the foregoing and annexed instrument for the purposes herein expressed for and in behalf of the said Evelyn H. Furr. Witness my hand and official stamp or seal, this 20th day of February, 2003.

My commission expires: 6/5/2004 Linda S. Watts Notary Public

NC-Cabarrus
The foregoing Certificate(s) of Glenda S Watts Notary Public is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

LINDA F. MCABEE
REGISTER OF DEEDS REGISTER OF DEEDS FOR Cabarrus COUNTY

By Cynthia E Zopf Deputy/Assistant-Register of Deeds.

2-20-2003

JAH:272902 v1
Printed by Agreement with the N.C. Bar Assoc.#003

EXHIBIT B

TO DEED FROM EVELYN H. FURR TO
BFI WASTE SYSTEMS OF NORTH AMERICA, INC.
DATED FEBRUARY , 2003

PERMITTED EXCEPTIONS

1. Ad valorem taxes for the year 2003 (an allowance for which has been made between Grantor and Grantee at closing) and for subsequent years, not yet due and payable.

2. Easements to Duke Power Company recorded in Book 160 at Page 313 and in Book 200 at Page 306 in the Cabarrus County Registry.

3. Easements to Concord Telephone Company recorded in Book 209 at Page 91 and in Book 327 at Page 15 of the Cabarrus County Registry.

4. Right-of-way Agreement and grant of easement to Morris Green Associates for sanitary sewer outfall line recorded in Book 654 at Page 151 in the Cabarrus County Registry.

5. Right-of-way Agreement, grant of easement and modification to Morris Green Associates recorded in Book 667 at Page 319 in the Cabarrus County Registry.

6. Right-of-way and easement to the City of Concord recorded in Book 2737 at Page 311 in the Cabarrus County Registry.

7. Matters shown on survey of the above described property prepared by David A. Weirich dated April 19, 2002 including sanitary sewer easement recorded in Book 667 at Page 319 in the Cabarrus County Registry (as referred to above) and riparian rights of others in and to the creek running in a north/south direction and, in some instances, being located along the easterly boundary of the property described above.

EXHIBIT B: Cabarrus County Land Records print out of names and addresses Of all immediately adjacent landowners

Owner: Bfi Waste Systems Of North America	**Address:** 5105 Morehead Rd
City: City Of Concord	**Zip Code:** 28027
Real ID: 02-042 -003.10	**Parcel Number:** 5508461614
Owner: Furr Evelyn H	**Address:** 05126 PITTS SCHOOL RD; 00700 PITTS SCHOOL RD SW
City: (Indeterminate) Concord	**Zip Code:** 28027
Real ID: 02-040 -023.00	**Parcel Number:** 5508730913

APPENDIX 7

FRANCHISE AGREEMENT

CERTIFICATE OF RECORDING OFFICER

I, Jill B. Chunn, the duly appointed and acting Deputy City Clerk for the City of Concord, North Carolina, do hereby certify and acknowledge that the attached Ordinance No. 03-10, titled "An Ordinance Renewing a Nonexclusive Franchise to BFI Waste Systems of North America, Inc." is accurate copy of the original ordinance on file and of record in the Office of the City Clerk.

WITNESS MY HAND AND SEAL of the City of Concord, North Carolina this 26th day of March, 2002.

Jill B. Chunn

Jill B. Chunn, Deputy City Clerk

(SEAL)

ORD. #03-10

AN ORDINANCE RENEWING A NONEXCLUSIVE FRANCHISE TO BFI WASTE SYSTEMS OF NORTH AMERICA, INC.

Whereas, the disposal of municipal solid waste is a statutory responsibility and a fiscal concern of the City of Concord; and

Whereas, the City of Concord disposes of its municipal solid waste at the sanitary landfill operated by BFI Waste Systems of North America, Inc., known as BFI-CMS Landfill (formerly known as CMS Development Corporation Landfill V), located in the City of Concord; and

Whereas, BFI Waste Systems of North America, Inc. is currently operating its BFI-CMS Landfill pursuant to permits and authorizations granted by the State of North Carolina; and

Whereas, under its Solid Waste Management Plan dated January 31, 1992, the City of Concord has confirmed its plan to rely upon the BFI-CMS Landfill for the disposal of municipal solid waste generated within the City; and

Whereas, the City now agrees to renew a franchise to BFI Waste Systems of North America, Inc. for the operation of the BFI-CMS Landfill consistent with the City's Solid Waste Management Plan;

Now, therefore, the City Council of Concord, North Carolina, pursuant to G.S. 160A-76, and G.S. 130A-294 et. seq., hereby renews a franchise to BFI Waste Systems of North America, Inc. to operate a sanitary landfill within the City of Concord, North Carolina, pursuant to the following terms:

(1) The franchise is for the operation of a sanitary landfill intended to receive ordinary household waste, commercial solid waste, industrial solid waste and special waste, including asbestos, ash and industrial processed waste, and such other non-hazardous waste as approved by the State of North Carolina.

(2) The geographic territory intended to be served by the sanitary landfill is the City of Concord, Cabarrus County, and the State of North Carolina and other areas within a seventy-five (75) mile radius of the BFI-CMS Landfill; the population intended to be served is the population of the City of Concord, Cabarrus County, and the State of North Carolina and other areas within a seventy-five (75) mile radius of the BFI-CMS Landfill.

(3) The duration of this franchise is thirty (30) years from the date of its adoption. It is estimated that the BFI-CMS Landfill will be able to accept for disposal municipal solid waste until the year 2033.

(4) This franchise is a non-exclusive franchise for the operation of a sanitary landfill by BFI Waste Systems of North America, Inc. within the geographic boundary line of property currently owned or under option by BFI Waste Systems of North America, Inc. located in Concord, North Carolina and described on Exhibit A (the "Site"); this franchise does not grant to BFI Waste Systems of North America, Inc. the exclusive right to operate a sanitary landfill within the city limits of Concord, and it does not grant to BFI Waste Systems of North America, Inc. a franchise to operate a sanitary landfill in any location outside the Site.

(5) In granting this franchise, it is estimated that BFI Waste Systems of North America, Inc. currently receives an average of approximately 90,000 tons of municipal solid waste per month at the BFI-CMS Landfill. The parties recognize that the volume of waste to be accepted at the Landfill may vary over the course of this franchise. Pursuant to this franchise, the franchisee may accept up to an average of approximately 120,000 tons of municipal solid waste

per month at the BFI-CMS Landfill with the maximum monthly volume not to exceed 140,000 tons per month, and subject to such permits as may be required by and issued by the N.C. Division of Solid Waste Management for additional cells within the BFI-CMS Landfill or other use of the BFI-CMS Landfill.

(6) The franchisee, BFI Waste Systems of America, Inc., is required to continue accepting for disposal municipal solid waste generated within the City of Concord, North Carolina, pursuant to the terms of the Contract for Disposal of Solid Waste by and between the City of Concord, North Carolina, and CMS Development Corp. and Browning-Ferris Industries of South Atlantic, Inc. (the predecessors to BFI Waste Systems of North America, Inc. by merger), dated August 1, 1990, as the Contract may be amended from time to time, including the amendment of even date herewith, by agreement between the City and BFI Waste Systems of North America, Inc. Further, the franchisee, BFI Waste Systems of America, Inc., or its successors in interest hereby agrees to provide airspace for the disposal of all residential municipal solid waste generated within the City of Concord, North Carolina for thirty (30) years from the date of the granting of this franchise. If the BFI-CMS Landfill should reach capacity before the conclusion of the thirty (30) year term of this franchise so that BFI could not continue to accept the monthly volume of waste at the BFI-CMS Landfill anticipated by this franchise and still provide airspace at the BFI-CMS Landfill for the disposal of all residential municipal solid waste generated with the City of Concord, North Carolina for the thirty (30) year term of this franchise, franchisee agrees to erect a transfer station on the Site and, if necessary, transport all residential municipal solid waste generated within the City of Concord, North Carolina to another location for disposal pursuant to law. The erection of said transfer station and the transportation and disposal of all residential municipal solid waste generated within the City of Concord, North Carolina for the said period of thirty (30) years shall be at the sole expense of the franchisee. The City agrees to cooperate with the franchisee in providing any required approvals and assist in obtaining all required authorizations for the siting of a transfer station.

The commercial waste disposal rates and the recycling program at no cost to the City shall continue under the same terms and conditions as set forth in previous franchises and/or agreements between the parties as amended.

(7) Host fees will be paid and managed as follows:

(a) With the exception of residential waste generated within the City of Concord, BFI will pay to the City a host fee of $.40 per ton of Waste deposited in the Landfill beginning on the day that the State of North Carolina issues to BFI a permit for the construction of the next phase of the Landfill. Beginning on the day that BFI begins to place Waste in the initial cell covered by said permit, BFI will increase the host fee to $.75 per ton of Waste deposited in the Landfill. BFI guarantees that the non-escrowed portion of the host fees paid will be at least $38,200.00 a month for a period of fifteen (15) years from the time BFI begins to pay host fees.

(b) Once the host fee is $.75 per ton of Waste deposited in the Landfill, the City will place $.25 of each $.75 in an interest bearing account. This account will be maintained throughout the life of the franchise. At the expiration of this franchise, if BFI has met its obligation to provide to the City disposal for all residential waste generated during the term of the franchise, then all principal and interest contained in the account will be paid to BFI (or its successor). If BFI defaults on its obligation to provide to the City disposal for all residential waste generated during the term of this franchise, then the principal and interest contained in the account will be paid to the City.

(c) Host fees shall be paid monthly, beginning twenty-one (21) days after the last day of the calendar month during which the State of North Carolina issues to BFI a permit for the construction of the next phase of the Landfill and continuing every twenty-one (21) days after the end of each calendar

month during which Waste has been accepted for disposal at the Landfill or at such other intervals as may be agreed to by the parties in writing. BFI will provide to the City a copy of its annual report to the State at the time the report is submitted to the State and, at the City's request, will make its daily log and supporting documents available for review at reasonable times and intervals.

(8) Nothing in this franchise shall authorize BFI Waste Systems of North America, Inc. to modify the BFI-CMS Landfill in a manner which would cause the City of Concord to incur any additional capital expenditures in the provision or delivery of services to the BFI-CMS Landfill such as water, sewer, utilities or roads as a result of such modification, unless BFI Waste Systems of North America, Inc. agrees to pay all additional costs associated with delivering those services.

(9) The City of Concord and BFI anticipate that the language of this franchise will satisfy the State of North Carolina sufficiently to permit the expansion described herein by BFI. In the event that the language of this franchise does not satisfy the requirements of the State of North Carolina, the franchise may be amended to conform to the requirements of the State of North Carolina or this franchise may be declared null and void at the option of the BFI.

(10) This franchise shall become effective upon the execution of a franchise agreement by BFI outlining the operation of the expanded landfill to the satisfaction of the Legal Department.

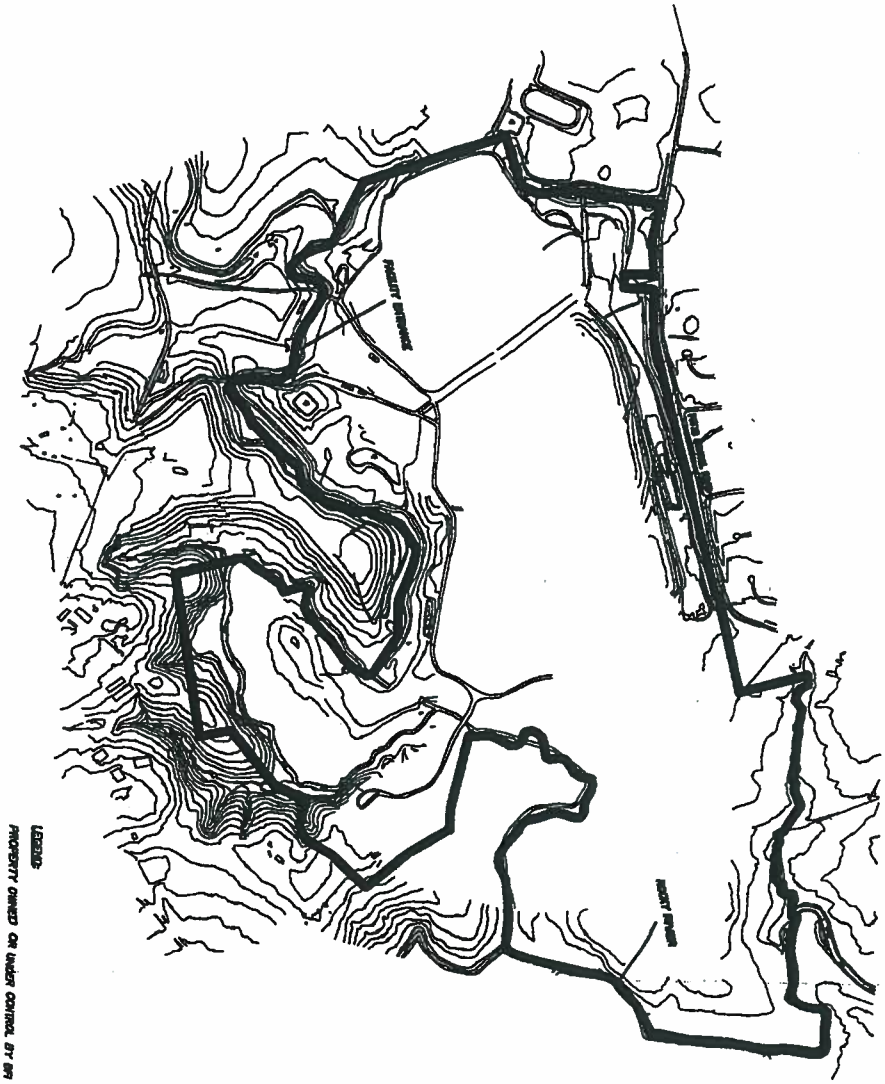
Adopted on first reading this 9th day of January, 2003.

Adopted on second reading this 13th day of February, 2003.

CITY COUNCIL
CITY OF CONCORD
NORTH CAROLINA

J. Scott Padgett, Mayor

ATTEST: Vickie C. Weant
Vickie C. Weant, City Clerk



LEGEND:
PROPERTY OWNED OR UNDER CONTROL BY BFI

PROJECT NO.	RC23
SCALE	N.T.S
DATE	2/13/01
DRAWN BY	MAG
CHECKED BY	DWW
	1 OF 1 SHT

SHEET TITLE

FRANCHISE ORDINANCE
EXHIBIT "A"
BFI – CMS LANDFILL V

PROJECT

BFI WASTE SYSTEMS OF N.A.

CMS FRANCH

CONCORD, NC

RSP ASSOCIATES, P.A.
engineering/surveying/planning
P.O. Box 7030, Charlotte, NC 28241
10315 Southern Loop Boulevard
Pineville, NC 28134 (704) 525-4640

3

NCDENR

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary

January 03, 2005

Mr. Mike Gurley, Regional Engineer
Allied Waste Industries
5105 Morehead Road
Concord, North Carolina 28075

Re: Notification of Updated Site Suitability (Furr Property, 21.44 acres)
CMS Landfill V, Phase 2 Expansion (Cells 2F, 2G, & 2H), and Phases 3, 4, & 5
Permit Number 13-04, Cabarrus County

Dear Mr. Gurley,

The Solid Waste Section of the Division of Waste Management has completed its review of the up dated site study of CMS Landfill V, Phase 2 Expansion (Cells 2F, 2G, & 2H), and Phases 3, 4, & 5. Pursuant to Rule .1618(a)(1), the Division hereby notifies BFI Waste Systems of North of America, Inc that the approximately 21.44 acre lateral expansion and the previously approved site boundary, as proposed in the facility plan, is suitable for development as a solid waste management facility in its redesigned expanded format. BFI Waste Systems of North of America, Inc. is authorized to prepare an application for a permit to construct.

The Permit to Construct Application shall be prepared in accordance with 15A NCAC 13B.1617(a) and shall address the first five-year phase of landfill development. The Permit to Construct Application should be in general accordance with facility plan shown in the Site Study. The Division will approve a specific disposal area only after reviewing the Facility Plan as required by Rule .1617(a)(1).

Solid Waste Management Rule .0201 requires the Division to issue a solid waste permit in two parts. The first part is a Permit to Construct and the second part is a Permit to Operate. This letter is not a permit. This letter only informs the applicant that they may proceed with their permit application. The final action the Division may take on a permit application is the issuance or denial of a permit

Sincerely,

Edward F. Mussler III
CN = Edward F. Mussler III, C = US, O = Division of Waste Management, OU = Solid Waste Section
I have reviewed this document and I am approving this document
2008.01.03 10:53:39 -05'00'

Edward F. Mussler III, P.E.
Permitting Branch Supervisor
Solid Waste Section
Division of Waste Management

Cc: Teresa Bradford, DWM
Bobby Lufty, DWM
Central File
Brent Rocket, DWM
David Wasiela, P.E., ESP Associates, P.A.

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-733-4996 \ FAX 919-715-3605 \ Internet http://wastenotnc.org
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U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **200531842** County: **Cabarrus** U.S.G.S. Quad: **Harrisburg**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: **BFI Waste Systems of North America / Attn: Mike Gurley**
Address: **5105 Morehead Road**
Concord, NC 28027
Telephone No.:
Size and location of property (waterbody, road name/number, town, etc.) **The site is located on the east side of Morehead Road, adjacent to the Lowe's Motor Speedway, in Concord, Cabarrus County, North Carolina.**

Indicate Which of the Following Apply:

_ Based on preliminary information, there may be wetlands and stream channels on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps.

X There are wetlands and stream channels on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the wetlands and stream channels on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

_ The wetlands and stream channels on your property have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

X The wetlands and stream channels have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on **July 5, 2005.** Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Washington, NC, at (252) 946-6481 to determine their requirements.

Remarks: **Site visit conducted on March 9, 2005.**

Corps Regulatory Official: _____

Date **July 5, 2005** Expiration Date **July 5, 2010**

Action Id. 200531842

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Amanda Jones** at **828-271-7980 x. 231**.

Basis For Determination: The site contains wetlands as determined by the USACE 1987 Wetland Delineation Manual and is adjacent to stream channels located on the property. The stream channel on the property is an unnamed tributary to Rocky River, which flows into the Yadkin River and ultimately flows to the Atlantic Ocean through the Winyah Bay in South Carolina.

Corps Regulatory Official (Initial): _____

FOR OFFICE USE ONLY:

- A plat or sketch of the property and the wetland data form must be attached to the file copy of this form.
- A copy of the "Notification Of Administrative Appeal Options And Process And Request For Appeal" form must be transmitted with the property owner/agent copy of this form.
- If the property contains isolated wetlands/waters, please indicate in "Remarks" section and attach the "Isolated Determination Information Sheet" to the file copy of this form.

CF: ESP Associates, Attn: Joanne Lewis, P.O. Box 7030, Charlotte, NC 28241

CMS 1/

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

RECEIVED
OCT 31 2005
ESP ASSOCIATES, P.A.

October 25, 2005

RECEIVED
NOV 03 2005
NC DEPT OF ENVIRONMENT
AND NATURAL RESOURCES
MOORESVILLE REGIONAL OFFICE

Ms. Joanne Lewis, CPESC
Environmental Scientist
ESP Associates, P.A.
P.O. Box 7030
Charlotte, North Carolina 28241

Dear Ms. Lewis:

Subject: Proposed CMS Landfill V Lateral Expansion Facility, North of Morehead Road in Concord, Cabarrus County, North Carolina (ESP Project No. TB18)

In your letter of September 29, 2005, you requested our comments on the subject project. **(Please note that your letter was incorrectly addressed to Mr. Mark Cantrell. Mark is a biologist in the Asheville Field Office, but letters requesting U.S. Fish and Wildlife Service input should be sent to the Field Supervisor.)** The following comments are based on our review of your protected species assessment. These comments are provided in accordance with the provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e), and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

According to the information provided in the protected species assessment, CMS Landfill V is proposing an expansion to their landfill by adding an adjacent 555-acre site that is located south of the current facility. The landfill expansion appears to have the potential to impact several unnamed streams and wetlands. The protected species assessment does not present any information about impacts to aquatic resources.

Federally Listed Species - According to your protected species assessment, no listed species were identified on the site. We concur with the determination that the project will not adversely affect any listed species; therefore, we believe the requirements under section 7 of the Act have been fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

Erosion Control and Wetland/Stream Protection. Given the close proximity of this project to several streams, we want to emphasize that stringent measures to control sediment and erosion should be implemented prior to any ground disturbance and should be maintained throughout project construction. Temporary (e.g., rye, grain, wheat, millet) or permanent herbaceous material should be planted to help control erosion immediately following any ground-disturbing activity. Native annual small grains and herbs appropriate for the season are recommended. Fescue-based mixtures should be avoided. Perimeter erosion-control devices should be installed prior to any on-the-ground activities. Frequent maintenance of these devices is critical to their proper function in order to minimize sediment discharge from the project site. Also, fertilizers and pesticides should not be used near streams.

Nonpoint-source pollution can have harmful effects on drinking water supplies, recreation, fisheries, and wildlife, and we are concerned that runoff from the landfill could have an effect on the aquatic species and water quality of the streams. Therefore, we recommend incorporation of the following measures into the project plans in order to minimize nonpoint-source pollution, potential effects to water quality, and impacts to fish and wildlife. Please note that the following recommendations and mitigation measures will be used in future correspondence with the U.S. Army Corps of Engineers upon review of the permit application, project plans, and subsequent public notice:

1. All storm-water outlets should drain through a vegetated upland area prior to reaching any stream or wetland area. Sufficient retention designs should be implemented to allow for the slow discharge of storm water, attenuating the potential adverse effects of storm-water surges; thermal spikes; and sediment, nutrient, and chemical discharges.

2. Forested stream buffers (a minimum of 100 feet wide on perennial streams and 50 feet wide on intermittent streams and wetlands) should be maintained throughout the project area. In addition to providing important habitat and travel corridors for wildlife, forested buffers protect the water quality, hydrology, and health of streams by slowing, absorbing, and filtering storm-water runoff; facilitating groundwater recharge, which is important for maintaining flows during dry periods; providing shade for maintaining water temperature; stabilizing stream banks and helping to maintain natural channel morphology; providing organic carbon and nutrients to support the aquatic food web; providing woody debris for cover, foraging, and nesting/spawning habitat for terrestrial and aquatic species; etc.

3. Daily waste-cover management should be implemented in order to minimize its attraction to wildlife.

4. Equipment should not be operated in the streams, wetlands, or on the stream banks. Equipment should be inspected daily and should be maintained to prevent contamination of surface waters from leaking fuels, lubricants,

hydraulic fluids, or other toxic materials. All fuels, lubricants, and other toxic materials should be stored outside the riparian management area of the stream, in a location where the material can be contained. Equipment should be checked for leaks of hydraulic fluids, cooling system liquids, and fuel and should be cleaned before fording any stream. Also, all fueling operations should be accomplished outside the riparian management area.

At this stage of project development and without more specifics about construction locations or techniques, it is difficult for us to fully assess potential environmental impacts (direct, indirect, secondary, and cumulative). From the protected species assessment, we could not determine whether wetlands or streams in the expansion area will be directly impacted by the project. If applicable, we would like to review the acreage of wetlands and linear feet of streams that will be impacted as a result of the project and an analysis of practicable alternatives that would avoid and minimize impacts. Where impacts are unavoidable, we recommend mitigation for the loss of all aquatic areas. As a general rule, we recommend that all direct impacts to wetlands and streams be mitigated with the restoration of comparable on-site wetlands and streams at a ratio of at least 2:1. If a comparable mitigation plan cannot be established because of on-site limitations, we recommend consideration of an in-kind, off-site mitigation plan for all unavoidable impacts to streams and wetlands. If all mitigation options have been exhausted and a buy-in to the North Carolina Ecosystem Enhancement Program becomes necessary for the mitigation of unavoidable impacts, the same restoration ratio of 2:1 should be used to calculate the payment amount.

We appreciate the opportunity to provide these comments. If we can be of assistance or if you have any questions, please do not hesitate to contact Mr. Bryan Tompkins of our staff at 828/258-3939, Ext. 240. In any future correspondence concerning this project, please reference our Log Number 4-2-05-457.

Sincerely,

Brian P. Cole
Field Supervisor

cc:
Ms. Amanda D. Jones, Asheville Regulatory Field Office, U.S. Army Corps of Engineers,
151 Patton Avenue, Room 208, Asheville, North Carolina 28801-5006

NCDENR

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary

January 03, 2005

Mr. Mike Gurley, Regional Engineer
Allied Waste Industries
5105 Morehead Road
Concord, North Carolina 28075

Re: Notification of Updated Site Suitability (Furr Property, 21.44 acres)
CMS Landfill V, Phase 2 Expansion (Cells 2F, 2G, & 2H), and Phases 3, 4, & 5
Permit Number 13-04, Cabarrus County

Dear Mr. Gurley,

The Solid Waste Section of the Division of Waste Management has completed its review of the up dated site study of CMS Landfill V, Phase 2 Expansion (Cells 2F, 2G, & 2H), and Phases 3, 4, & 5. Pursuant to Rule .1618(a)(1), the Division hereby notifies BFI Waste Systems of North of America, Inc that the approximately 21.44 acre lateral expansion and the previously approved site boundary, as proposed in the facility plan, is suitable for development as a solid waste management facility in its redesigned expanded format. BFI Waste Systems of North of America, Inc. is authorized to prepare an application for a permit to construct.

The Permit to Construct Application shall be prepared in accordance with 15A NCAC 13B.1617(a) and shall address the first five-year phase of landfill development. The Permit to Construct Application should be in general accordance with facility plan shown in the Site Study. The Division will approve a specific disposal area only after reviewing the Facility Plan as required by Rule .1617(a)(1).

Solid Waste Management Rule .0201 requires the Division to issue a solid waste permit in two parts. The first part is a Permit to Construct and the second part is a Permit to Operate. This letter is not a permit. This letter only informs the applicant that they may proceed with their permit application. The final action the Division may take on a permit application is the issuance or denial of a permit

Sincerely,

Edward F. Mussler III
CN = Edward F. Mussler III, C = US, O = Division of Waste Management, OU = Solid Waste Section
I have reviewed this document and I am approving this document
2006.01.03 10:53:39 -05'00'

Edward F. Mussler III, P.E.
Permitting Branch Supervisor
Solid Waste Section
Division of Waste Management

Cc: Teresa Bradford, DWM
Bobby Lufty, DWM
Central File
Brent Rocket, DWM
David Wasiela, P.E., ESP Associates, P.A.

B. INDUSTRIAL USER PRETREATMENT PERMIT

WATER AND SEWER AUTHORITY
OF CABARRUS COUNTY
Concord, North Carolina

PERMIT

Industrial User Pretreatment Permit (IUP)
To Discharge Wastewater Under the
Industrial Pretreatment Program

Permit No. 1024 40 CFR 403

In Compliance with the Water & Sewer Authority of Cabarrus County (WSACC) Sewer Use Ordinance, North Carolina General Statute 143-215.1, other lawful standards and regulations promulgated and adopted by the North Carolina Environmental Management Commission, and WSACC, the following industry,

BFI WASTE SYSTEMS OF NORTH AMERICA, INC.
BFI-CMS LANDFILL
5105 MOREHEAD ROAD
CONCORD, N.C. 28027

Hereafter referred to by name or as the Permittee, is hereby authorized to discharge wastewater from a facility located at the above listed address into the sanitary sewer collection system and the wastewater treatment facility of WSACC listed below:

Rocky River Regional Wastewater Treatment Plant
NPDES No. NC0036269
6400 Breezy Lane
Concord, N.C. 28025

in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, and III of this industrial user pretreatment permit (IUP). All such discharges shall be made at discharge locations approved in advance by WSACC.

This permit shall become effective October 12, 2010.

This permit and the authorization to discharge shall expire at midnight on December 31, 2014.

Signed this 12th day of October, 2010

for Timothy H. Mauldin
Wastewater Operations Manager

PART I. INDUSTRIAL USER SPECIFIC CONDITIONS

A. IUP Basic Information:

Receiving POTW:	Rocky River Regional Wastewater Treatment Plant
POTW NPDES#:	NC0036269
IUP Name:	BFI Waste Systems of North America, Inc.
IUP Number:	1024
IUP Effective Date:	October 12, 2010
IUP Expiration Date:	December 31, 2014
Regulated Pipes:	Pipe 01
IUP 40 CFR#:	40 CFR 403

B. IUP Modification History:

Effective Date	Renewal or Modification	Description of Changes Over Previous IUP
October 12, 2010	Modification	WSACC removed cyanide monitoring.
June 25, 2010	Modification	BFI requested interim limits for ammonia for the discharge of accumulated leachate from lagoon.
January 1, 2010	Renewal	IUP renewed for 5 years.
July 15, 2009	Modification	Per BFI's request, to extend interim limits for ammonia based on recent heavy rainfall.
May 26, 2009	Modification	Per BFI's request, to extend interim limits for ammonia based on recent heavy rainfall.
April 21, 2009	Modification	BFI requested interim limits for ammonia for the discharge of accumulated leachate from recent rainfall.
March 20, 2009	Modification	WSACC reopened IUP to include LTMP changes and amend daily maximum civil penalty.
January 1, 2005	Renewal	IUP renewal for 5 years.
April 1, 2004	Modification	To amend the self-monitoring requirement for the priority pollutant scan.

C. Authorization Statement:

1. The Permittee is hereby authorized to discharge wastewater in accordance with the effluent limitations, monitoring requirements, and all other conditions set forth in this Industrial User Pretreatment Permit (IUP) into the sewer collection system and wastewater treatment facility of WSACC.

2. The Permittee is hereby authorized to continue operation of and discharge wastewater from the following treatment or pretreatment facilities, consisting of:
   - a 2.9 million gallon aeration basin;
   - a 1300 gallon pH adjustment tank(optional);
   - a 2035 gallon flocculation tank;
   - a 1034 gallon clarifier;
   - a 1900 surge tank;
   - an effluent flowmeter; and
   - an effluent sampler.

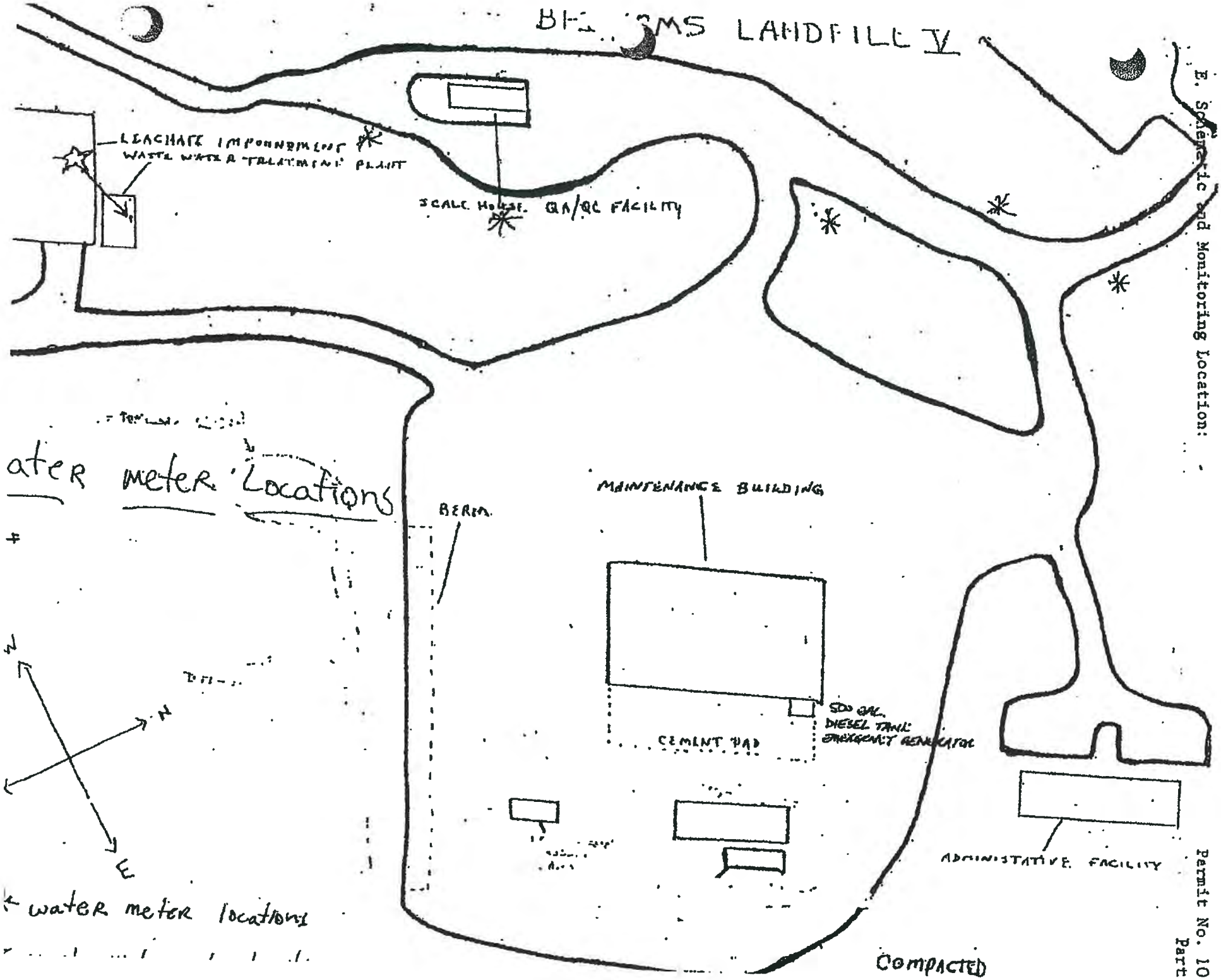
3. After receiving authorization to construct from WSACC, construct and operate additional pretreatment units as needed to meet final effluent limitations, monitoring requirements and all other conditions set forth in Parts I, II, and III hereof.

4. Dispose of pretreatment solids through dewatering and landfilling, which is subject to approval from the North Carolina Department of Environment, Health and Natural Resources, Division of Solid Waste Management.

D. Description of Discharge

Pipe	Description
Pipe 01	Pretreated leachate from the landfill for municipal solid waste and wastewater from the electrical generating plant.
Pipe 02	Domestic sewage
Pipe 03	Wastewater from washing trucks.

* Pipe 02: Discharge at Pipe 02 of pollutants at levels above those associated with typical domestic sewage is prohibited. The discharge from this pipe may be monitored periodically and unannounced by WSACC to assess compliance. Should a requirement to use Pipe 02 for the discharge of process wastewater arise, a permit application must be submitted to WSACC and a new permit issued prior to any such discharge.



E. Schematic and Monitoring Location:

Permit No. 10
Part

F. Effluent Limits and Monitoring Requirements

Effective October 12, 2010 and lasting until midnight on December 31, 2014, the Permittee is authorized to discharge wastewater from pipe 01. This discharge shall be limited and monitored as specified below. Parameters and prohibitions not limited in this permit shall be regulated and limited in compliance with WSACC Sewer Use Ordinance and applicable federal categorical regulation.

	Effluent Limitation (lbs/day)		Monitoring Frequency		
Limited Parameter	Daily Maximum	Maximum Monthly Avg.	Sample Type	WSACC	BFI
Flow	0.200 MGD	0.150 MGD	Continuous		Continuous
BOD	1385	923	Composite	4/month	
COD	2273	1516	Composite	4/month	
TSS	270	180	Composite	4/month	
NH_3	85.78	57.19	Composite	4/month	
Arsenic	**	**	Composite	4/6 months	
Cadmium	0.022	0.015	Composite	4/quarter	
Chromium	0.11	0.07	Composite	4/quarter	
Copper	0.086	0.058	Composite	4/quarter	
Lead	0.053	0.035	Composite	4/quarter	
Mercury	**	**	Composite	1/6 months	
Nickel	0.11	0.07	Composite	4/quarter	
Zinc	0.54	0.36	Composite	4/quarter	
*pH			Grab	4/month	
+ Priority Pollutant Scan			Composite		Biannually

* Permittee's discharge pH shall not be less than 5.0 standard units nor greater than 10.0 standard units and shall be monitored as required by WSACC.

** No limits at this time, only monitoring.

+ A priority pollutant scan shall be conducted by the Permittee biannually or twice a year. Please see definition Part I (G)(8) for specifics of monitoring frequency. WSACC may modify the frequency of the priority pollutant scan based upon the results.

G. Definitions and Limit Page notes:

In addition to the definitions in WSACC's Sewer Use Ordinance, the following definitions and requirements apply:

1. Maximum Monthly Average:

The maximum monthly average discharge is the arithmetic mean of all the samples received, evaluated and accepted by WSACC for a calendar month.

2. Daily Maximum:

The daily maximum discharge means the total discharge from all production periods during a 24-hour calendar day.

3. Continuous:

Continuous for the purpose of flow monitoring is defined as the measure of discharge flow from the facility which is documented in the form of permanent flow records and occurs without interruption.

4. DENR:

DENR means the Department of Environment and Natural Resources, State of North Carolina.

5. Composite Sample:

A 24 hour flow proportional composite sample which consists of a series of aliquots of equal volume collected from a representative point in the discharge stream over a 24 hour period with the time intervals between aliquots determined by a preset number of gallons passing through Pipe 01. Flow measurement between aliquot intervals shall be determined by the primary measuring device and wastewater meter, and the preset gallon interval between aliquot collection fixed at no greater than 1/24 of the expected total daily flow through Pipe 01.The volume of each aliquot shall be in direct proportion to the rate of flow during the time of collection.

6. Grab Sample:

A grab sample is defined as a single sample collected instantaneously at a representative point in the actively flowing discharge stream.

7. 4/Month or Monthly Monitoring Frequency:

The monthly monitoring frequency shall mean composite or grab samples collected over four (4) consecutive discharge days per month at the designated monitoring site.

8. 4/6 Months or Semiannually Monitoring Frequency:

The semiannually or 4/6 months monitoring frequency shall mean composite or grab samples collected over four (4) discharge days per six months at the designated monitoring site. For purposes of this permit, the six months periods shall be January – June and July – December.

9. Biannually Monitoring Frequency:

The biannually or twice a year monitoring frequency shall mean a composite sample collected, at the designated monitoring site, from one discharge day per six months of discharge during a calendar year. In other words, BFI should collect a wastewater sample during the first month and seventh month of discharge that occurs during the same calendar year. The months in which a discharge occurs do not have to be consecutive months. For the purposes of this IUP, the calendar year shall be January - December.

H. Flow Measurement and Monitoring Point:

1. The Permittee shall provide and operate monitoring facilities for the inspection, sampling and flow measurement of the Permittee's process wastewater discharges.

2. The approved wastewater meter shall be calibrated, at a minimum, once every six months by the manufacturer's authorized service representative.

3. The Permittee is responsible for the periodic maintenance and calibration of the meter and primary measuring device to assure accuracy. The Permittee shall, upon request of WSACC, furnish maintenance and calibration records.

4. There shall be interface capability with an Isco model sampler (contact closure); the Permittee shall purchase the interface line. WSACC shall take precedence; therefore, a splitter cable, purchased by the Permittee, will enable both WSACC and the Permittee to monitor at the same time and insure no interruption occurs in the Permittee's self-monitoring event.

5. The wastewater meter must have a non-resettable mechanical totalizer that reads in cubic feet or gallons.

6. If the wastewater meter is being used for billing or compliance, it must have permanent flow records (i.e. strip chart recordings) that include at minimum the following basic information: date, time, totalizer reading (with units), interval flow (with units), maximum flow rate (with units), primary measuring device type, and if there is a graph, a scale with units on both axis. Any interruption in such records is a violation of this permit and may result in a fine of at least $100.00 each day the interruption is allowed to continue.

7. Flow monitoring equipment and the sampling point shall be located in an area accessible to WSACC personnel without prior notification. WSACC must be supplied with any keys and/or other tools necessary to perform the aforementioned.

8. There shall be no by-pass capability of the wastewater metering devices and monitoring point(s). The Permittee is required, within thirty days after receipt of this permit, to deliver to WSACC certification that all process wastewaters discharged into WSACC's POTW, flow through pipe 01 as specified in Part I, C. of this permit.

9. The wastewater meter shall have a back-up power source (battery or generator) to insure uninterrupted measurement of the discharge flow in the event of a power failure. The back-up source shall provide power to the wastewater meter's sensor and permanent flow records for a minimum of 12 hours.

10. The Permittee shall maintain permanent flow records and maintenance and calibration records for a minimum of three years.

11. The daily wastewater meter readings shall be recorded in a binder which is to be located in the immediate area of the wastewater meter. A copy of these readings shall be submitted to WSACC by the second day of the following month.

PART II: GENERAL CONDITIONS

1. Representative Sampling:

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the specified monitoring points, before the effluent joins or is diluted by any other wastestream. Monitoring points shall not be changed without notification to, and approval by, the permit issuing authority.

2. Reporting:

a. Monitoring results obtained by the Permittee from shall be summarized and reported on the forms specified by WSACC, postmarked no later than the last day of the month following the month in which the samples were taken. The chain of custody forms shall accompany all reports. If no discharge occurs during the reporting period, "no discharge" shall be reported. Copies of these and all other reports required herein shall be submitted to WSACC and shall be sent to:

Attention: Industrial Pretreatment Coordinator
Water & Sewer Authority of Cabarrus County
6400 Breezy Lane
Concord, N.C. 28025

b. If the monitoring performed by the Permittee indicates a violation, the Permittee shall notify WSACC within 24 hours of becoming aware of the violation(s). The Permittee shall also repeat the sampling and analysis and submit the results of the repeat analysis to WSACC within thirty (30) days after becoming aware of the violation.

c. If no self-monitoring is required by this IUP, and the sampling performed by WSACC indicates a violation, WSACC shall repeat the sampling and analysis and receive the results of the repeat analysis within 30 days after becoming aware of the violation.

3. Test procedures:

Test procedures for the analysis of pollutants shall be performed in accordance with the techniques prescribed in 40 CFR 136 and amendments thereto (unless specified otherwise in the monitoring conditions of this permit) by a North Carolina Division of Environmental Management Certified Laboratory that is certified in the analysis of the pollutant in wastewater.

7. Duty to Mitigate - Prevention of Adverse Impact:

The Permittee shall take all reasonable steps to prevent or minimize any discharge in violation of this permit which has the potential of adversely affecting human health, the sewer system, wastewater treatment plant, receiving waters, or environment, including such accelerated or additional monitoring necessary to determine the nature and impact of the non- complying discharge or installation of necessary pretreatment methods or devices which will insure compliance.

8. Facilities Operation, Bypass:

The Permittee shall at all times maintain in good working order and operate as efficiently as possible, all control facilities or systems installed or used by the Permittee to achieve compliance with the terms and conditions of this permit. Bypass of treatment facilities is prohibited except when approved in advance by WSACC. Bypass approval shall be given only when such bypass is in compliance with 40 CFR 403.17.

9. Removed Substances:

Solids, sludges, filter backwash or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in an approved manner such as to prevent any pollutants from such materials from entering the sewer system. The Permittee is responsible for assuring its compliance with any requirements regarding the generation, treatment, storage, and/or disposal of "hazardous waste" as defined under the Federal Resource Conservation and Recovery Act.

10. Upset Conditions:

An "upset" means an exceptional incident in which there is an unintentional and temporary noncompliance with the effluent limitations of this permit because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed or inadequate treatment facilities, lack of preventative maintenance, or careless or improper operations.

An upset may constitute an affirmative defense for action brought for the noncompliance. The Permittee has the burden of proof to provide evidence and demonstrate that none of the specifically listed above were responsible for the noncompliance.

14. Signatory Requirements:

All reports or information submitted pursuant to the requirements of this permit must be signed and certified by the Authorized Representative as defined under the Sewer Use Ordinance. If the designation of an Authorized Representative is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, or overall responsibility for environmental matters for the company, a new authorization satisfying the requirements of this section must be submitted to WSACC prior to or together with any reports to be signed by an authorized representative.

15. Toxic Pollutants:

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Federal Clean Water Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit may be revised or modified in accordance with the toxic effluent standard or prohibition and the Permittee so notified.

16. Civil and Criminal Liability:

Nothing in this permit shall be construed to relieve the Permittee from civil or criminal penalties for noncompliance.

17. Federal, State and/or Local Laws:

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities or penalties established pursuant to any applicable Federal and/or State laws or regulations or WSACC's Sewer Use Ordinance.

18. Penalties:

The Sewer Use Ordinance of WSACC provides that any person who violates a permit condition is subject to a civil penalty not to exceed $25,000 dollars per day of such violation for as long as the violation(s) continues.

Under state law, (NCGS 143-215.6B), under certain circumstances it is a crime to violate terms, conditions, or requirements of pretreatment permits. It is a crime to knowingly make any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance. These crimes are enforced at the prosecutorial discretion of the local District Attorney.

26. Reports of Changed Conditions:

The Permittee shall give notice to WSACC of any planned significant changes to the Permittee's operations or system which might alter the nature, quality, or volume of its wastewater at least 180 days before the change. The Permittee shall not begin the changes until receiving written approval from WSACC. Also, see Part II (30) below for additional reporting requirements for spill/slug issues.

Significant changes may include but are not limited to:
(a) increases or decreases to production;
(b) increases in discharge of previously reported pollutants;
(c) discharge of pollutants not previously reported to WSACC;
(d) new or changed product lines;
(e) new or changed manufacturing processes and/or chemicals; or
(f) new or changed customers.

27. Construction:

No construction of pretreatment facilities or additions thereto shall begin until Final Plans and Specifications have been submitted to WSACC and written approval and an Authorization to Construct have been issued

28. Categorical Standard Reopener:

This permit shall be modified, or alternatively, revoked and reissued to comply with any applicable effluent standard or limitation issued or approved under Sections 302(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

a. Contains different conditions or is otherwise more stringent than any effluent limitation in this permit; or
b. Controls any pollutant not limited in this permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

29. General Prohibitive Standards:

The Permittee shall comply with the general prohibitive discharge standards in 40 CFR 403.5 (a) and (b) of the Federal pretreatment regulations.

33. Concentration Limitation:

The Permittee shall not discharge any concentration of pollutant which has an adverse impact on the wastewater treatment plant facilities or operation.

34. Industrial Surcharges and Schedule of Payments:

a. Industrial sewer surcharges will be assessed and billed monthly in accordance with the limitations in and provisions adopted pursuant to Section 3.3 of WSACC Code (Sewer Use Ordinance) or as amended and shall be due as specified on the bill. The effluent limitations set forth in this pretreatment permit do not void any appropriate user charges (surcharges) adopted in accordance with Section 3.3.

b. Failure to pay all surcharges, fees, fines, and late fees in a timely manner may cause WSACC to initiate action to revoke the industrial user pretreatment permit.

c. Any discharge by the Permittee after revocation of the permit will be subject to a fine of $25,000 per day for as long as the discharge continues without a valid permit.

5. Permit Reopener:

The permit shall be reopened and modified or, alternatively, revoked and reissued to comply with any applicable effluent standard or limitation for the control of any pollutant shown through headworks analysis to contribute to interference, inhibition, pass through and/or toxicity at the POTW. Similarly, permit modification or reissuance shall be made for any pollutant that is otherwise limited by or appears on the POTW's NPDES discharge permit and/or is limited by 503 sludge regulations. The permit as modified or reissued under this paragraph may also contain any other requirements of State or Federal pretreatment regulations then applicable.

In the event monitoring and analysis confirm the need for additional pretreatment process(es) to reduce the concentration(s) of a pollutant or a class of pollutants, this permit shall be modified to include specific compliance schedule(s) for installation and operation of those process(es) and compliance with pollutant limits.

6. Resources Conservation and Recovery Act (RCRA):

The Resources Conservation and Recovery Act was established to control the generation, storage and disposal of hazardous wastes. Any facility that generates, stores, handles, or disposes of hazardous wastes shall meet RCRA requirements. Questions or information should be directed to the North Carolina Department of Environment and Natural Resources, Division of Solid Waste Management, Hazardous Waste Branch, (919)-733-2178.

7. Hazardous Waste:

The Permittee shall not store, process or discharge any hazardous waste into the POTW.

8. Non-regulated Wastestream(s):

The Permittee shall not introduce into the regulated wastestream any dilution, domestic and/or non-process wastewater, prior to the sampling point identified in Part I, D. of this permit for Pipe 01.

9. Slug/Spill Control Plan:

The Permittee shall provide protection from accidental and slug discharges of prohibited materials and other substances regulated by this permit. As pollutants reach the allowable loadings listed in this IUP, the Permittee shall develop a written slug/spill control plan and submit it to WSACC within thirty (30) days for approval by WSACC. The plan shall include, but is not limited to:

ACTION 1: Upon notification of a concern by WSACC, or upon BFI's detection of an elevated parameter, BFI will resample leachate on two consecutive days and have analyzed for the parameter(s) of concern. Analytical turnaround time is generally in the 7-14 day range for organic compounds, 2-3 days for metals and 5-7 days for BOD. The resampling is done to attempt to verify if the excursion was a laboratory error, an anomaly or if there is a trend of noncompliance with a pretreatment standard.

ACTION 2: If the duplicate analytical data indicates an excursion, BFI will schedule a meeting with representatives of WSACC within 48 hours to discuss the results and possible alternatives. Some possible interim alternatives include:

a. batch treat and test pond contents prior to release

b. tank truck to alternate facility

c. recycle leachate to landfill on temporary basis

d. increase aeration

f. add or change polymers

g. adjust retention time

ACTION 3: Determine corrective action. If additional treatment processes are deemed necessary (e.g. carbon adsorption canisters, sand filtration), select vendor, perform pilot testing as necessary and install equipment. At this time a schedule of compliance will be developed and submitted to WSACC.

ACTION 4: Implement and monitor for compliance.

C. EVALUATION OF LOADING AND SETTLEMENT ON HDPE LEACHATE COLLECTION PIPE

BLE INC.
BUNNELL-LAMMONS ENGINEERING, INC.
GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

April 3, 2012

Hodges, Harbin, Newberry & Tribble, Inc.
3820 Arkwright Road, Suite 101
Macon, Georgia 31210

Attention: Mr. Matt Cheek, P.E.

Subject: **Review of Final Design Overburden Height over Leachate Piping**
Case II: Long Term Loading – Finite Element Stress Distribution
Charlotte Motor Speedway Landfill
Cabarrus County, North Carolina
BLE Project No. J11-6452-04

Dear Mr. Cheek:

Bunnell-Lammons Engineering, Inc. (BLE) has completed a review of the maximum design height of solid waste and earth cover in the waste cells based on the furnished HHNT Conceptual Design Drawing CMS_V-FP-FG, dated March 16, 2012. The purpose of the review was to confirm that the maximum design height over the base liner was less than the allowable height presented in our report dated December 22, 2011.

The overburden heights and HDPE leachate piping in Cells No. 1A, 1B, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, and 2L were reviewed. Based on our review, the maximum design height over the base liner is less than the allowable height with a recommended factor of safety against crushing and buckling of 2.0.

Please contact us if you have any questions concerning this letter.

Sincerely,
BUNNELL-LAMMONS ENGINEERING, INC.

Gary L. Weekley, P.E.
Senior Engineer
Licensed, NC 8251

NORTH CAROLINA PROFESSIONAL SEAL 8251 ENGINEER GARY L. WEEKLEY
4-3-12

Daniel B. Bunnell, P.E.
Principal Engineer
Licensed, NC 13814

NORTH CAROLINA PROFESSIONAL SEAL 13814 ENGINEER DANIEL B. BUNNELL
4/3/12

Copy: Mr. H. Lowry Tribble, Jr., P.E.
Mr. Brant Lane, P.E.
Mr. Jeff Helvey, P.E.

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29615

PHONE (864) 288-1265
FAX (864) 288-4430

BLE INC.
BUNNELL-LAMMONS ENGINEERING, INC.
GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

December 22, 2011

Hodges, Harbin, Newberry & Tribble, Inc.
3820 Arkwright Road, Suite 101
Macon, Georgia 31210

Attention: Mr. R. Brant Lane, P.E.

Subject: **Revised Evaluation of Loading on HDPE Leachate Pipe**
Case II: Long Term Loading – Finite Element Stress Distribution
Charlotte Motor Speedway Landfill
Cabarrus County, North Carolina
BLE Project No. J11-6452-04

Dear Mr. Lane:

Bunnell-Lammons Engineering, Inc. (BLE) has prepared analyses to determine the factors of safety against pipe failure for varying waste overburden heights above the existing leachate HDPE piping in Cells No. 1A, 1B, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, and 2L. The analysis considered the pipe size, SDR and burial conditions provided to us by Hodges, Harbin, Newberry & Tribble, Inc. (HHNT). This analysis assumes the actual loading to the pipe is only 50 % of the prism load, with the prism load being the total weight of the waste overlying the vertical projection of the pipe. The stress distribution is based on the results of finite element modeling of the waste mound, leachate pipe and leachate stone presented by Bonaparte, Daniel and Koerner, USEPA, 2002.

Project Information: Information regarding the various pipe sizes, SDRs, and burial conditions was provided to us by HHNT in correspondence dated November 21, 2011 and December 21, 2011. An analysis of each of the following conditions was requested to determine the maximum waste height over each pipe with an appropriate factor of safety:

1. **Cells 1A and 1B** – 4-inch diameter HDPE SDR 21 pipe with no stone collection trench (Pipe is surrounded by native soil).
2. **Cells 2A and 2B** – 6-inch diameter HDPE SDR 17 pipe with the stone collection trench in a truncated pyramid shape. No stone is located on top of the pipe and approximately 1 pipe diameter of stone is provided on each side of the pipe.
3. **Cells 2C, 2D and 2L** – 6-inch diameter HDPE SDR 17 pipe with a 2-foot wide by 1-foot high stone trench.

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4. **Cell 2E** – 6-inch and 8-inch diameter HDPE SDR 17 pipe in a 2-foot wide by 2-foot high stone trench.
5. **Cell 2F** – 8-inch diameter HDPE SDR-11 pipe with a 3-foot wide by 2-foot tall stone encasement cross-section.
6. **Cells 2G and 2H** – 6-inch and 8-inch diameter HDPE SDR 11 pipe with a 3-foot wide by 18 to 20-inch tall stone cross-section.

The stone is understood to be an angular to subangular granitic stone with an ASTM No. 57 gradation.

Summary of Analysis: Using the furnished parameters indicated in the Project Information section of this report and pipe stress analysis formulas for crushing and buckling (Driscopipe Polyethylene Piping System Manual, Phillips Chemical Company, 1998), we have analyzed the existing leachate and underdrain piping under the proposed loading. The waste load on the pipe is calculated as 50 % of the prism load above the pipe using an assumed unit weight of solid waste of 70 pcf. The 50 % reduction of the prism load assumes that as the pipe deflects under the load arching occurs over the pipe which reduces the load. The analysis assumed that the piping was encased as noted in the project information section of this report. The recommended factors of safety against crushing and buckling for leachate pipe are 2.0, when using the reduced prism loading.

Ring deflection of the leachate pipe was also analyzed using the traditional Modified Iowa Formula and comparison with the pipe deflection limited to that of the strain in the material encasing the pipe.

We assumed various moduli (E′) for the confining material surrounding the pipe in accordance with the Vylon Pipe – Plastic Pipe Design Manual. We assumed a maximum allowable ring deflection of 5 percent which provides a factor of safety of approximately 2.

Summary of Results: The maximum recommended waste heights were calculated considering the appropriate factors of safety for each potential failure mode. The results of our analysis are provided on the attached spread sheets. The critical failure mode for the corresponding waste height and pipe parameters are summarized below:

Cell Number (1)	Pipe Diameter (inch)	SDR	Critical Failure Mode	Maximum Recommended Waste Height (feet)
1A / 1B	4	21	Wall Buckling	173
2A / 2B	6	17	Ring Deflection	259
2C / 2D / 2L	6	17	Ring Deflection	259
2E	6 & 8	17	Wall Crushing	410
2F	8	11	Wall Crushing / Ring Deflection	>500
2G & 2H	6 & 8	11	Wall Crushing	414

Note (1): Pipe encasement details are provided in the Project Information section of this report. In addition, the constrained modulus for each pipe encasement condition selected to determine the maximum waste height for that condition is noted in the attached calculation results tables.

Please call if you have any questions concerning this letter and the attached information.

Sincerely,

BUNNELL-LAMMONS ENGINEERING, INC.

12-22-11

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Attachments: Design Method Example – Cells 2A & 2B, 6-inch diameter SDR 17 pipe
Design Method Example – Cells 1A & 1B, 4-inch diameter SDR 21 pipe
Pipe Stress Results, Long Term Load – 50 % of Prism Load (Finite Element Reduction)

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE

HDPE PIPE STRESS ANALYSIS

Conditions: Cell 2A and 2B – 6-inch SDR 17 pipe with the stone collection trench in a truncated pyramid shape. No stone is located on top of the pipe and approximately 1 pipe diameter is present on each side of the pipe.

(Ref. Driscopipe Polyethylene Piping System Manual, Phillips Chemical Company, 1998)

1. Determine the total pressure at the top of leachate pipe

$P_t = P_s + P_l + P_i$

P_t: Total Pressure
P_s: Total Static Pressure
P_l: Total Live Pressure
P_i: Total Internal Pressure

$P_l = 0$ (Assume no Equipment Load)
$P_i = 0$ (Gravity Flow Pipe – No Internal Pressure)
$P_s = P_{de} + P_{we} + P_b$

P_{de} : Static load pressure of dry or slightly moist soil
P_{we} : Static load pressure of wet, saturated soil under the water table
P_b : Static load pressure due to stationary structures

P_{we}: Soil and waste are moist but not saturated. Top of pipe is above leachate. Therefore $P_{we} = 0$
P_b: No structures. Therefore, $P_b = 0$
P_{de}: Varies with waste height (259 feet in this example).

$P_{de} = (H_{waste} - 3.5'_{pc/stone\ and\ final\ cover\ soil}) \times \gamma_{waste} + H_{pc/stone} \times \gamma_{pc/stone} + H_{final\ cover\ soil} \times \gamma_{final\ cover\ soil}$

$H_{waste} = 259$ feet (difference between the final cover and base liner elevations)
$\gamma_{waste} = 70$ pcf
$H_{leachate\ collection\ stone} = 1.5$ feet (protective cover soil / leachate stone thickness above the pipe)
$\gamma_{pc/stone} = 115$ pcf (for moderately compacted protective cover soil)
$H_{soil\ cover} = 2$ feet (final cover soil)
$\gamma_{soil\ cover} = 120$ pcf

For this example, $P_{de} = (259 - 3.5) \times 70 + (1.5 \times 115) + (2 \times 120) = 18{,}298$ psf = 127 psi

$P_t = P_s = P_{de}$ (for this example).

Total Pressure (P_t) = 127 psi is reduced by 50% for the Case II Long Term Condition
= **63.5 psi**

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE

HDPE PIPE STRESS ANALYSIS

(References. Driscopipe Polyethylene Piping System Manual, Phillips Chemical Company, 1998.
Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.
Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.
Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data)

2. Calculate Factor of Safety against Wall Crushing – Case II:

Wall Crushing occurs when total pressure (P_t) exceeds actual compressive pressure (S_a).
The total pressure (P_t) value is reduced by 50% for the Long Term (Case II)
$S_a = [(SDR - 1) / 2] \times P_t$

S_a:	Actual Compressive Pressure (in this example, under 259 feet of waste)
SDR:	Standard Dimension Ratio (SDR 17 in this example)
P_t:	Total Pressure (calculated in step 1 reduced by 50% for Case II)

$P_t = 63.5$ psi
SDR = 17

$S_a = [(17-1) / 2] \times 63.5 = 508$ psi

FS against wall crushing equals the compressive strength of HDPE pipe, 1,600 psi, divided by the actual Compressive Pressure, S_a.

FS = 1,600 / 508= 3.15

(FS $\geq$ 2 Therefore, the Cell No. 2A-2B, 6-inch diameter SDR 17 pipe under 259 feet of waste is acceptable against crushing failure).

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE

HDPE PIPE STRESS ANALYSIS

3. Calculate Factor of Safety against Wall Buckling:

Buckling occurs when total pressure (P_t) exceeds critical buckling soil pressure (P_{cb}).

$P_{cb} = 0.8\sqrt{(E' \times P_c)}$

P_{cb}: Critical buckling pressure

P_c: Critical collapse differential pressure

E′: Modulus of material surrounding pipe

For this example, moderately compacted protective cover soil (CL, ML, SM, SC) in Cell 2A and 2B over the 6-inch diameter SDR 17 pipe with the stone collection trench in a truncated pyramid shape. No stone is located on top of the pipe and approximately 1 pipe diameter of stone is present on each side of the pipe. Based on this information, an E′ value of 2,000 psi was selected from the published values in the Vylon Plastic Pipe Design Manual.

$P_c = 2.32 \times E / SDR^3$

E: Tensile Modulus of Elasticity.

In the case of buried pipe in landfills, use 28,200 psi. This value corresponds to an elastic modulus for HDPE pipe (PE 3608) at 50 years and 73° F.
Reference Table 1: Typical Elastic Modulus for DriscoPlex PE 3608 in Book 2 Chapter 5 in the Performance Pipe Engineering Manual. First Addition, 2003.

$P_c = (2.32 \times 28{,}200) / 17^3 = 13.32$ psi

$P_{cb} = 0.8\sqrt{(2{,}000 \times 13.32)} = 130.6$ psi

FS against wall buckling equals the Critical Buckling Soil Pressure (P_{cb}) divided by the Total Pressure (P_t). The Total Pressure is reduced by 50% in the Long Term (Case II)

FS = 130.6 / 63.5 psi = 2.06

FS $\geq$ 2 Therefore, the Cell No. 2A – 2B SDR 17 pipe under 259 feet of waste is acceptable against buckling failure (*Reference: Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25. Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994. Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data*).

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE
HDPE PIPE STRESS ANALYSIS

4. Calculate Factor of Safety against excessive Ring Deflection:

Deflection of flexible pipe under prism loading is given by the Modified Iowa Formula:

$\Delta y = (k \times D_L \times W) / ((0.149 \times (4.472 \times E / (SDR - 1)^3)) + 0.061 \times E')$

where: k = Bedding Constant = 0.1

D_L =Deflection Lag Factor = 1

W = Prism Load per inch reduced by 50% for Case II = 63.5 psi x 6 inch pipe diameter = 381 pounds per inch for 259 ft of waste in the Long Term (Case II).

E = Modulus of Elasticity of HDPE = 28,200 psi

E′ = Modulus of soil surrounding pipe = 2,000 psi

SDR = Standard Dimension Ratio, 17

$\Delta y = (0.1 * 1 * 381) / (0.149 \times ((4.472 \times 28{,}200) / (17-1)^3) + 0.061 \times 2{,}000)$

$\Delta y = 38.1 / (4.59 + 122) = 0.3$ inch of vertical deflection under 259 feet of waste

% Ring Deflection = $(1 - D_{min} / D_o) \times 100$

where: D_o = Original Pipe Diameter = 6 inches

D_{min} = Minimum Pipe Diameter = $6 - \Delta y = 6 - 0.3 = 5.7$ inches

% Ring Deflection = $(1 - 5.7 / 6) \times 100 = 5.0$ %, therefore OK

(% Ring Deflection should be 5 % or less to yield a Factor of Safety of 2 or greater.)

Alternatively, the pipe deflection and ring deflection may be assumed to be governed by the lateral soil displacement.

$\Delta y = W / E'$ *{units: pounds / inch divided by pounds / inch^2 = inch}*

$\Delta y = 381 / 2{,}000 = 0.19$ inch

% Ring Deflection = $(1 - (6 - 0.19) / 6) \times 100 = 3.17$ % OK, Ring Deflection less than 5 %

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE

HDPE PIPE STRESS ANALYSIS

Conditions: Cell 1A and 1B – 4-inch SDR 21 pipe with no stone. Bedded in silty sand / sandy silt native soils.

(Ref. Driscopipe Polyethylene Piping System Manual, Phillips Chemical Company, 1998)

1. Determine the total pressure at the top of leachate pipe

$P_t = P_s + P_l + P_i$

P_t: Total Pressure
P_s: Total Static Pressure
P_l: Total Live Pressure
P_i: Total Internal Pressure

$P_l = 0$ (Assume no Equipment Load)
$P_i = 0$ (Gravity Flow Pipe – No Internal Pressure)
$P_s = P_{de} + P_{we} + P_b$

P_{de}: Static load pressure of dry or slightly moist soil
P_{we}: Static load pressure of wet, saturated soil under the water table
P_b: Static load pressure due to stationary structures

P_{we}: Soil and waste are moist but not saturated. Top of pipe is above leachate. Therefore $P_{we} = 0$
P_b: No structures. Therefore, $P_b = 0$
P_{de}: Varies with waste height (173 feet in this example).

$P_{de} = (H_{waste} - 3.67'_{pc/stone\ and\ final\ cover\ soil}) \times \gamma_{waste} + H_{pc/stone} \times \gamma_{pc/stone} + H_{final\ cover\ soil} \times \gamma_{final\ cover\ soil}$

$H_{waste} = 173$ feet (difference between the final cover and base liner elevations)
$\gamma_{waste} = 70$ pcf
$H_{leachate\ collection\ stone} = 1.67$ feet (protective cover soil thickness above the pipe)
$\gamma_{pc/stone} = 120$ pcf (for moderately compacted protective cover soil)
$H_{soil\ cover} = 2$ feet (final cover soil)
$\gamma_{soil\ cover} = 120$ pcf

For this example, $P_{de} = (173 - 3.67) \times 70 + (1.67 \times 120) + (2 \times 120) = 12{,}293.5$ psf $= 85.37$ psi

$P_t = P_s = P_{de}$ (for this example).

Total Pressure (P_t) = 85.37 psi is reduced by 50% for the Case II Long Term Condition
= **42.7 psi**

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE

HDPE PIPE STRESS ANALYSIS

(References. Driscopipe Polyethylene Piping System Manual, Phillips Chemical Company, 1998.
Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.
Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.
Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data)

2. Calculate Factor of Safety against Wall Crushing – Case II:

Wall Crushing occurs when total pressure (P_t) exceeds actual compressive pressure (S_a).
The total pressure (P_t) value is reduced by 50% for the Long Term (Case II)
$S_a = [(SDR - 1) / 2] \times P_t$

S_a: Actual Compressive Pressure (in this example, under 173 feet of waste)
SDR: Standard Dimension Ratio (SDR 21 in this example)
P_t: Total Pressure (calculated in step 1 reduced by 50% for Case II)

$P_t = 42.7$ psi
SDR = 21

$S_a = [(21-1) / 2] \times 42.7 = 427$ psi

FS against wall crushing equals the compressive strength of HDPE pipe, 1,600 psi, divided by the actual Compressive Pressure, S_a.

FS = 1,600 / 427= 3.75

(FS $\geq$ 2 Therefore, the Cell No. 1A-1B, 4-inch diameter SDR 21 pipe under 173 feet of waste is acceptable against crushing failure).

LONG TERM (CASE II) DESIGN METHOD AND EXAMPLE

HDPE PIPE STRESS ANALYSIS

3. Calculate Factor of Safety against Wall Buckling:

Buckling occurs when total pressure (P_t) exceeds critical buckling soil pressure (P_{cb}).

$P_{cb} = 0.8\sqrt{(E' \times P_c)}$

P_{cb}: Critical buckling pressure

P_c: Critical collapse differential pressure

E′: Modulus of material surrounding pipe

For this example, moderately compacted protective cover soil (CL, ML, SM, SC) in Cell 1A and 1B over the 4-inch diameter SDR 21 pipe with the no stone collection trench. The pipe is bedded in moderately compacted ML soils. Based on this information, an E′ value of 1,600 psi was selected from the published values in the Vylon Plastic Pipe Design Manual.

$P_c = 2.32 \times E / SDR^3$

E: Tensile Modulus of Elasticity.

In the case of buried pipe in landfills, use 28,200 psi. This value corresponds to an elastic modulus for HDPE pipe (PE 3608) at 50 years and 73° F.
Reference Table 1: Typical Elastic Modulus for DriscoPlex PE 3608 in Book 2 Chapter 5 in the Performance Pipe Engineering Manual. First Addition, 2003.

$P_c = (2.32 \times 28{,}200) / 21^3 = 7.06$ psi

$P_{cb} = 0.8\sqrt{(1{,}600 \times 13.32)} = 85.1$ psi

FS against wall buckling equals the Critical Buckling Soil Pressure (P_{cb}) divided by the Total Pressure (P_t). The Total Pressure is reduced by 50% in the Long Term (Case II)

FS = 85.1 / 42.7 psi = 2.0

FS $\geq$ 2 Therefore, the Cell No. 1A – 1B SDR 21 pipe under 173 feet of waste is acceptable against buckling failure (*Reference: Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25. Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994. Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data*).

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL

CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04

December 5, 2011

Cells 1A & 1B

Design Height over the Base Liner (feet)	100	120	130	150	160	173	186	200	250	300	400
Total External Pressure (psi)[1]	25	30	32	37	39	43	46	49	61	73	98
Wall Crushing (psi)	249	297	322	370	394	426	458	492	613	735	978
Factor of Safety against Wall Crushing	**6.44**	**5.38**	**4.98**	**4.32**	**4.06**	**3.76**	**3.50**	**3.25**	**2.61**	**2.18**	**1.64**
Critical Collapse Differential Pressure (psi)	7	7	7	7	7	7	7	7	7	7	7
Total Buckling Pressure (psi)[2]	85	85	85	85	85	85	85	85	85	85	85
Factor of Safety against Wall Buckling	**3.42**	**2.86**	**2.65**	**2.30**	**2.16**	**2.00**	**1.86**	**1.73**	**1.39**	**1.16**	**0.87**
Vertical Deflection, inch (based on soil/stone modulus)	0.06	0.07	0.08	0.09	0.10	0.11	0.11	0.12	0.15	0.18	0.24
Strain, %	1.55	1.86	2.01	2.31	2.47	2.66	2.86	3.07	3.83	4.59	6.11
Factor of Safety against Ring Deflection Failure[3]	**6.44**	**5.38**	**4.98**	**4.32**	**4.06**	**3.76**	**3.50**	**3.25**	**2.61**	**2.18**	**1.64**
Vertical Deflection, inch (based on Iowa Formula)	0.10	0.12	0.13	0.15	0.16	0.17	0.18	0.19	0.24	0.29	0.39
Ring Deflection, %	2.49	2.97	3.22	3.70	3.95	4.26	4.58	4.92	6.14	7.35	9.78
Factor of Safety against Ring Deflection Failure[3]	**4.02**	**3.36**	**3.11**	**2.70**	**2.53**	**2.35**	**2.18**	**2.03**	**1.63**	**1.36**	**1.02**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 1,600 **psi**

Encasment Conditions: **No Stone encasement. Pipe is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**

The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.

Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.

Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.

Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: Jeff Helvey, P.E.
Reviewed by:

Pipe SDR	21
Nominal Pipe Diameter (feet)	0.33
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	120
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL

CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04

December 5, 2011

Cells 2A and 2B

Design Height over the Base Liner (feet)	100	120	130	150	160	185	186	200	250	259	300
Total External Pressure (psi)[1]	25	30	32	37	39	45	46	49	61	63.44	73
Wall Crushing (psi)	198	237	257	296	315	364	366	393	490	508	587
Factor of Safety against Wall Crushing	**8.07**	**6.74**	**6.23**	**5.41**	**5.08**	**4.40**	**4.38**	**4.07**	**3.27**	**3.15**	**2.72**
Critical Collapse Differential Pressure (psi)	13	13	13	13	13	13	13	13	13	13	13
Total Buckling Pressure (psi)[2]	131	131	131	131	131	131	131	131	131	131	131
Factor of Safety against Wall Buckling	**5.27**	**4.40**	**4.07**	**3.53**	**3.32**	**2.87**	**2.86**	**2.66**	**2.13**	**2.06**	**1.78**
Vertical Deflection, inch (based on soil/stone modulus)	0.07	0.09	0.10	0.11	0.12	0.14	0.14	0.15	0.18	0.19	0.22
Strain, %	1.24	1.48	1.60	1.85	1.97	2.27	2.28	2.45	3.06	3.17	3.67
Factor of Safety against Ring Deflection Failure[3]	**8.07**	**6.74**	**6.23**	**5.41**	**5.08**	**4.40**	**4.38**	**4.07**	**3.27**	**3.15**	**2.72**
Vertical Deflection, inch (based on Iowa Formula)	0.12	0.14	0.15	0.18	0.19	0.22	0.22	0.23	0.29	0.30	0.35
Ring Deflection, %	1.96	2.34	2.53	2.92	3.11	3.59	3.61	3.88	4.84	5.01	5.80
Factor of Safety against Ring Deflection Failure[3]	**5.11**	**4.27**	**3.95**	**3.43**	**3.21**	**2.79**	**2.77**	**2.58**	**2.07**	**2.00**	**1.72**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 2,000 **psi**

Encasment Conditions: **1 pipe diameter of stone on the flanks. No stone on top of the pipe. Stone is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**

The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.

Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.

Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.

Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: Jeff Helvey, P.E.
Reviewed by:

Pipe SDR	17
Nominal Pipe Diameter (feet)	0.5
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	115
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL

CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04

December 5, 2011

Cells 2C, 2D and 2L

Design Height over the Base Liner (feet)	100	120	130	150	160	185	186	200	250	259	300
Total External Pressure (psi)[1]	25	30	32	37	39	45	46	49	61	63	73
Wall Crushing (psi)	198	237	257	296	315	364	366	393	490	508	587
Factor of Safety against Wall Crushing	**8.07**	**6.74**	**6.23**	**5.41**	**5.08**	**4.40**	**4.38**	**4.07**	**3.27**	**3.15**	**2.72**
Critical Collapse Differential Pressure (psi)	13	13	13	13	13	13	13	13	13	13	13
Total Buckling Pressure (psi)[2]	131	131	131	131	131	131	131	131	131	131	131
Factor of Safety against Wall Buckling	**5.27**	**4.40**	**4.07**	**3.53**	**3.32**	**2.87**	**2.86**	**2.66**	**2.13**	**2.06**	**1.78**
Vertical Deflection, inch (based on soil/stone modulus)	0.07	0.09	0.10	0.11	0.12	0.14	0.14	0.15	0.18	0.19	0.22
Strain, %	1.24	1.48	1.60	1.85	1.97	2.27	2.28	2.45	3.06	3.17	3.67
Factor of Safety against Ring Deflection Failure[3]	**8.07**	**6.74**	**6.23**	**5.41**	**5.08**	**4.40**	**4.38**	**4.07**	**3.27**	**3.15**	**2.72**
Vertical Deflection, inch (based on Iowa Formula)	0.12	0.14	0.15	0.18	0.19	0.22	0.22	0.23	0.29	0.30	0.35
Ring Deflection, %	1.96	2.34	2.53	2.92	3.11	3.59	3.61	3.88	4.84	5.01	5.80
Factor of Safety against Ring Deflection Failure[3]	**5.11**	**4.27**	**3.95**	**3.43**	**3.21**	**2.79**	**2.77**	**2.58**	**2.07**	**2.00**	**1.72**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 2,000 **psi**

Encasment Conditions: **A 1-foot high by 2-foot wide stone trench. Stone is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**

The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.

Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.

Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.

Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: **Jeff Helvey, P.E.**

Reviewed by:

Pipe SDR	17
Nominal Pipe Diameter (feet)	0.5
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	110
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL

CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04

December 5, 2011

Cell 2E - 6-inch pipe

Design Height over the Base Liner (feet)	200	250	300	350	375	380	385	390	405	410	415
Total External Pressure (psi)[1]	49	61	73	86	92	93	94	95	99	100	101
Wall Crushing (psi)	393	490	587	684	733	743	753	762	791	801	811
Factor of Safety against Wall Crushing	**4.07**	**3.27**	**2.72**	**2.34**	**2.18**	**2.15**	**2.13**	**2.10**	**2.02**	**2.00**	**1.97**
Critical Collapse Differential Pressure (psi)	13	13	13	13	13	13	13	13	13	13	13
Total Buckling Pressure (psi)[2]	206	206	206	206	206	206	206	206	206	206	206
Factor of Safety against Wall Buckling	**4.20**	**3.37**	**2.81**	**2.41**	**2.25**	**2.22**	**2.19**	**2.17**	**2.09**	**2.06**	**2.04**
Vertical Deflection, inch (based on soil/stone modulus)	0.06	0.07	0.09	0.10	0.11	0.11	0.11	0.11	0.12	0.12	0.12
Strain, %	0.98	1.23	1.47	1.71	1.83	1.86	1.88	1.91	1.98	2.00	2.03
Factor of Safety against Ring Deflection Failure[3]	**10.18**	**8.16**	**6.81**	**5.84**	**5.46**	**5.39**	**5.32**	**5.25**	**5.05**	**4.99**	**4.93**
Vertical Deflection, inch (based on Iowa Formula)	0.10	0.12	0.14	0.17	0.18	0.18	0.18	0.18	0.19	0.19	0.20
Ring Deflection, %	1.59	1.98	2.37	2.76	2.96	3.00	3.04	3.08	3.20	3.23	3.27
Factor of Safety against Ring Deflection Failure[3]	**6.31**	**5.05**	**4.22**	**3.62**	**3.38**	**3.33**	**3.29**	**3.25**	**3.13**	**3.09**	**3.05**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 5,000 **psi**

Encasment Conditions: **A 2-foot high by 2-foot wide stone trench. Stone is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**

The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.

Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.

Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.

Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: Jeff Helvey, P.E.

Reviewed by:

Pipe SDR	17
Nominal Pipe Diameter (feet)	0.5
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	110
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL

CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04
December 5, 2011

Cell 2E - 8-inch pipe

Design Height over the Base Liner (feet)	200	250	300	350	375	380	385	390	405	410	415
Total External Pressure (psi)[1]	49	61	73	85	92	93	94	95	99	100	101
Wall Crushing (psi)	392	489	587	684	732	742	752	762	791	801	810
Factor of Safety against Wall Crushing	**4.08**	**3.27**	**2.73**	**2.34**	**2.18**	**2.16**	**2.13**	**2.10**	**2.02**	**2.00**	**1.97**
Critical Collapse Differential Pressure (psi)	13	13	13	13	13	13	13	13	13	13	13
Total Buckling Pressure (psi)[2]	206	206	206	206	206	206	206	206	206	206	206
Factor of Safety against Wall Buckling	**4.21**	**3.37**	**2.81**	**2.41**	**2.25**	**2.23**	**2.20**	**2.17**	**2.09**	**2.06**	**2.04**
Vertical Deflection, inch (based on soil/stone modulus)	0.08	0.10	0.12	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16
Strain, %	0.98	1.22	1.47	1.71	1.83	1.86	1.88	1.90	1.98	2.00	2.03
Factor of Safety against Ring Deflection Failure[3]	**10.20**	**8.17**	**6.82**	**5.85**	**5.46**	**5.39**	**5.32**	**5.25**	**5.06**	**5.00**	**4.94**
Vertical Deflection, inch (based on Iowa Formula)	0.13	0.16	0.19	0.22	0.24	0.24	0.24	0.25	0.26	0.26	0.26
Ring Deflection, %	1.58	1.98	2.37	2.76	2.96	3.00	3.04	3.08	3.19	3.23	3.27
Factor of Safety against Ring Deflection Failure[3]	**6.31**	**5.06**	**4.22**	**3.62**	**3.38**	**3.34**	**3.29**	**3.25**	**3.13**	**3.09**	**3.06**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 5,000 **psi**

Encasment Conditions: **A 2-foot high by 2-foot wide stone trench. Stone is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**

The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.

Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.

Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.

Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: Jeff Helvey, P.E.
Reviewed by:

Pipe SDR	17
Nominal Pipe Diameter (feet)	0.67
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	110
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL

CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04
December 5, 2011

Cells 2F

Design Height over the Base Liner (feet)	200	250	300	350	375	380	385	400	500	655	700
Total External Pressure (psi)[1]	49	61	73	85	92	93	94	98	122	160	171
Wall Crushing (psi)	245	306	367	427	458	464	470	488	610	798	853
Factor of Safety against Wall Crushing	**6.53**	**5.23**	**4.36**	**3.74**	**3.49**	**3.45**	**3.40**	**3.28**	**2.62**	**2.00**	**1.88**
Critical Collapse Differential Pressure (psi)	49	49	49	49	49	49	49	49	49	49	49
Total Buckling Pressure (psi)[2]	397	397	397	397	397	397	397	397	397	397	397
Factor of Safety against Wall Buckling	**8.09**	**6.48**	**5.41**	**4.64**	**4.33**	**4.27**	**4.22**	**4.06**	**3.25**	**2.48**	**2.33**
Vertical Deflection, inch (based on soil/stone modulus)	0.08	0.10	0.12	0.14	0.15	0.15	0.15	0.16	0.20	0.26	0.27
Strain, %	0.98	1.22	1.47	1.71	1.83	1.86	1.88	1.95	2.44	3.19	3.41
Factor of Safety against Ring Deflection Failure[3]	**10.20**	**8.17**	**6.82**	**5.85**	**5.46**	**5.39**	**5.32**	**5.12**	**4.10**	**3.13**	**2.93**
Vertical Deflection, inch (based on Iowa Formula)	0.12	0.15	0.18	0.21	0.23	0.23	0.23	0.24	0.30	0.40	0.42
Ring Deflection, %	1.51	1.89	2.26	2.64	2.83	2.87	2.90	3.02	3.77	4.93	5.27
Factor of Safety against Ring Deflection Failure[3]	**6.60**	**5.29**	**4.42**	**3.79**	**3.54**	**3.49**	**3.44**	**3.32**	**2.66**	**2.03**	**1.90**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 5,000 **psi**

Encasment Conditions: A 2-foot high by 3-foot wide stone trench. Stone is surrounded by native soil protective cover assumed to be moderately compacted.

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**

The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.

Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.

Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.

Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: Jeff Helvey, P.E.
Reviewed by:

Pipe SDR	11
Nominal Pipe Diameter (feet)	0.67
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	110
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL
CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04
December 5, 2011

Cells 2G and 2H - 6-inch pipe

Design Height over the Base Liner (feet)	200	250	300	350	375	380	385	400	410	414	425
Total External Pressure (psi)[1]	49	61	73	86	92	93	94	98	100	101	104
Wall Crushing (psi)	245	306	367	428	458	464	470	489	501	506	519
Factor of Safety against Wall Crushing	**6.52**	**5.22**	**4.36**	**3.74**	**3.49**	**3.45**	**3.40**	**3.28**	**3.20**	**3.16**	**3.08**
Critical Collapse Differential Pressure (psi)	49	49	49	49	49	49	49	49	49	49	49
Total Buckling Pressure (psi)[2]	307	307	307	307	307	307	307	307	307	307	307
Factor of Safety against Wall Buckling	**6.26**	**5.02**	**4.19**	**3.59**	**3.35**	**3.31**	**3.27**	**3.14**	**3.07**	**3.04**	**2.96**
Vertical Deflection, inch (based on soil/stone modulus)	0.10	0.12	0.15	0.17	0.18	0.19	0.19	0.20	0.20	0.20	0.21
Strain, %	1.64	2.04	2.45	2.85	3.05	3.09	3.14	3.26	3.34	3.37	3.46
Factor of Safety against Ring Deflection Failure[3]	**6.11**	**4.90**	**4.09**	**3.51**	**3.27**	**3.23**	**3.19**	**3.07**	**3.00**	**2.97**	**2.89**
Vertical Deflection, inch (based on Iowa Formula)	0.15	0.18	0.22	0.25	0.27	0.28	0.28	0.29	0.30	0.30	0.31
Ring Deflection, %	2.43	3.04	3.64	4.24	4.54	4.60	4.66	4.84	4.96	5.01	5.14
Factor of Safety against Ring Deflection Failure[3]	**4.11**	**3.29**	**2.75**	**2.36**	**2.20**	**2.17**	**2.15**	**2.07**	**2.02**	**2.00**	**1.94**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 3,000 **psi**

Encasment Conditions: **A 1.5-foot high by 3-foot wide stone trench. Stone is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**
The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.
Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.
Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.
Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: **Jeff Helvey, P.E.**
Reviewed by:

Pipe SDR	11
Nominal Pipe Diameter (feet)	0.5
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	110
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

PIPE STRESS ANALYSIS RESULTS CASE II: LONG TERM LOAD - 50 % OF PRISM LOAD (FINITE ELEMENT REDUCTION)

HDPE LEACHATE PIPE WALL CRUSHING, BUCKLING & RING DEFLECTION - 50 YR DESIGN LIFE (73° F)

LONG TERM ANALYSIS (MINIMUM FS ≥ 2.0)

CMS LANDFILL
CABARRUS COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project No. J11-6452-04
December 5, 2011

Cells 2G and 2H - 8-inch pipe

Design Height over the Base Liner (feet)	200	250	300	350	375	380	385	400	410	414	425
Total External Pressure (psi)[1]	49	61	73	85	92	93	94	98	100	101	104
Wall Crushing (psi)	245	306	367	427	458	464	470	488	500	505	519
Factor of Safety against Wall Crushing	**6.53**	**5.23**	**4.36**	**3.74**	**3.49**	**3.45**	**3.40**	**3.28**	**3.20**	**3.17**	**3.09**
Critical Collapse Differential Pressure (psi)	49	49	49	49	49	49	49	49	49	49	49
Total Buckling Pressure (psi)[2]	307	307	307	307	307	307	307	307	307	307	307
Factor of Safety against Wall Buckling	**6.27**	**5.02**	**4.19**	**3.59**	**3.36**	**3.31**	**3.27**	**3.15**	**3.07**	**3.04**	**2.96**
Vertical Deflection, inch (based on soil/stone modulus)	0.13	0.16	0.20	0.23	0.25	0.25	0.25	0.26	0.27	0.27	0.28
Strain, %	1.63	2.04	2.44	2.85	3.05	3.09	3.13	3.25	3.34	3.37	3.46
Factor of Safety against Ring Deflection Failure[3]	**6.12**	**4.90**	**4.09**	**3.51**	**3.28**	**3.23**	**3.19**	**3.07**	**3.00**	**2.97**	**2.89**
Vertical Deflection, inch (based on Iowa Formula)	0.20	0.24	0.29	0.34	0.36	0.37	0.37	0.39	0.40	0.40	0.41
Ring Deflection, %	2.43	3.03	3.63	4.24	4.54	4.60	4.66	4.84	4.96	5.01	5.14
Factor of Safety against Ring Deflection Failure[3]	**4.12**	**3.30**	**2.75**	**2.36**	**2.20**	**2.18**	**2.15**	**2.07**	**2.02**	**2.00**	**1.95**

Note 1: **External Stress calculated as 50% of overburden prism weight to account for long term arching effect.**

Note 2: **Constrained Modulus, E' =** 3,000 **psi**

Encasment Conditions: **A 1.5-foot high by 3-foot wide stone trench. Stone is surrounded by native soil protective cover assumed to be moderately compacted.**

Note 3: **The recommended Factor of Safety against Wall Crushing is 2 in the long term condition.**
The recommended Factor of Safety against Wall Buckling is 2 in the long term condition.
Maximum allowable ring deflection of 5 % includes a Factor of Safety is 2.

References:

Assessment and Recommendations for Improving the Performance of Waste Containment Systems, US EPA, by Bonaparte, Daniel & Koerner, 2002, pages 2-13 to 2-25.
Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems, Wilson-Fahmy & Koerner, 1994.
Plastic Pipe Design Manual - Vylon Pipe for Elastic Modulus Data

Performed by: Jeff Helvey, P.E.
Reviewed by:

Pipe SDR	11
Nominal Pipe Diameter (feet)	0.67
Protective Cover / Leachate Stone Thickness (feet)	2
Protective Cover / Leachate Stone Unit Weight (pcf)	110
Unit Weight of Solid Waste (pcf)	70
Final Cover Soil Thickness (feet)	2
Final Cover Soil Unit Weight (pcf)	120
Compressive Strength of HDPE Pipe (psi)	1,600
Tensile Modulus of Elasticity of HDPE Pipe (psi)	28,200

BLE INC.
BUNNELL-LAMMONS ENGINEERING, INC.
GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

December 22, 2011

Hodges, Harbin, Newberry & Tribble, Inc.
3820 Arkwright Road, Suite 101
Macon, Georgia 31210

Attention: Mr. R. Brant Lane, P.E.

Subject: **Summary of Evaluation of Slope of Post-Settlement Leachate Pipes**
Proposed Vertical Expansion
Charlotte Motor Speedway Landfill
Cabarrus County, North Carolina
BLE NC License C-1538
BLE Project No. J11-6452-04

Dear Mr. Lane:

Bunnell-Lammons Engineering, Inc. (BLE) has completed an analysis of the potential subgrade settlement and the resulting post-settlement slope of the existing leachate piping in Cells No. 2A through 2H and 2L resulting from additional waste height from the proposed vertical expansion of the landfill. The analyses considered the proposed variable waste thickness, the original slopes of the lateral and main leachate lines and the corresponding subgrade settlement. The estimated subgrade settlements at points along the leachate lines were used to calculate the post-settlement slope of the leachate lines. The subsurface conditions from previous hydrogeological studies as well as the planned expanded cap and existing bottom liner (FML) grades were provided to us by Hodges, Harbin, Newberry and Tribble, Inc. (HHNT).

Based on our analysis, the effect of the increase in the waste height over the existing leachate lines will be minimal. The residual subgrade soils are typically very firm and better and exhibit low to moderate compressibility. Settlements of the subgrade soils will vary with the height of the waste and the thickness of the structural fill at a given point. Maximum subgrade settlements of approximately 20 inches will occur under the maximum height of waste and thickness of subgrade fill soils. This settlement is well within tolerable limits of the liner and leachate collection system. In conclusion, the post-settlement slope of the leachate lines will be adequate for the system to function as designed.

Please contact us if you have any questions concerning this letter.

Sincerely,
BUNNELL-LAMMONS ENGINEERING, INC.

Gary L. Weekley, P.E.
Senior Engineer
Licensed, NC 8251

NORTH CAROLINA PROFESSIONAL SEAL 8251 ENGINEER GARY L. WEEKLEY
12-22-11

Daniel B. Bunnell, P.E.
Principal Engineer
Licensed, NC 13814

NORTH CAROLINA PROFESSIONAL SEAL 13814 ENGINEER DANIEL B. BUNNELL
12-22-11

Copy: Mr. H. Lowry Tribble, Jr., P.E.

6004 PONDERS COURT
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FAX (864) 288-4430

D. FRANCHISE AGREEMENT

Concord
NORTH CAROLINA
High Performance Living
30 Market Street South, PO Box 308, Concord, NC 28026 - www.ci.concord.nc.us

June 7, 2011

Mr. Booker Pullen
Air Quality Supervisor
NCDENR
1614 Mail Service Center
Raleigh, NC 27699

In re: City of Concord Franchise Granted to BFI Waste Systems of North Carolina, Inc.

Dear Mr. Pullen:

On November 12, 2009, the City Council adopted ordinance #09-95 granting BFI Waste Systems of North Carolina, Inc. a non-exclusive franchise to operate a sanitary landfill within the corporate limits. The term of this Ordinance extends to the year 2035. A copy of the ordinance is attached.

Should you have any questions or require any further information, please do not hesitate to contact me at the number above.

Very truly yours,

/s/

Albert M. Benshoff
City Attorney

Encl. (1)

CC: Jim Greene, Deputy City Manager

L:\Contracts\Franchises\BFI\11 06 07 Booker Pullen ltr re adopted ordinance.doc

Legal
Phone (704) 920-5114 • Fax (704) 784-1791

ORD. #09-95

AN ORDINANCE AMENDING AND RESTATING A NONEXCLUSIVE FRANCHISE TO BFI WASTE SYSTEMS OF NORTH AMERICA, INC.

Whereas, the disposal of municipal solid waste is a statutory responsibility and a fiscal concern of the City of Concord (referred to below as City or Franchisor); and

Whereas, the City disposes of its municipal solid waste at the sanitary landfill operated by BFI Waste Systems of North America, Inc., known as BFI-CMS Landfill (formerly known as CMS Development Corporation Landfill V), located in the City of Concord. (BFI Waste Systems of North America, Inc. may be referred to below as Franchisee or BFI); and

Whereas, BFI Waste Systems of North America, Inc. is currently operating its BFI-CMS Landfill pursuant to permits and authorizations granted by the State of North Carolina; and

Whereas, pursuant to a Contract for Disposal of Solid Waste by and between the City, and CMS Development Corp. and Browning-Ferris Industries of South Atlantic, Inc. (the predecessors to BFI Waste Systems of North America, Inc. by merger), dated August 1, 1990 (the "1990 Solid Waste Disposal Contract") , and under its Solid Waste Management Plan dated January 31, 1992, the City has confirmed its plan to rely upon the BFI-CMS Landfill for the disposal of municipal solid waste generated within the City; and

Whereas, the City granted or renewed the Franchise to BFI Waste Systems of North America, Inc., on February 10, 2005 (the "2005 Franchise") for the operation of the BFI-CMS Landfill; and

Whereas, the City now agrees to restate and amend the 2005 Franchise for the operation of the BFI-CMS Landfill consistent with the City's Solid Waste Management Plan and the terms contained in this Ordinance;

NOW, THEREFORE, BE IT ORDAINED that the City Council of Concord, North Carolina:

Section 1. Pursuant to G.S. 160A-76, and G.S. 130A-294 et. seq., hereby restates and amends the 2005 Franchise to BFI Waste Systems of North America, Inc. to operate a sanitary landfill within the City of Concord, North Carolina, pursuant to the following terms:

(1) The 2005 Franchise is for the operation of a sanitary landfill intended to receive ordinary household waste, commercial solid waste, industrial solid waste and special waste, including asbestos, ash and industrial processed waste, petroleum contaminated soil, wastewater treatment sludge, and such other non-hazardous waste as approved by the State of North Carolina.

(2) The geographic territory intended to be served by the sanitary landfill is the City of Concord, Cabarrus County, the State of North Carolina and the following counties in the State of South Carolina: Cherokee, York, Lancaster, Chesterfield and Chester; the population intended to be served is the population of the City of Concord, Cabarrus County, the State of North Carolina and the following counties in the State of South Carolina: Cherokee, York, Lancaster, Chesterfield and Chester.

(3) The duration of the 2005 Franchise is thirty (30) years from February 10, 2005, the previous date of adoption, until February 9, 2035.

(4) The 2005 Franchise is a non-exclusive franchise for the operation of a sanitary landfill by BFI Waste Systems of North America, Inc. within the geographic boundary line of property currently owned or under option by BFI Waste Systems of North America, Inc. located at 5105 Morehead Road in Concord, North Carolina and

described in Exhibit A, which depicts the expanded boundaries of the site (the "Site"); this franchise does not grant to Franchisee the exclusive right to operate a sanitary landfill within the city limits of Concord, and it does not grant to Franchisee a franchise to operate a sanitary landfill in any location outside the Site.

(5) In granting, restating and amending the 2005 Franchise, it is estimated that the operating capacity for the BFI-CMS Landfill as currently permitted or submitted for permitting is approximately 15.2 million tons. It is further estimated that Franchisee currently has contracts to receive approximately 99,000 tons per month. Pursuant to this 2005 Franchise, the Franchisee may accept an average of 120,000 tons of municipal solid waste per month each calendar year with a maximum monthly volume not to exceed 140,000 tons per month. Based on the current contracted and average tonnages, the projected useful life of the BFI-CMS Landfill ranges from approximately 10.5 years to 12.8 years. Consistent with the terms of their 1990 Solid Waste Disposal Contract, the Franchise Agreement made and entered into as of February 10, 2005 and the 30-year term of this 2005 Franchise, the parties intend for the City to be able to dispose of its solid waste at the BFI-CMS Landfill until 2035. Based on this intent, the contract terms and this amended Franchise, the parties recognize the potential for future expansion opportunities at the BFI-CMS Landfill and agree to continue in the future to work in good faith and in accordance with the terms of their agreements, this franchise and the requirements of applicable laws and regulations to fulfill their intent.

(6) The Franchisee is required to continue accepting for disposal municipal solid waste generated within the City of Concord, North Carolina, pursuant to the terms of the 1990 Solid Waste Disposal Contract, as that Contract may have been amended from time to time. Further, the Franchisee, hereby agrees to provide airspace for the disposal of all residential municipal solid waste generated within the City of Concord, North Carolina for thirty (30) years from the date of the granting of this franchise. If the BFI-CMS Landfill should reach capacity before the conclusion of the thirty (30) year term of this franchise so that Franchisee could not continue to accept the monthly volume of waste at the BFI-CMS Landfill anticipated by this franchise and still provide airspace at the BFI-CMS Landfill for the disposal of all residential municipal solid waste generated with the City of Concord, North Carolina for the thirty (30) year term of this 2005 Franchise, Franchisee agrees to erect a transfer station on the Site and, if necessary, transport all residential municipal solid waste generated within the City of Concord, North Carolina to another location for disposal pursuant to law. The erection of said transfer station and the transportation and disposal of all residential municipal solid waste generated within the City of Concord, North Carolina for the said period of thirty (30) years shall be at the sole expense of the Franchisee. The City agrees to cooperate with the Franchisee in providing any required approvals and assist in obtaining all required authorizations for the citing of a transfer station.

(7) Host fees will be paid and managed during the active life of the Landfill as follows:

(a) With the exception of residential waste generated within the City of Concord, Franchisee will pay to the City a "Solid Waste Host Fee" of $0.75 per ton of solid waste deposited in the Landfill, Franchisee guarantees that the non-escrowed portion of the host fees paid will be at least $38,200.00 a month for a period of fifteen (15) years from September 1, 2007, or until August 31, 2022.

(b) The City will place $0.25 of each $0.75 Solid Waste Host Fee" in an interest bearing account. This account will be maintained throughout the intended thirty (30) year life of the franchise. At the expiration of this franchise, if Franchisee has met its obligation to provide to the City disposal for all residential waste generated during the term of the franchise, then all principal and interest contained in the account will be paid to Franchisee (or its successor). If Franchisee defaults on its obligation to provide to the City disposal for all residential waste generated during the term of this 2005 Franchise, then the principal and interest contained in the account will be paid to the City.

(c) Franchisee will provide the funding necessary for the City to perform or contract to provide a curbside recycling collection program. Franchisee will pay to the City $.90 per ton of solid waste disposed in the landfill, with the exception of residential waste generated within the City of Concord, for the City's recycling program (the "Recycling Host Fees"). Franchisee guarantees that the Recycling Host Fees paid are and will be in addition to the "Solid Waste Host Fees" described in sections 7 (a) and (b) above. Franchisee will pay to the City for the term specified Recycling Host Fees of no less than $65,000.00 per month. Should the City be unable to secure a responsible contractor to provide for the collection of recyclables for the amounts stipulated in the preceding sentences in this sub-section (c), then Franchisee will at the City's option either: 1) Provide the required curbside recycling collection services; or 2) Increase the Recycling Host Fees to a commercially reasonable amount to pay for the cost of the required curbside recycling services. Additionally, each June 30, Franchisee will adjust these fees upward or downward, in an amount commensurate with the percentage change in the Consumer Price Index for Urban Wage Earners and Clerical Workers (All Items) as published by the US Department of Labor, as of June 30 of the prior year.

(d) Solid Waste Host Fees and Recycling Host Fees shall be paid monthly, every twenty-one (21) days after the end of each calendar month during which Solid Waste has been accepted for disposal at the Landfill or at such other intervals as may be agreed to by the parties in writing. Franchisee will provide to the City a copy of its annual report to the State at the time the report is submitted to the State and, at the City's request, will make its daily log and supporting documents available for review at reasonable times and intervals.

(8) Nothing in this 2005 Franchise shall authorize Franchisee to modify the BFI-CMS Landfill in a manner which would cause the City of Concord to incur any additional capital expenditures in the provision or delivery of services to the BFI-CMS Landfill such as potable water, storm water, sanitary sewer, utilities or roads as a result of such modification, unless Franchisee agrees to pay all additional costs associated with delivering those services.

Section 2. That this Ordinance be effective immediately upon adoption at second reading.

Adopted on first reading this 8th day of October 2009.
Adopted on second reading this 12th day of November 2009.

CITY COUNCIL
CITY OF CONCORD
NORTH CAROLINA

J. Scott Padgett, Mayor

ATTEST:

Kim J. Deason, City Clerk

Albert M. Benshoff, City Attorney

E. FINAL COVER SYSTEM STABILITY ANALYSIS

Final Cover System Tension Analysis

And

Final Cover System Stability Analysis

Analyses were obtained from the "Permit Modification Application, Charlotte Motor Speedway Landfill – V, Lateral Expansion Cells 2F, 2G, and 2H, prepared by Almes and Associates, Inc., dated May 2004.

APPENDIX E.1
FINAL COVER SYSTEM TENSION ANALYSIS

E.1.1 INTRODUCTION

The stability of the proposed liner system prior to and during liner system construction is addressed in this appendix. The liner system must be designed to withstand self weight loads, settlement, and wind and temperature loadings. To simplify the analysis, the liner system was analyzed for the most important factor governing stability of the system during placement, stress and strain due to placement of the final cover soil.

E.1.2 DESIGN INFORMATION

For this analysis, it was assumed that stress and strain from construction equipment would be temporary, and limited to small areas of the liner system. Construction loading characteristics are relatively small compared to the weight of the final cover soil, are limited in areal extent, and generally are not critical for liner system stability. Therefore, construction loadings were not considered in the liner system deployment stability analysis.

E.1.3 FINAL COVER INDUCED STRESS

A significant source of stress and strain on the liner system is the load applied by the final cover material that is to be placed over all areas of the final cover system. The liner will be comprised of a number of components, including a geotextile-geonet-geotextile drainage composite, 40-mil textured LLDPE geomembrane, and 18 inches of compacted soil liner, all of which have different mechanical and physical properties. the stability of the liner system depends on the shear strength and strain properties of the components used in its construction along with the characteristics of the over lying cover soil. the stability is limited to the amount of stability afforded by the weakest component of the liner system. Therefore, the design of the liner system was based upon the limiting stress and strain to within a range tolerable for the "weakest" liner system component for each condition.

As the final cover soil is placed on the sloped portions of the liner system, tension could be induced into the liner system if the frictional resistance within the liner system is not sufficient to resist the applied stress. The tension that is created in the liner is equal to the remaining portion of the final cover soil load that cannot be resisted by the frictional resistance afforded by the liner system. Thus, the lower the interface friction between components in the liner system, the larger the resultant tension.

It was necessary to determine the various shear strength properties and design parameters for each of the liner system components. These properties were obtained through a number of sources (See References for Appendix C.1). the values used in the design of the geosynthetic components are very conservative, and in all likelihood, the liner system

in the field should meet or exceed characteristics relative to those characteristics used in the design analysis.

The theoretical tension that may be introduced into a liner system during placement of the 2 feet of final cover soil can be estimated from the following equation (Reference 1):

$$\alpha = \frac{\gamma_c T_c^2}{\sin 2\beta}\left[\left(\frac{2H\cos\beta}{T_c} - 1\right)\frac{\sin(\beta - \phi_{im})}{\cos\phi_{im}} - \frac{\sin\phi_{cm}}{\cos(\beta + \phi_{cm})}\right]$$

Where:

α = Tension introduced into final cover system (ppf);
γ_c = Unit weight of final cover soil (pcf);
T_c = Thickness of final cover soil (ft);
β = Slope angle (degrees) = 18.4 degrees (3H:1V);
H = Maximum height of the slope between benches (ft);
ϕ_{im} = Critical mobilized interface friction angle of cover system (degrees); and
ϕ_{cm} = Mobilized friction angle of final cover soil (degrees).

Where:

$\tan\phi_{im}$ = $(\tan\phi_i)/FS$
$\tan\phi_{cm}$ = $(\tan\phi_c)/FS$
FS = Partial Factor of Safety (Recommended range from 1.0 to 1.3)

Evaluation of the above equation to determine the magnitude of tension in the liner system during protective cover placement can be found in the attached calculation.

E.1.4 Conclusion

Results have shown a tensile force of 82.95 pounds per foot. The slightly positive liner tension indicates that placement of the final cover soil along the 3H:1V slope will induce a slight tension into the underlying geosynthetic cover system components. The reason for this result is simply that the shear strength within the final cover system is slightly lower than the tension induced by the weight (placement) of the final cover soil, and as such, a slight tension will develop in the cover system. The slight tension will be less than the strength of the 40 mil LLDPE liner (i.e., ~1,200 ppf) and less than the anchor trench capacity (~722 ppf). In conclusion, the final cover system will be stable.

REFERENCES:

1. Giroud, J.P., and Beech, J.F., "Stability of Soil Layers on Geosynthetic Lining Systems", Proceedings, Geosynthetics '89 Conference, San Diego, CA, 1989.

ALMES & ASSOCIATES, INC.
CONSULTING ENGINEERS

BY: WML DATE: 05/06/04 CHKD BY: WSA DATE: 5/6/04

PROJECT NAME BFI-CMS Landfill V, Lateral Expansion

PROJECT NO. R02-575-686 SHEET 1 OF 4

DESCRIPTION E.1 – Final Cover System Tension Analysis

OBJECTIVE:

Determine the tension that may be developed in the landfill final cover system.

METHODOLOGY:

The final cover system consists of the following components (from top to bottom):

For cap areas with slopes of 5% or less the cap shall consist of the following:

- 24 inches Final Cover Soil;
- Geotextile-Geonet-Geotextile Drainage Composite;
- 40-mil Textured LLDPE Geomembrane;
- 18 inches Compacted Soil Barrier; and
- 12 inches Intermediate Cover.

For cap areas with slopes of 30% or more the cap shall consist of the following:

- 24 inches Final Cover Soil;
- Geotextile-Geonet-Geotextile Drainage Composite;
- 40-mil Textured LLDPE Geomembrane; and
- 12 inches Intermediate Cover.

The maximum vertical height between benches is 120 feet. The theoretical tension that may be introduced into the final cover system along the 3 horizontal to 1 vertical (3H:1V) slopes between each bench was estimated using the method of analysis developed by Giroud and Beech (1989) (Reference 1). This theoretical tension was compared to the allowable tension for the cover system to check that excessive straining or stressing of the cover system does not occur.

REFERENCES:

1. Giroud, J.P., and Beech, J.F., "Stability of Soil Layers on Geosynthetic Lining Systems", Proceedings, Geosynthetics '89 Conference, San Diego, CA, 1989.

CALCULATION:

The theoretical tension that may be introduced into a liner system during placement of the 2 feet of final cover soil can be estimated from the following equation (Reference 1):

$$\alpha = \frac{\gamma_c T_c^2}{\sin 2\beta}\left[\left(\frac{2H\cos\beta}{T_c} - 1\right)\frac{\sin(\beta - \phi_{im})}{\cos\phi_{im}} - \frac{\sin\phi_{cm}}{\cos(\beta + \phi_{cm})}\right]$$

Where:

α = Tension introduced into final cover system (ppf);
γ_c = Unit weight of final cover soil (pcf);
T_c = Thickness of final cover soil (ft);
β = Slope angle (degrees) = 18.4 degrees (3H:1V);
H = Maximum height of the slope between benches (ft);
ϕ_{im} = Critical mobilized interface friction angle of cover system (degrees); and
ϕ_{cm} = Mobilized friction angle of final cover soil (degrees).

Where:

$\tan\phi_{im}$ = $(\tan\phi_i)/FS$
$\tan\phi_{cm}$ = $(\tan\phi_c)/FS$
FS = Partial Factor of Safety (Recommended range from 1.0 to 1.3)

Friction Angles:

The following friction angles were used for the above final cover system:

- The friction angle for the final cover soil (ϕ_c) is 30 degrees.
- The interface friction angles for the various geosynthetic-to-soil and geosynthetic-to-geosynthetic interfaces are as follows:

  Final Cover Soil to Nonwoven Geotextile: $\phi = 27°$;
  Nonwoven Geotextile to Textured LLDPE Geomembrane: $\phi = 24°$; and
  Textured LLDPE Geomembrane to Intermediate Cover Soil: $\phi = 30°$.

- Based on the above interface friction angles, the critical interface friction angle of the cover system (ϕ_i) is 24 degrees.

Mobilized Friction Angles:

The partial factor of safety (FS) applied to the various friction angles is 1.3, which is the highest partial factor of safety recommended by the Giroud and Beech.

Thus, the mobilized friction angles are:

Final Cover Soil: $\tan\phi_{cm} = (\tan 30^\circ)/1.3$

$\phi_{cm} = \tan^{-1}((\tan 30^\circ)/1.3)$

$\phi_{cm} = 23.9^\circ$

Critical Interface: $\tan\phi_{im} = (\tan 23^\circ)/1.3$

$\phi_{im} = \tan^{-1}((\tan 23^\circ)/1.3)$

$\phi_{im} = 18.1^\circ$

The cap tension is calculated using the following values:

$\gamma_c = 115$ pcf
$T_c = 2.0$ ft
$\beta = 18.4^\circ$
$H = 140$ ft
$\phi_{im} = 18.1^\circ$
$\phi_{cm} = 23.9^\circ$

The cap tension is calculated as follows:

$$\alpha = \frac{\gamma_c T_c^2}{\sin 2\beta}\left[\left(\frac{2H\cos\beta}{T_c} - 1\right)\frac{\sin(\beta - \phi_{im})}{\cos\phi_{im}} - \frac{\sin\phi_{cm}}{\cos(\beta + \phi_{cm})}\right]$$

$$= \frac{115(2.0)^2}{\sin[2(18.4)]}\left[\left(\frac{2(120)\cos 18.4}{2.0} - 1\right)\frac{\sin(18.4 - 18.1)}{\cos 18.1} - \frac{\sin 23.9}{\cos(18.4 + 23.9)}\right]$$

$\alpha = 82.95$ ppf

ALMES & ASSOCIATES, INC.
CONSULTING ENGINEERS

BY: WML DATE: 05/06/04 CHKD BY: WSA DATE: 5/6/04

PROJECT NAME BFI-CMS Landfill V, Lateral Expansion

PROJECT NO. R02-575-686 SHEET 4 OF 4

DESCRIPTION E.1 – Final Cover System Tension Analysis

CONCLUSION:

The slightly positive liner tension indicates that placement of the final cover soil along the 3H:1V slope will induce a slight tension into the underlying geosynthetic cover system components. The reason for this result is simply that the shear strength within the final cover system is slightly lower than the tension induced by the weight (placement) of the final cover soil, and as such, a slight tension will develop in the cover system. The slight tension will be less than the strength of the 40 mil LLDPE liner (i.e., ~1,200 ppf) and less than the anchor trench capacity (~722 ppf). In conclusion, the final cover system will be stable.

APPENDIX E.2
FINAL COVER SYSTEM STABILITY ANALYSIS

APPENDIX E.2
FINAL COVER SYSTEM STABILITY ANALYSIS

E.2.1 INTRODUCTION

The permanent stability of the cover system can be attained if the final slope (cover system) is stable and the system is capable of withstanding the tensile force developed due to 2 feet of soil cover.

The final cover system consists of the following components (from top to bottom):

For cap areas with slopes of 5% or less the cap shall consist of the following:
- 24 inches Final Cover Soil;
- Geotextile-Geonet-Geotextile Drainage Composite;
- 40-mil Textured LLDPE Geomembrane;
- 18 inches Compacted Soil Barrier; and
- 12 inches Intermediate Cover.

For cap areas with slopes of 30% or more the cap shall consist of the following:
- 24 inches Final Cover Soil;
- Geotextile-Geonet-Geotextile Drainage Composite;
- 40-mil Textured LLDPE Geomembrane; and
- 12 inches Intermediate Cover.

The maximum vertical distance between built-up benches is 40 feet with slopes of 5 percent for the top and 33 percent for the sides. PC STABL 5M (Reference 1) was used to approximate the minimum factor of safety for the final cover slopes by means of sliding block-type failure surfaces.

E.2.2 ANALYSIS

The overall stability of the final cover system depends on the shear strength properties of the soils and geosynthetic components used in its construction. The design parameters, shear strength properties, and subsequent calculations can be found in the calculation brief attached to this narrative.

When performing a final cover stability analysis, it is not practical to attempt to model the shear strength characteristics between each capping system interface due to the number of interfaces present. Conversely, there is a great deal of interaction between capping system components that occurs in reality, but which cannot be accurately modeled in a stability analysis. As such, the final cover stability analysis will only model the weakest (or most critical) interface in the capping system. For this final cover system configuration, the critical interface should be located between the textured LLDPE geomembrane and the nonwoven geotextile. This interface is modeled with a friction angle of 24 degrees and no cohesion.

Two cross-sections are to be analyzed for final cover stability; however, the cross-section analyzed were not taken from the proposed final grading plan for the site. Instead, a typical section depicting the final 3H: 1V sideslopes and four benches will be used for the stability analysis. The first block failure surface is calculated to determine the overall stability of the cap across the four benches. The second block failure is calculated for the wedge of soil between two of the benches located at the middle of the slope..

The following minimum factor of safety (FS) was obtained from the PC STABL 5M analysis for the typical cross-section:

Overall Slope Sliding Block	FS = 1.35
Intermediate Sliding Block	FS = 1.39

E.2.3 Conclusion

The calculated factor of safety indicates that stability of final cover system will be adequate for long-term loading conditions. Since the material properties used in the stability analysis were conservatively estimated, adequate short-term stability should also exist.

REFERENCES:

1. Achilleos, E. (1988) "User Guide for PC STABL 5M, "Joint Highway Research Project, Informational Report JHRP-88/19, Purdue University, 132 pages.

2. Sowers, G. F. (1972) "Foundation Engineering in Waste Disposal Fills," Proceedings of the 21st Annual Conference on Soil Mechanics and Foundation Engineering, University of Kansas, 1972, pp. 100-120. Tech. Pub. No. 2.

ALMES & ASSOCIATES, INC.
CONSULTING ENGINEERS

BY: WML DATE: 05/06/04 CHKD BY: GJSA DATE: 5/6/04

PROJECT NAME BFI-CMS Landfill V, Lateral Expansion

PROJECT NO. R02-575-686 SHEET 1 OF 17

DESCRIPTION E.2 – Final Cover System Stability Analysis

OBJECTIVE:

Evaluate the stability of the final cover system for failure surfaces along the weakest cover system interface.

METHODOLOGY:

The final cover system consists of the following components (from top to bottom):

For cap areas with slopes of 5% or less the cap shall consist of the following:

- 24 inches Final Cover Soil;
- Geotextile-Geonet-Geotextile Drainage Composite;
- 40-mil Textured LLDPE Geomembrane;
- 18 inches Compacted Soil Barrier; and
- 12 inches Intermediate Cover.

For cap areas with slopes of 30% or more the cap shall consist of the following:

- 24 inches Final Cover Soil;
- Geotextile-Geonet-Geotextile Drainage Composite;
- 40-mil Textured LLDPE Geomembrane; and
- 12 inches Intermediate Cover.

The maximum vertical distance between benches is 120 feet. The slope stability computer software program PC STABL 5M (Reference 1) was used to approximate the minimum factor of safety for the final cover slopes by means of sliding block-type failure surfaces.

REFERENCES:

1. Achilleos, E. (1988) "User Guide for PC STABL 5M, "Joint Highway Research Project, Informational Report JHRP-88/19, Purdue University, 132 pages.

2. Sowers, G. F. (1972) "Foundation Engineering in Waste Disposal Fills," Proceedings of the 21st Annual Conference on Soil Mechanics and Foundation Engineering, University of Kansas, 1972, pp. 100-120. Tech. Pub. No. 2.

CALCULATION:

The overall stability of the final cover system depends on the shear strength properties of the soils and geosynthetic components used in its construction. The following design parameters and shear strength properties are used in the slope stability analysis.

General Design Parameters:

Slope of landfill final cover system	= 3H:1V (horizontal to vertical) for the most critical slope section.
Built-up Bench Side Slopes	= 2H:1V (horizontal to vertical)
Top Bench Width	= 2 feet
Bench height above 3H:1V slope at the uphill intercept of the slopes	= 3 feet
Vertical distance between benches	= 40 feet

Properties of Final Cover Soil (Soil Type No. 1):

Moist Unit Weight	= 115 pcf
Effective Angle of Internal Friction (ϕ')	= 30 degrees
Effective Cohesion (c')	= 0 psf

Cap System Interface Friction Values (Soil Type No. 2):

Friction Angle between Nonwoven Geotextile and Final or Intermediate Cover Soil	= 27 degrees
Friction Angle between Nonwoven Geotextile and Textured LLDPE Geomembrane	= 24 degrees

Friction Angle between Textured LLDPE Geomembrane and Compacted Clay Barrier Soil	= 30 degrees

Properties of Intermediate Cover Soil (Soil type No.3):

Moist Unit Weight	= 120 pcf
Effective Angle of Internal Friction (ϕ')	= 30 degrees
Effective Cohesion (c')	= 0 psf

Properties of Waste (Soil Type No. 4):

Unit weight of waste (Approximate weight of refuse including daily and intermediate cover soil)	= 65 pcf
Effective Angle of Internal Friction (ϕ')	= 30 degrees (Reference 2)
Effective Cohesion (c')	= 250 psf

The internal friction angles for the final and intermediate cover soil are based on an interpretation of geotechnical index properties, grain-size analyses and densities expected to be achieved for on-site materials during construction. The waste properties were estimated based on previous experience of the industry.

When performing a final cover stability analysis, it is not practical to attempt to model the shear strength characteristics between each capping system interface due to the number of interfaces present. Conversely, there is a great deal of interaction between capping system components that occurs in reality, but which cannot be accurately modeled in a stability analysis. As such, the final cover stability analysis will only model the weakest (or most critical) interface in the capping system. For this final cover system configuration, the critical interface should be located between the textured LLDPE geomembrane and the nonwoven geotextile. This interface is modeled with a friction angle of 24 degrees and no cohesion.

Two cross-sections are to be analyzed for final cover stability; however, the cross-section analyzed were not taken from the proposed final grading plan for the site. Instead, a typical section depicting the final 3H: 1V sideslopes and four benches will be used for the stability analysis. The first block failure surface is calculated to determine the overall stability of the cap across the four benches. The second block failure is calculated for the wedge of soil between two of the benches located at the middle of the slope.

Results:

The following minimum factor of safety (FS) was obtained from the PC STABL 5M analysis for the typical cross-section:

Overall Slope Sliding Block	FS = 1.35
Intermediate Sliding Block	FS = 1.39

CONCLUSIONS:

The calculated factor of safety indicates that stability of final cover system will be adequate for long-term loading conditions. Since the material properties used in the stability analysis were conservatively estimated, adequate short-term stability should also exist.

CAP BLOCK SLOPE STABILITY

- OVERALL BLOCK FAILURE SURFACE

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 5/3/2004
Time of Run: 09:59AM
Run By: William M. Lupi, Almes & Assoc. Inc
Input Data Filename: C:cmscap8.in
Output Filename: C:cmscap8.OUT
Unit: ENGLISH
Plotted Output Filename: C:cmscap8.PLT
PROBLEM DESCRIPTION BFI-CMS Landfill V Lateral Exp. - Cells 2F,2G and 2H(Cap w/40' 2:1 Bench)overall

BOUNDARY COORDINATES
19 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	169.77	108.00	180.02	108.43	1
2	180.02	108.43	258.47	134.44	1
3	258.47	134.44	292.03	151.44	1
4	292.03	151.44	294.03	151.44	1
5	294.03	151.44	300.03	148.44	1
6	300.03	148.44	381.22	175.50	1

7/17

7	381.22	175.50	413.10	191.44	1
8	413.10	191.44	415.10	191.44	1
9	415.10	191.44	420.67	188.65	1
10	420.67	188.65	498.68	214.66	1
11	498.68	214.66	532.68	231.66	1
12	532.68	231.66	534.68	231.66	1
13	534.68	231.66	540.68	228.66	1
14	540.68	228.66	619.33	254.87	1
15	619.33	254.87	653.33	271.87	1
16	653.33	271.87	655.33	271.87	1
17	655.33	271.87	662.17	268.45	1
18	662.17	268.45	726.03	290.44	1
19	726.03	290.44	842.19	294.76	1
20	183.44	107.14	726.01	288.01	2
21	726.01	288.01	842.17	293.15	2
22	183.49	107.11	726.02	287.95	3
23	726.02	287.95	842.18	293.11	3
24	187.41	105.83	726.47	285.53	4
25	726.47	285.53	842.19	290.65	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	115.0	120.0	.0	30.0	.00	.0	1
2	60.0	60.0	.0	24.0	.00	.0	1
3	120.0	120.0	.0	30.0	.00	.0	1
4	65.0	60.0	250.0	30.0	.00	.0	1

Janbus Empirical Coef is being used for the case of c & phi both > 0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

500 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	183.47	107.13	208.56	115.50	1.00
2	704.62	280.97	726.02	287.89	1.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	192.42	112.54
2	197.08	111.69
3	709.82	282.58
4	712.48	285.78

*** 1.345 ***

Individual data on the 20 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.7	642.7	.0	.0	.0	.0	.0	.0	.0
2	61.4	16549.2	.0	.0	.0	.0	.0	.0	.0
3	33.6	20056.1	.0	.0	.0	.0	.0	.0	.0
4	2.0	1787.2	.0	.0	.0	.0	.0	.0	.0
5	6.0	3406.5	.0	.0	.0	.0	.0	.0	.0
6	81.2	22744.7	.0	.0	.0	.0	.0	.0	.0
7	31.9	18667.9	.0	.0	.0	.0	.0	.0	.0
8	2.0	1705.6	.0	.0	.0	.0	.0	.0	.0
9	5.6	3048.3	.0	.0	.0	.0	.0	.0	.0
10	78.0	21885.1	.0	.0	.0	.0	.0	.0	.0

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11	34.0	20633.1	.0	.0	.0	.0	.0	.0	.0
12	2.0	1788.8	.0	.0	.0	.0	.0	.0	.0
13	6.0	3411.4	.0	.0	.0	.0	.0	.0	.0
14	78.7	22081.1	.0	.0	.0	.0	.0	.0	.0
15	34.0	20614.1	.0	.0	.0	.0	.0	.0	.0
16	2.0	1787.7	.0	.0	.0	.0	.0	.0	.0
17	6.8	3609.8	.0	.0	.0	.0	.0	.0	.0
18	47.7	10970.9	.0	.0	.0	.0	.0	.0	.0
19	.0	11.2	.0	.0	.0	.0	.0	.0	.0
20	2.6	338.0	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	199.56	114.91
2	201.50	113.15
3	711.46	283.11
4	711.68	285.50

*** 1.351 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	201.49	115.55
2	204.49	114.08
3	719.57	285.85
4	720.72	288.61

*** 1.471 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	186.10	110.45
2	188.33	108.83
3	720.92	286.25
4	721.35	288.83

*** 1.524 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.17	112.13
2	193.40	110.37
3	717.72	285.24
4	718.55	287.86

*** 1.525 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.78	111.67
2	193.41	110.45
3	720.28	286.00
4	720.65	288.59

*** 1.564 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	181.92	109.06
2	183.82	107.17
3	721.21	286.38
4	724.16	289.80

*** 1.570 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.96	111.06
2	189.75	109.28
3	711.89	283.27
4	713.47	286.12

*** 1.570 ***

Failure Surface Specified By 4 Coordinate Points

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.54	110.92
2	190.40	109.36
3	707.05	281.73
4	707.43	284.04

*** 1.598 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.35	111.19
2	190.41	109.51
3	712.16	283.26
4	715.68	286.87

*** 1.604 ***

BFI-CMS Landfill V Lateral Exp. - Cells 2F,2G and 2H(Cap w/40' 2:1 Bench)overall

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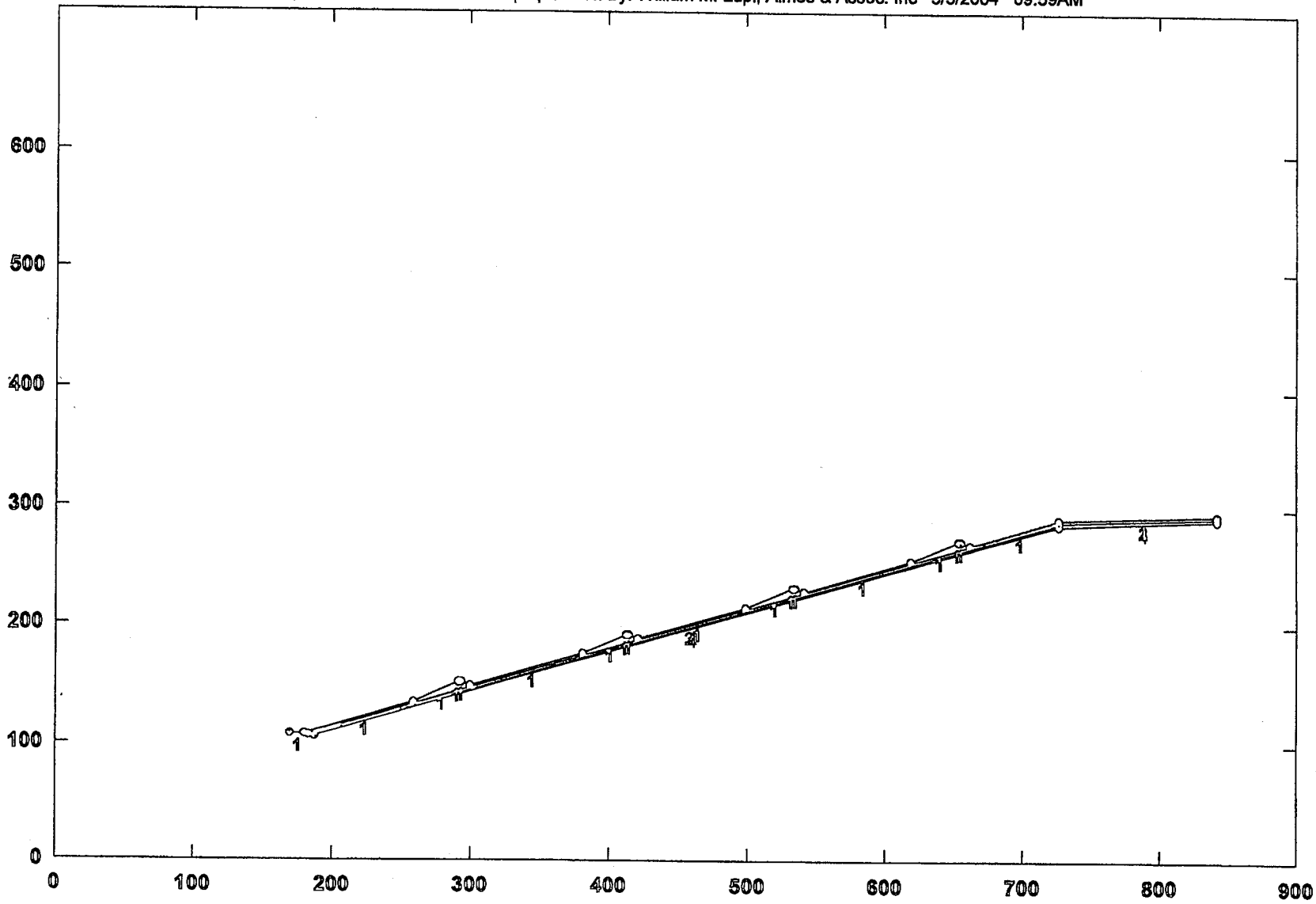

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10/17

BFI-CMS Landfill V Lateral Exp. - Cells 2F,2G and 2H(Cap w/40' 2:1 Bench)overall

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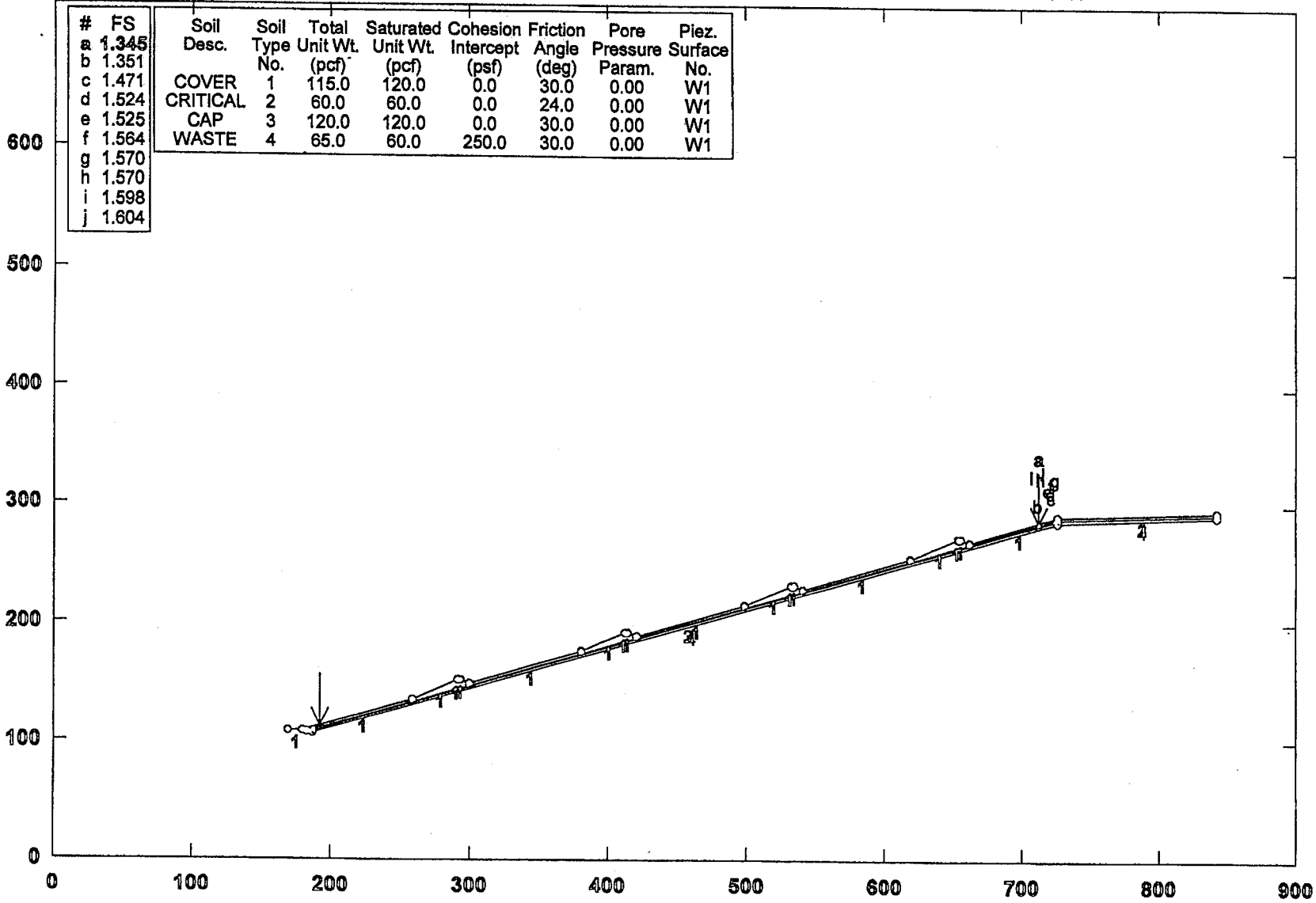
#	FS
a	1.345
b	1.351
c	1.471
d	1.524
e	1.525
f	1.564
g	1.570
h	1.570
i	1.598
j	1.604

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Piez. Surface No.
COVER	1	115.0	120.0	0.0	30.0	0.00	W1
CRITICAL	2	60.0	60.0	0.0	24.0	0.00	W1
CAP	3	120.0	120.0	0.0	30.0	0.00	W1
WASTE	4	65.0	60.0	250.0	30.0	0.00	W1



PCSTABL5M/si FSmin=1.345

Safety Factors Are Calculated By The Modified Janbu Method for the case of c & phi both > 0

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BY: WMA DATE: 05/05/04 CHKD BY: [illegible] DATE: 5/6/04

PROJECT NAME BFI-CMS Landfill V, Lateral Expansion

PROJECT NO. R02-575-686 SHEET 12 OF 17

DESCRIPTION E.2 – Final Cover System Stability Analysis

CAP BLOCK SLOPE STABILITY

- INTERMEDIATE BLOCK FAILURE SURFACE

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 5/3/2004
Time of Run: 10:00AM
Run By: William M. Lupi, Almes & Assoc. Inc
Input Data Filename: C:cmscap7.in
Output Filename: C:cmscap7.OUT
Unit: ENGLISH
Plotted Output Filename: C:cmscap7.PLT
PROBLEM DESCRIPTION BFI-CMS Landfill V Lateral Exp. - Cells 2F,2G and 2H(Cap w/40' 2:1 Benches) Int.

BOUNDARY COORDINATES
19 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	169.77	108.00	180.02	108.43	1
2	180.02	108.43	258.47	134.44	1
3	258.47	134.44	292.03	151.44	1
4	292.03	151.44	294.03	151.44	1
5	294.03	151.44	300.03	148.44	1
6	300.03	148.44	381.22	175.50	1
7	381.22	175.50	413.10	191.44	1
8	413.10	191.44	415.10	191.44	1
9	415.10	191.44	420.67	188.65	1
10	420.67	188.65	498.68	214.66	1
11	498.68	214.66	532.68	231.66	1
12	532.68	231.66	534.68	231.66	1
13	534.68	231.66	540.68	228.66	1
14	540.68	228.66	619.33	254.87	1
15	619.33	254.87	653.33	271.87	1
16	653.33	271.87	655.33	271.87	1
17	655.33	271.87	662.17	268.45	1
18	662.17	268.45	726.03	290.44	1
19	726.03	290.44	842.19	294.76	1
20	183.44	107.14	726.01	288.01	2
21	726.01	288.01	842.17	293.15	2
22	183.49	107.11	726.02	287.95	3
23	726.02	287.95	842.18	293.11	3
24	187.41	105.83	726.47	285.53	4
25	726.47	285.53	842.19	290.65	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	115.0	120.0	.0	30.0	.00	.0	1
2	60.0	60.0	.0	24.0	.00	.0	1
3	120.0	120.0	.0	30.0	.00	.0	1
4	65.0	60.0	250.0	30.0	.00	.0	1

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
500 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	381.85	173.60	421.30	186.76	1.00
2	499.32	212.76	541.32	226.76	1.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	385.73	177.75
2	393.24	177.07
3	507.82	215.24
4	514.63	222.64

*** 1.391 ***

Individual data on the 9 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.5	1904.9	.0	.0	.0	.0	.0	.0	.0
2	.0	15.6	.0	.0	.0	.0	.0	.0	.0
3	19.9	13916.8	.0	.0	.0	.0	.0	.0	.0
4	2.0	1705.7	.0	.0	.0	.0	.0	.0	.0
5	5.6	3048.7	.0	.0	.0	.0	.0	.0	.0
6	78.0	21904.4	.0	.0	.0	.0	.0	.0	.0
7	9.1	3371.9	.0	.0	.0	.0	.0	.0	.0
8	.0	17.9	.0	.0	.0	.0	.0	.0	.0
9	6.8	1543.2	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	414.26	191.44
2	421.02	186.27
3	520.66	219.53
4	525.08	227.86

*** 1.435 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	386.59	178.18
2	390.87	176.20
3	534.33	224.12
4	537.31	230.35

*** 1.474 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	393.23	181.50
2	396.65	178.22
3	518.83	218.84
4	529.04	229.84

*** 1.498 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	384.22	177.00
2	390.22	175.98
3	529.37	222.90
4	536.64	230.68

*** 1.566 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	383.97	176.87
2	386.29	174.69
3	499.59	212.57
4	502.11	216.38

*** 1.575 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	381.94	175.86
2	385.13	174.49
3	527.90	221.82
4	533.37	231.66

*** 1.580 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	393.68	181.73
2	397.83	178.57
3	500.56	212.80
4	504.27	217.45

*** 1.580 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	385.13	177.45
2	390.14	176.37
3	531.26	223.05
4	537.82	230.09

*** 1.585 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	384.49	177.14
2	386.75	175.37
3	530.27	222.66
4	536.08	230.96

*** 1.588 ***

BFI-CMS Landfill V Lateral Exp. - Cells 2F,2G and 2H(Cap w/40' 2:1 Benches) Int.

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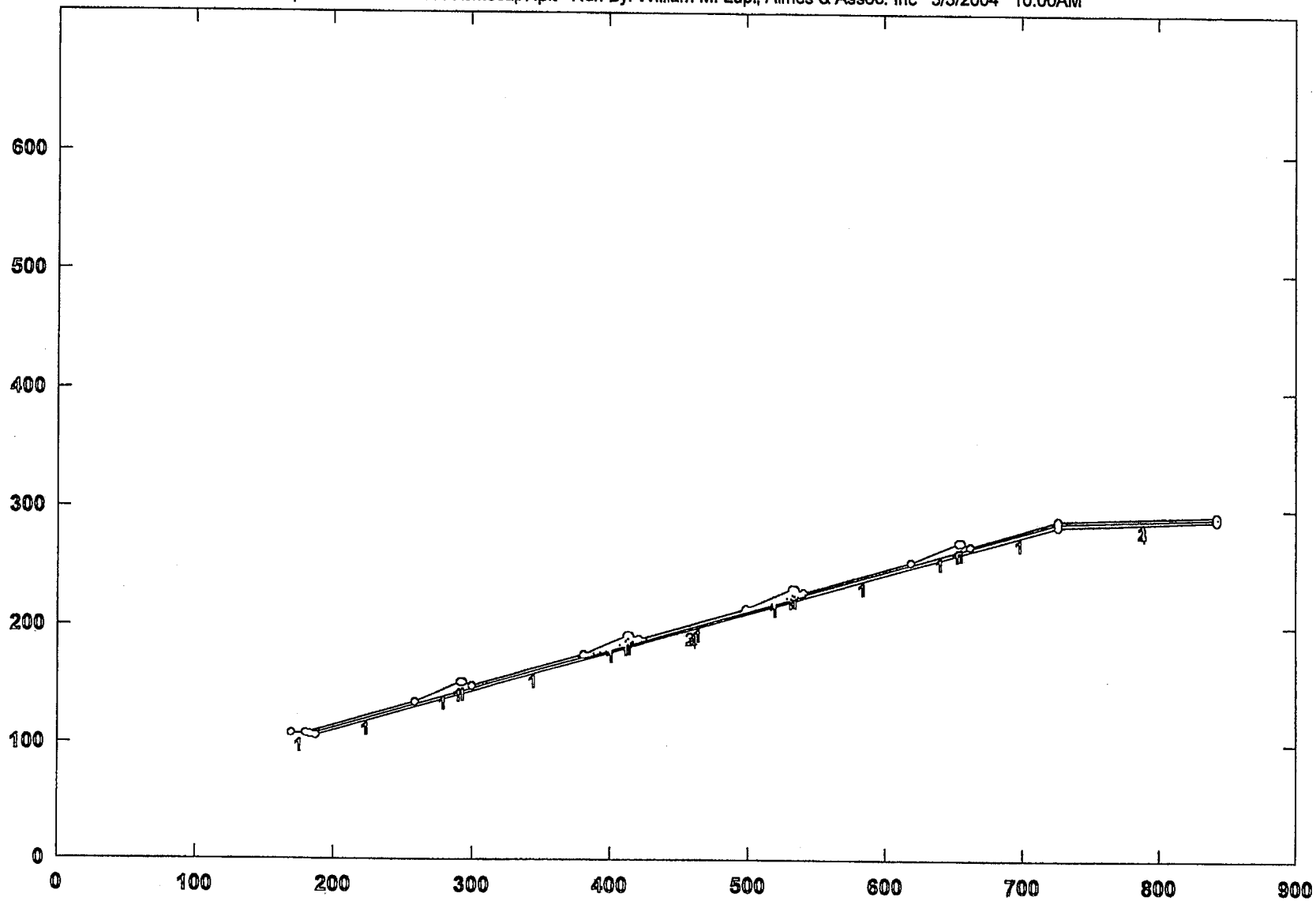

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BFI-CMS Landfill V Lateral Exp. - Cells 2F,2G and 2H(Cap w/40' 2:1 Benches) Int.

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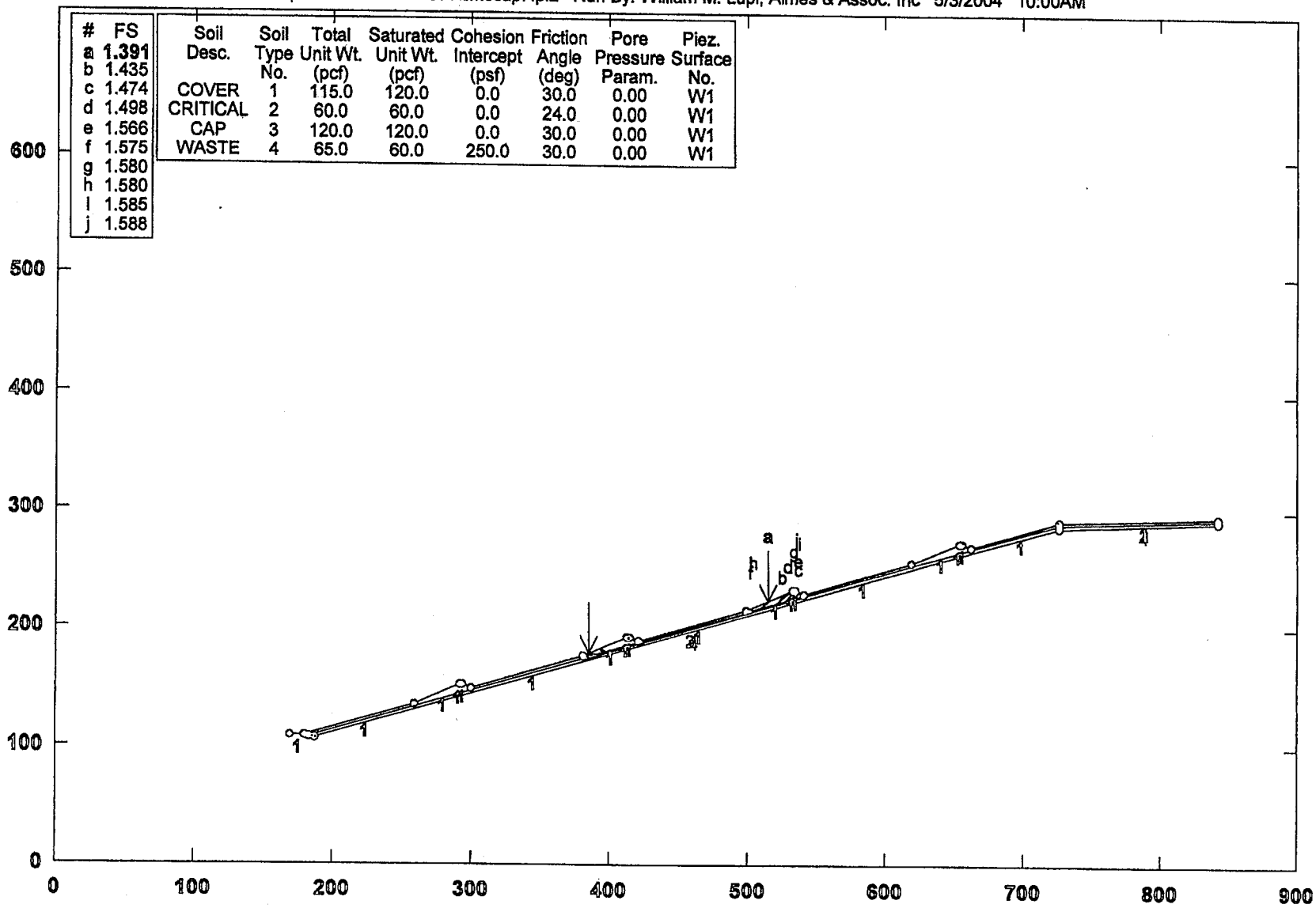
#	FS
a	1.391
b	1.435
c	1.474
d	1.498
e	1.566
f	1.575
g	1.580
h	1.580
i	1.585
j	1.588

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Piez. Surface No.
COVER	1	115.0	120.0	0.0	30.0	0.00	W1
CRITICAL	2	60.0	60.0	0.0	24.0	0.00	W1
CAP	3	120.0	120.0	0.0	30.0	0.00	W1
WASTE	4	65.0	60.0	250.0	30.0	0.00	W1



PCSTABL5M/si FSmin=1.391

Safety Factors Are Calculated By The Modified Janbu Method for the case of c & phi both > 0

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