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June 17, 2010

Fac/Perm/Co ID #	Date	Doc ID#
44-07	6,21,10	10902

Mr. Allen Gaither
Regional Engineer
Solid Waste Permitting Section
Division of Waste Management
North Carolina Department of Environment and Natural Resources
2090 U.S. Highway 70
Swannanoa, North Carolina 28778

RE: Construction Quality Assurance Certification Report – MSW Phase 3
White Oak MSW Landfill Permit # 44-07
Haywood County, North Carolina

Dear Mr. Gaither:

On behalf of Haywood County, McGill Associates is pleased to submit the Construction Quality Assurance Certification Report for the construction of the MSW Phase 3 Cell at the White Oak MSW Landfill, Permit #44-07, Haywood County, North Carolina. In addition to the printed copy, the Report contains digital versions of the complete submittals.

We appreciate your assistance throughout the permitting and construction phases of this project. Should you have any questions or if we can be of further assistance, please give us a call.

Sincerely,
McGILL ASSOCIATES, P.A.

JEFFREY R. BISHOP, PE
Director of Solid Waste Services

Enclosure

cc: David Cotton, County Manager, Haywood County, w/o enc
Mr. Marty Stamey, Assistant County Manager, Haywood County, w/o enc
Mr. David Francis, Director, Haywood County Tax Administration, w/o enc
Stephen King, Haywood County Solid Waste Director, w/ enc

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McGill Associates, P.A. • P.O. Box 2259, Asheville, NC 28802 • 55 Broad Street, Asheville, NC 28801
828-252-0575 • Fax: 828-252-2518

White Oak MSW Landfill
Haywood County, North Carolina
Permit No. 44-07

CONSTRUCTION QUALITY ASSURANCE CERTIFICATION REPORT
MSW PHASE 3

JUNE 2010

McGill ASSOCIATES

PROFESSIONAL ENGINEERING DESIGN CERTIFICATION

In accordance with the Solid Waste Management Rules, 15A NCAC 13 B, Section .1600, I certify that the construction of the White Oak MSW Landfill, Permit 44-07, MSW Phase 3 has been constructed in substantial accordance with the approved plans and specifications, as presented in the Permit to Construct approved on May 5, 2009 and subsequently modified on October 7, 2009.

Jeffrey R. Bishop, PE
Director of Solid Waste Services
McGill Associates, P.A.
North Carolina PE Registration #23574

CONSTRUCTION QUALITY ASSURANCE CERTIFICATION REPORT

WHITE OAK MSW LANDFILL
MSW PHASE 3
HAYWOOD COUNTY, NORTH CAROLINA

PERMIT NO. 44-07

Submitted To:

North Carolina Department of
Environment And Natural Resources,
Division of Waste Management,
Solid Waste Section
2090 US Highway 70
Swannanoa, North Carolina 28778

June 2010

Prepared By:

McGill Associates, P.A.
55 Broad Street
Asheville, North Carolina 28801
828-252-0575

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SECTIONS

CERTIFICATION REPORT
FOR
WHITE OAK MSW LANDFILL
MSW PHASE 3
PERMIT NO. 44-07
HAYWOOD COUNTY, NORTH CAROLINA

1.0 INTRODUCTION

This Report, prepared by McGill Associates on behalf of Haywood County, North Carolina addresses the quality assurance procedures and activities performed during the construction of the MSW Phase 3 cell at the White Oak MSW Landfill. The documents comprising this report were compiled in general conformance with North Carolina Solid Waste Management Regulations, 15A NCAC 13B and the General Permit Conditions of Permit #44-07. The project generally consisted of the construction of approximately 8.8 acres of lined landfill, including earthwork, soil liner, geosynthetic clay liner (GCL), high density polyethylene liner, leachate collection system, leachate pumping stations, leachate force main and gravity sewer, improvements to the existing leachate storage lagoon, access roads, and erosion control measures.

On May 5, 2009 a **Permit to Construct** Municipal Solid Waste Landfill Phase 3 was issued by the North Carolina Department of Environment and Natural Resources (NCDENR). On October 7, 2009 the NCDENR issued a modification to the May 5, 2009 **Permit to Construct** to allow the addition of a geosynthetic clay liner (GCL) alternative base liner system. A copy of the May 5, 2009 and the October 7, 2009 **Permit to Construct** is included in Section 1 of this Report.

A copy of the Technical Specifications portion of the Conformed Documents for the White Oak MSW Landfill, MSW Phase 3, Haywood County, North Carolina is included in Section 2 of this Report for reference. The Site Specific Construction Quality Assurance Plan (SSCQAP) for this project is included in Section 3 of this Report. A copy of the Contract Drawings, issued for construction, is included in Section 4 of this Report.

Joyce Engineering Inc. was contracted by Haywood County, North Carolina to be the Construction Quality Assurance (CQA) Engineer to perform specific quality assurance procedures and activities relative to the construction of the landfill cell itself. Their specific duties included the soil subgrade foundation, low permeability soil liner, geosynthetic clay liner, high density polyethylene geomembrane liner, geotextile cushion, and the aggregate drainage layer. A copy of their certification report titled Construction Quality Assurance Certification Report, dated May 2010 for the White Oak Landfill, Phase 3 Construction, NCDENR Permit #44-07 is included in Section 5 of this Report.

2.0 WELL ABANDONMENT

Prior to commencing construction activities for the construction of the Phase 3 cell, various piezometers/monitoring wells installed and utilized during the design phase of the project that were in conflict with the proposed construction were abandoned. These piezometers/monitoring wells were abandoned in accordance with the applicable section of the North Carolina Well Construction Standards Rule 15A NCAC 2C. This activity was performed under the supervision of Bunnell-Lammons Engineering, Inc. A copy of the Report of Well Abandonment for the Phase 3 & 4 Expansion, dated July 9, 2009 is included in Section 6.

3.0 SOIL SUBGRADE FOUNDATION

3.1 Removal of Unsuitable Material

In the lower elevations of the Phase 3 cell an area containing unsuitable materials was discovered during the design phase of the project. Plans were developed and included in the construction drawings to remove this material, install an under drain system as needed and replace with suitable compacted material. Approximately 8,000 cubic yards of unsuitable material was removed and replaced under the supervision of the CQA Engineer. The specific quantities of material removed and the areas from which it was removed are included in Appendix 1 of the Construction Quality Assurance Certification Report included in Section 5 of this report. In addition to the undercutting, approximately 900 linear feet of under drain was installed per the contract documents.

3.2 Existing Leachate Sewer Lines

Existing leachate sewer lines from Phase 1, Cell 4 and Phase 2 were removed and replaced as a part of the construction of the Phase 3 Cell. These lines were replaced as dual contained HDPE gravity sewer lines with a minimum separation of four feet maintained between the top of the pipe and the bottom elevation of the proposed soil liner material. These two gravity sewer lines discharged to a new manhole constructed as a part of the construction for eventual discharge in the existing leachate lagoon. These pipes were pressure tested on August 19, 2009. A copy of the pressure test is included in Section 7.

3.3 Rock Pinnacles

During the construction of the subgrade of Phase 3 rock pinnacles were encountered along the northern half of the western edge of the cell, near the tie-in with the proposed Phase 4 cell. These pinnacles could not be removed by conventional excavation methods. Rock pinnacles were also encountered in sediment basin #6. A request to allow the removal of the rock pinnacles through the use of explosives was submitted to

NCDENR and was approved on September 15, 2009. Drilling and blasting operations were performed under the supervision of a licensed blaster under contract to the site contractor. Blasting operations were completed on or about October 23, 2009. In accordance with the conditions of the approval to blast, the site was inspected by a licensed geologist following completion of blasting activities. A report evaluating the possible impact on the area's hydrology was prepared by Bunnell-Lammons Engineering, Inc. and is included in Section 8. The findings in the report concluded the blasting activities had no impact on the area's hydrology and therefore no modification to the facility's groundwater monitoring plan was necessary. A copy of the blasting plan and associated correspondence is also included in Section 8 of this report. The CQA Engineer observed the excavation to confirm the rock had been removed to sufficient depth and the backfilling of the excavated area as a part of the overall observation of the preparation of the subgrade.

3.4 Soil Subgrade Certification

The CQA Engineer observed the soil subgrade preparation and issued a subgrade certification letter on November 19, 2009. A copy of this certification letter is included in Appendix VII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. A certified survey of the subgrade elevations for Phase 3 (titled "As-Built For Cell Subgrade") is included as "Drawing #1 Subgrade" in Appendix VIII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

4.0 LOW PERMEABILITY SOIL LINER

Following the completion of the subgrade construction the Contractor proceeded with construction of the low permeability soil liner. Initially the Contractor constructed a test pad, in the southwest corner of Phase 3 along the sloped cell floor in accordance with the Contract Documents. The test pad measured approximately 100 feet by 150 feet. Low permeability soil from an identified on-site borrow source was used for the test pad. Four lifts, each approximately 8 inches thick, were placed/spread with a dozer and compacted with a sheep's foot roller/compactor. The Contractor made repeated efforts to work the soil to obtain the required minimum permeability of 1x10E-7 cm/sec. This effort was repeated numerous times utilizing varying moisture levels and compactive efforts. The CQA Engineer observed this operation and performed in-situ permeability tests to confirm the results. After repeated attempts, it was determined that the on-site borrow source, previously identified as a source of low permeability soil liner, would apparently not meet the minimum required permeability of 1x10E-7 cm/sec. The Contractor proposed the use of a geosynthetic clay liner (GCL) in lieu of a low permeability soil liner meeting the minimum requirements of 1x10E-7 cm/sec. McGill Associates prepared and submitted to NCDENR a permit modification to allow the use of 18 inches of low permeability soil liner meeting a minimum permeability of 1x10E-5 cm/sec and a

GCL with a permeability of approximately 1x10E-9 cm/sec. The top elevation of the low permeability soil liner (1x10E-5 cm/sec) would remain the same as the designed top elevation of the original low permeability soil liner (1x10E-7 cm/sec). This permit modification was approved by NCDENR on October 7, 2009, a copy of which is included in Section 1 of this report. Following the approval of the permit modification, the alternate low permeability soil liner was constructed in three lifts for a total thickness of 24 inches. In-situ permeability testing was performed by the CQA Engineer to confirm the top 18 inches met the minimum permeability of 1x10E-5 cm/sec. The results of this testing protocol are included in Appendix I of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. A certified survey of the low permeability soil liner elevations for Phase 3 (titled "As-Built For Cell Clay Liner") is included as "Drawing #2 Soil Liner" in Appendix VIII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

The leachate lagoon berm, raised in elevation as a part of this project, was also constructed of the same low permeability soil material as the Phase 3 alternate low permeability soil liner approved in the aforementioned permit modification. The CQA Engineer observed the placement of this material and performed the quality assurance testing as required by the Contract Documents. The final results of the field and laboratory testing for the leachate lagoon berm expansion are included in Appendix 1 of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

5.0 GEOSYNTHETIC CLAY LINER (GCL)

With the approval of the Permit Modification dated October 7, 2009, a copy of which is included in Section 1 of this report, the Contractor placed the GCL across the entire floor of the Phase 3 Cell. Prior to the placement of the GCL panels the Geosynthetics Contractor inspected and completed the subgrade acceptance form for the applicable work area. Copies of the subgrade acceptance forms are included in Appendix III of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. The GCL panels were placed simultaneously with the placement of the HDPE Geomembrane Liner and all GCL panel material was covered with HDPE Geomembrane Liner each day. The particular panels utilized for this project were manufactured by CETCO and were supplied with a proprietary Winning Edge Super Grove™ allowing a more direct contact of bentonite clay with the adjacent panel. Adjacent GCL panels were overlapped a minimum of 6 inches and end-of-rolls were overlapped and shingled a minimum of 24 inches. The Contractor applied accessory sodium bentonite between the end-of-roll overlaps as required in the Contract Documents. The CQA Engineer observed the placement of the GCL panels to ensure placement in accordance with the Contract Documents. The manufacturer's quality certifications (MQC) are contained in Appendix II of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

The GCL panels were also utilized for the expansion of the leachate lagoon berm. These panels were deployed in the same fashion as the GCL panels for the Phase 3 Cell. Adjacent GCL panels were overlapped a minimum of 6 inches and end-of-rolls were overlapped and shingled a minimum of 24 inches. The Contractor applied accessory sodium bentonite between the end-of-roll overlaps as required in the Contract Documents. The CQA Engineer observed the placement of the GCL panels for the leachate lagoon expansion to ensure placement in accordance with the Contract Documents. The manufacturer's quality certifications (MQC) are contained in Appendix II of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

6.0 HIGH DENSITY POLYETHYLENE GEOMEMBRANE (HDPE) – PHASE 3 CELL

The primary HDPE Geomembrane was deployed in the Phase 3 Cell immediately following the deployment of the GCL panels. Sufficient HDPE Geomembrane Liner was deployed in the Phase 3 Cell area during each installation cycle to completely cover the GCL panels. Once the HDPE Geomembrane panels were placed and properly positioned the Geosynthetics Contractor undertook the task of seaming the joints and overlaps in accordance with the Contract Documents. The CQA Engineer observed the placement and seaming of all HDPE Geomembrane Liner to ensure conformance with the Contract Documents and testing protocol. The installation records and QA/QC data for the HDPE Geomembrane Liner installed in the Phase 3 Cell area are included in Appendix III of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. The as-built HDPE Geomembrane panel layout drawing for the Phase 3 Cell, noting all seams, repairs, etc. is included as "Drawing #4 Geomembrane" in Appendix VIII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

7.0 GEOTEXTILE CUSHION

The geotextile cushion, consisting of a 16 oz/sy nonwoven geotextile, was placed to cover and protect the HDPE Geomembrane Liner once all seaming and QA/QC activities had been completed. The geotextile cushion was placed with all adjacent seams and end-of-roll seams overlapped a minimum of 6 inches. The individual geotextile panels were smoothed out and heat bonded together to form a contiguous geotextile cushion over the entire lined Phase 3 Cell area. The CQA Engineer observed the placement and heat seaming of all geotextile material. Manufacturer certificates and material conformance test results are included in Appendix IV of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

8.0 GEOCOMPOSITE

A geocomposite was placed between the existing HDPE Geomembrane Liner and the new HDPE Geomembrane Liner as a part of the expansion of the leachate lagoon. The CQA Engineer observed the placement and seaming of the geocomposite panels. Manufacturer certificates and material conformance test results are included in Appendix IV of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

9.0 HIGH DENSITY POLYETHYLENE GEOMEMBRANE (HDPE) – LEACHATE LAGOON EXPANSION

The primary HDPE Geomembrane deployed as a part of the leachate lagoon expansion was placed immediately following the deployment of the GCL panels and the geocomposite. Sufficient HDPE Geomembrane Liner was deployed in the leachate lagoon during each installation cycle to completely cover the GCL panels and the geocomposite. Once the HDPE Geomembrane panels were placed and properly positioned the Geosynthetics Contractor undertook the task of seaming the joints and overlaps in accordance with the Contract Documents. The CQA Engineer observed the placement and seaming of all HDPE Geomembrane Liner and pipe boots to ensure conformance with the Contract Documents and testing protocol. The installation records and QA/QC data for the HDPE Geomembrane Liner installed as a part of the leachate lagoon expansion is included in Appendix III of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. The as-built HDPE Geomembrane panel layout drawing for the leachate lagoon expansion, noting all seams, repairs, etc. is included as "Drawing #4 Geomembrane" in Appendix VIII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

10.0 LEACHATE COLLECTION REMOVAL SYSTEM

The leachate collection removal system consisted of the placement of 6 inch and 8 inch perforated HDPE pipe (SDR 17) surrounded by 12 inches of NCDOT #5 washed stone wrapped in a 6 oz/sy nonwoven geotextile fabric. The leachate collection removal system was placed in the lower reaches of the cell and strategically along portions of the sloped sides of the cell to facilitate the collection and transportation of the collected leachate to the sump area for ultimate removal from the cell. Cleanouts were installed along the western edge of the Phase 3 Cell as well as in the vicinity of the sump area. The leachate collection removal system sump consisted of depressed collection area with two 24 inch HDPE riser pipes (SDR 17) set within the depressed area and extending up the adjacent side slope to a point just outside the lined area of the cell. The portions of the 24 inch riser pipes in the sump area were perforated to allow the inflow of leachate to the leachate pumping system. Solid 24 inch HDPE pipe extended up the

side slope. The perforated portions of the 24 inch HDPE riser pipes were interconnected with an 8 inch HDPE perforated cross pipe to facilitate the flow of leachate. The perforated portion of the 24 inch HDPE riser pipes were also interconnected with the associated leachate collection removal system installed throughout the cell floor area. The depressed portion of the sump area was backfilled with NCDOT #5 washed stone and overlain with an 8 oz/sy nonwoven geotextile over which a 2 foot thick layer of aggregate drainage material was placed. The leachate pumping system consisted of a stainless steel pump, flexible discharge line and associated appurtenances installed in each riser pipe. The pumps and control systems were specifically designed for use in landfill leachate removal operations and were equipped to operate automatically on alternate pumping cycles or manually should the need arise. The pumps were set within the perforated section of the riser pipe. The installation of the leachate removal collection system was observed by the Engineer who also performed tests on the pumping system to ensure proper operation in accordance with the Contract Documents. An as-built drawing of the leachate collection removal system titled "Record Drawing for White Oak MSW Landfill, Phase 3" under the file name "White Oak MSW record drawing.pdf" is included in Section 9 of this report.

11.0 AGGREGATE DRAINAGE LAYER

Once the geotextile cushion was placed, and in conjunction with the installation of the leachate collection removal system, a 2 foot thick aggregate drainage layer comprised of NCDOT #57 washed stone meeting the gradation and calcium carbonate requirements of the Contract Documents was installed. The placement of the aggregate drainage layer was initiated on the southern end of the Phase 3 Cell and systematically worked toward the sump area at the northern end of the cell. As the placement of the aggregate drainage layer progressed in a northerly direction, care was taken to push the stone material in an uphill fashion to avoid undue stress on the soil/synthetic interface. The aggregate drainage layer was placed using a GPS guided dozer to ensure a consistent thickness was maintained over the synthetic liner material and the leachate collection removal system. Material pre-construction and construction testing results are contained in Appendix I.C of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. A certified survey of the aggregate drainage layer elevations for Phase 3 (titled "As-Built For Cell Protective Cover") is included as "Drawing #3 Aggregate Drainage Layer" in Appendix VIII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

12.0 STORMWATER CONTROL LINER

Upon completion of the placement of the aggregate drainage layer a geomembrane stormwater cover was installed and secured by the Geosynthetic Contractor. The stormwater control liner will assist in minimizing the volume of leachate generated within the Phase 3 Cell until such time as the cell is completely floored in with waste. As the placement of waste progresses from the southern end of the Phase 3 Cell to the north, the stormwater control liner will be systematically removed to allow intimate contact between the waste mass and the aggregate drainage layer thereby ensuring the capture and removal of all leachate. The Engineer observed the placement and anchoring of the stormwater control liner.

13.0 SUMMARY OF CQA FIELD DATA

A summary of the CQA field data collected and tabulated by Joyce Engineering, Inc., the CQA Engineer hired by Haywood County to perform specific CQA activities during the construction of the Phase 3 Cell at the Haywood County MSW Landfill, is discussed in 3.0 Summary of CQA Field Data in the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

14.0 DEVIATION FROM THE CONTRACT DOCUMENTS – PHASE 3 TIE-IN TO PHASE 1, CELL 4 AND PHASE 2

As construction progressed along the tie-in between the Phase 3 Cell and the existing Phase1, Cell 4 and Phase 2 Cell it became apparent that existing conditions along that connection point would make the anchor trench and liner tie-in detailed in the Contract Drawings difficult to construct. The Contractor suggested a change in the anchor trench and liner tie-in design to avoid excavating existing soil material below the elevation of the adjacent waste mass prior to placement of the low permeability soil liner material. McGill Associates reviewed the Contractor's request and provided a revised anchor trench and liner connection detail for use along this connection point. A drawing of the proposed revised anchor trench and liner connection detail, titled "09 1103 – Liner Tie-in Detail – Phase 3 to Phase 1 & 2.pdf" is included in Section 10 of this report. A key component of this detail required that once the anchor trench was excavated; Shelby tube samples would be taken a minimum of 18 inches deep through the bottom of the anchor trench at intervals not to exceed 250 feet. The purpose of the tests was to confirm a minimum of 18 inches of low permeability soil below the bottom of the anchor trench meeting a minimum permeability of 1x10E-5 cm/sec. Four samples (S-1 through S-4) were collected by CQA Engineer along the Phase 3 Cell tie-in with Phase 1, Cell 4 and Phase 2. Test sample S-2, along the Phase 2 Cell connection, failed to meet the required minimum permeability. A re-sample, S-2A (laboratory sample PH2B), was taken in the anchor trench approximately 100 feet to the west of failed sample S-2. This sample met the minimum thickness and permeability requirements. The anchor trench soil tests and locations are included in Appendix I.B – Construction Testing in the Construction Quality Assurance Certification

Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. As a result of the existing soil material below the anchor trench failing to meet the minimum permeability requirements of the low permeability soil liner (Sample S-2), McGill Associates prepared a detail of the proposed repair and submitted it by e-mail to NCDENR on December 11, 2009. A copy of the e-mail titled "09 1211 – E-mail to AG – Additional GCL.pdf" and its associated attachments is included in Section 10 of this report. The repair required the Contractor to place an additional GCL panel over the section of anchor trench affected by the failure. On April 14, 2010 an e-mail was sent to the Contractor providing a blow-up detail of the existing conditions and the suggested repair. This e-mail, titled "10 0414 – E-mail to KV – Install GCL.pdf", and its associated attachments drawings is included in Section 10 of this report. To accomplish this repair, the Contractor removed the aggregate drainage layer along the specified area requiring repair to expose the synthetic liner material initially installed over the anchor trench. The geotextile cover and HDPE Geomembrane flap initially installed over the anchor trench were pulled back and the soil anchor in the anchor trench was checked and regraded to promote positive drainage into the Phase 3 Cell area. A single GCL panel, approximately 14.5 feet wide by 150 feet long was placed over the affected area by the Geosynthetic Contractor followed by a HDPE Geomembrane flap of sufficient size to cover the GCL and extend over the break in the adjacent slope leading into the Phase 3 Cell. A geotextile cushion layer was then installed over the HDPE Geomembrane flap and the aggregate drainage layer replaced over the affected area. The overall dimensions of the modified tie-in were approximately 22 feet wide by 203 feet long. The CQA Engineer observed the work done as a part of the modified tie-in procedure. There was some initial concern that the aggregate drainage layer had become slightly contaminated with fine soil material washing from the Phase 2 Cell area; however, after the aggregate drainage layer was removed and observed, the CQA Engineer determined the contamination was minimal and should not affect the flow of leachate to the Phase 3 Cell area. A drawing showing the area along the Phase 3/Phase 2 connection where the additional GCL and HDPE Geomembrane was installed is included in Appendix III.C – Installation of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report. The as-built HDPE Geomembrane panel layout drawing for the Phase 3 Cell also defines this modified tie-in area and is included as "Drawing #4 Geomembrane" in Appendix VIII of the Construction Quality Assurance Certification Report prepared by Joyce Engineering, Inc. included in Section 5 of this report.

END

SECTIONS

SECTIONS

SECTION 1: PERMIT TO CONSTRUCT

SECTION 2: TECHNICAL SPECIFICATIONS

SECTION 3: SITE SPECIFIC CONSTRUCTION QUALITY ASSURANCE PLAN

SECTION 4: CONTRACT DRAWINGS

SECTION 5: CONSTRUCTION QUALITY ASSURANCE CERTIFICATION REPORT
Prepared by: Joyce Engineering, Inc.
May 2010

SECTION 6: WELL ABANDONMENT

SECTION 7: LEACHATE SEWER LINE PRESSURE TEST RESULTS

SECTION 8: ROCK PINNACLE BLASTING OPERATIONS

SECTION 9: LEACHATE COLLECTION REMOVAL SYSTEM

SECTION 10: PHASE 3 / PHASE 2 ANCHOR TRENCH MODIFICATIONS

Section 1

North Carolina Department of Environment and Natural Resources
Division of Waste Management

Beverly Eaves Perdue, Governor
Dexter R. Matthews, Director
Dee Freeman, Secretary

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION

MUNICIPAL SOLID WASTE LANDFILL FACILITY
Permit No. 44-07

HAYWOOD COUNTY
is hereby issued a

PERMIT TO OPERATE
WHITE OAK MUNICIPAL SOLID WASTE LANDFILL
PERMIT TO CONSTRUCT
MUNICIPAL SOLID WASTE LANDFILL PHASE 3

Located at 3898 Fines Creek Road, SR 1338, in Haywood County, North Carolina, in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The legal description of the site is identified on the deeds recorded for this property listed in Attachment No. 1 of this permit.

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

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-508-8400 \ FAX 919-733-4810 \ Internet: www.wastenotnc.org/swhome

ATTACHMENT 1

PART I: PERMITTING HISTORY

1. On June 30, 1999 an amendment was made to the Permit to Operate for a five-year renewal of the MSW landfill unit.
2. On November 27, 2001 an amendment was made to the Permit to Operate for the operation of Phase 2.
3. On November 18, 2002 an amendment was made to the Permit to Operate for the operation of a C&D landfill unit.
4. On November 8, 2008 an amendment was made to the Permit to Operate for a five-year renewal of the MSW landfill unit and the addition of a LCID landfill unit.
5. On May 5, 2009 an amendment was made to the Permit to Construct. Conditions were added for the construction of MSW Unit Phase 3. In addition, a modification was made to the Permit to Operate for the addition of a Processing (mulching and grinding of land clearing waste) unit, a small Type II Composting unit, tarp and soil/mulch mixture alternative daily covers as well as Type II composting for use as a soil amendment.

Permit Type	**Date Issued**	**DIN**
Original Permit to Construct	July 22, 1992	
Original Permit to Operate	October 8, 1993	
Permit Amendment	June 30, 1999	
Permit Amendment	November 27, 2001	
Permit Amendment	November 8, 2006	595
Permit Amendment /Modification	May 5, 2009	7070

PART II: LIST OF DOCUMENTS FOR THE APPROVED PLAN

NO.	**DOCUMENT DESCRIPTION**	**DOCUMENT ID NO.**
1.	*MSWLF Facility Permit To Construct, Phase 2*. Prepared by Municipal Engineering. Prepared for Haywood County. March 2000.	
2.	*Design Hydrogeologic Study, Phase 2, White Oak Subtitle D Landfill*. Prepared by Municipal Engineering. Prepared for Haywood County. June 2000.	

3.	*Alternate Liner System Modifications / Permit to Construct for Haywood County Municipal Solid Waste Landfill Facility, Phase 2*. Prepared by Municipal Engineering, Prepared for Haywood County. October, 2000.	
4.	*Site Hydrogeologic Study, Haywood County Construction & Demolition Landfill, Waynesville, North Carolina*. Prepared by Municipal Engineering. Prepared for Haywood County. June 4, 2001.	
5.	*Construction Quality Assurance Report, Municipal Solid Waste Landfill Facility, Phase 2, Haywood County*. Prepared by Municipal Engineering. Prepared for Haywood County. August, 2001.	
6.	*Plans entitled As-Built for Haywood County C&D Landfill*. Prepared by Municipal Engineering. Prepared for Haywood County. October 22, 2002.	
7.	*Letter with reference: Geologic Conditions Haywood County C&D Landfill*. Prepared by Edward Custer, L.G. Prepared for Haywood County. November 5, 2002.	
8.	*Land Clearing and Inert Debris Landfill Facility, Haywood County*. Prepared by Municipal Engineering. Prepared for Haywood County. September, 2006.	
9.	*Permit Renewal Proposed Fill Plan, Municipal Solid Waste Landfill Facility, Phase 2, Haywood County*, Prepared by: Municipal Engineering. Prepared for: Haywood County. October 31, 2006.	
10.	*Alternative Daily Cover Demonstration Authorization Letter, Polypropylene Tarp*. Prepared by: James Patterson. Prepared for: Solid Waste Section. June 28, 2007.	3924
11.	*Email: Haywood County Construction & Demolition Landfill Closure*. Prepared by: McGill Associates. Prepared for: Haywood County. March 31, 2008.	4286
12.	*Modifications to the Operations Plan, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: McGill Associates. Prepared for: Haywood County. June 6, 2008.	4929
13.	*White Oak Operations Plan Modification Response Letter*. Prepared by: Allen Gaither. Prepared for: Solid Waste Section. June 30, 2008.	4930
14.	*Closure Plan, Construction & Demolition Landfill Phase 1*. Prepared by: McGill Associates. Prepared for: Haywood County. June 27, 2008.	5031
15.	*Permit to Construct Submittal, MSW Phases 3 & 4, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: McGill Associates. Prepared for: Haywood County. September 12, 2008.	5806

16.	*Design Hydrogeologic Report, Phases 3 and 4, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: Bunnell-Lammons Engineering. Prepared for: McGill Associates. July 11, 2008	5807
17.	*Environmental Monitoring Plan, Phases 3 and 4, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: Bunnell-Lammons Engineering. Prepared for: McGill Associates. July 11, 2008	5808
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PART III: PROPERTIES APPROVED FOR THE SOLID WASTE FACILITY

Haywood County, N.C. Register of Deeds				
Book	Page	Grantee	Grantor	Parcel No.
424	204	Haywood County	Leatherwood & Monson	8712-30-1872
403	1374	Haywood County	Davis, Davis & Raulerson	8712-11-8775
461	1036	Haywood County	Bramlett	8712-00-6575
				Total Site Acreage: ±268.4 acres

Notes:

1. Deed book references are from the Haywood County Register of Deeds office (http://maps.haywoodnc.net/gisweb/default.aspx).

PART IV: GENERAL PERMIT CONDITIONS

1. This permit is issued by the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Section (Section). In accordance with North Carolina Solid Waste Management Rule 15A NCAC 13B .0201(d), a solid waste management facility permit shall have two parts: a Permit to Construct and a Permit to Operate. The Permit to Construct shall expire on November xx, 2010. The Permit to Construct must be implemented in accordance with Attachment 2 of this permit. The Permit to Operate shall expire November 8, 2011. The Permit to Operate must be implemented in accordance with Attachment 3 of this permit.

2. The persons to whom this permit is issued ("permittee") are the owners and operators of the solid waste management facility.

3. (Intentionally blank)

4. When this property is sold, leased, conveyed, or transferred in any manner, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument, a statement that the property has been used as a sanitary landfill and a reference by book and page to the recordation of the permit.

5. By initiating construction or receiving waste at this facility the permittee shall be considered to have accepted the terms and conditions of this permit.

6. Construction and operation of this solid waste management facility must be in accordance with the Solid Waste Management Rules, 15A NCAC 13B, Article 9 of the Chapter 130A of the North Carolina General Statutes (NCGS 130A-290, et seq.), the conditions contained in this permit; and the approved plan. Should the approved plan and the rules conflict, the Solid Waste Management Rules shall take precedence unless specifically addressed by permit condition.

7. This permit is issued based on the documents submitted in support of the application for permitting the facility including those identified in Attachment 1, "List of Documents for Approved Plan," and which constitute the approved plan for the facility. Where discrepancies exist, the most recent submittals and the Conditions of Permit shall govern.

8. This permit may be transferred only with the approval of the Section, through the issuance of a new or substantially amended permit in accordance with applicable statutes and rules. In accordance with NCGS 130A-295.2(g) the permittee must notify the Section thirty (30) days prior to any significant change in the identity or business structure of either the owner or the operator, including but not limited to a proposed transfer of ownership of the facility or a change in the parent company of the owner or operator of the facility.

9. The permittee is responsible for obtaining all permits and approvals necessary for the development of this project including approval from appropriate agencies for a General or Individual NPDES Stormwater Discharge Permit. Issuance of this permit does not remove the permittee's responsibilities for compliance with any other local, state or federal rule, regulation or statute.

- End of Section -

ATTACHMENT 2
CONDITIONS OF PERMIT TO CONSTRUCT

PART I: MUNICIPAL SOLID WASTE LANDFILL UNIT SPECIFIC CONDITIONS

1. Pursuant to the NC Solid Waste Management Rules (Rule) 15A NCAC 13B .0201(c) and (d)(1), this permit approves construction for MSW Phase 3 consisting of approximately 8.8 acres with a projected operating capacity of 686,000 cubic yards of airspace.

2. The initial, substantial, construction authorized by this Permit to Construct must commence within 18 months from the issuance date of this permit. If substantial construction does not begin within 18 months from the issuance date of this permit, then the permit to construct shall expire. Substantial construction includes, but is not limited to, issuance of construction contracts, mobilization of equipment on site, and construction activities including installation of sedimentation and erosion control structures. The permittee may reapply for the permit to construct prior to the expiration date. The re-application will be subject to the statutes and rules in effect on that date and may be subject to additional fees.

3. Construction of all solid waste management units within this facility must be in accordance with the pertinent approved plans and only for those phases of development approved for construction as described in Attachment I, Part II List of Documents for the Approved Plan.

4. The permittee must conduct a preconstruction meeting at the facility prior to initiating construction of any unit/cell and must notify the Section at least 10 days prior to the meeting.

5. Modifications or revisions of the approved documents or changes during construction of any landfill unit/cell require approval by the Section, and may constitute a permit modification and be subject to a permitting fee.

6. The following conditions must be met prior to operation of the Phase 3:

   a. The Permittee must obtain a Permit to Operate for Phase 3 from the Section in accordance with 15A NCAC 13B .0201(d).

   b. Construction Quality Assurance (CQA) documentation as well as a certification by the project engineer that the landfill was built in accordance with approved plans and the conditions of the permit must be submitted to the Section for review and approval.

c. The Permittee must contact the appropriate regional environmental specialist and permitting engineer to determine whether the Section chooses to hold a pre-operative meeting with key landfill personnel and representatives of the Section.

d. The edge of the waste footprint must be identified with permanent physical markers.

Geologic, Ground Water and Monitoring Requirements

7. Prior to issuing the Permit to Operate, samples from new ground water monitoring wells and surface water stations shall be sampled for the Appendix I constituent list.

8. Prior to construction of the phase or cell(s) within the phase, all piezometers, borings, and groundwater monitoring wells within the footprint must be properly abandoned in accordance with 15A NCAC 2C .0113 (b)(1), entitled "Abandonment of Wells."

9. In areas where soil is to be undercut, abandoned piezometers, monitoring wells and borings must not be grouted to pregrade land surface, but to the proposed base grade surface to prevent having to cut excess grout and possibly damage the wells.

10. A Licensed Geologist must report any pertinent geological feature(s) exposed during phase or cell excavation. Prior to placing any landfill liner, the geologist must submit to the Section hydrogeologist a written report that includes an accurate description of the exposed geological feature(s) and effect of the geological feature(s) on the design, construction, and operation of the cell, phase, or unit.

11. A Licensed Geologist must supervise installation of groundwater monitoring wells and surface water sampling stations.

12. Any modification to the approved water quality monitoring, sampling, and analysis plan must be submitted to the Section Hydrogeologist for review.

13. Within 30 days of completed construction of each new groundwater monitoring well, a well construction record (GW-1 form), typical well schematic, boring log, field log and notes, and description of well development activities must be submitted to the Section.

14. The permittee must provide a plan sheet-sized, scaled topographical map, showing the location and identification of new, existing, and abandoned wells and piezometers after installation of groundwater monitoring wells.

15. Within thirty (30) days of the completed permanent abandonment of a ground-water monitoring well, the well abandonment record (GW-30 form) and any additional information included in the abandonment record) must be submitted to the Section. The well abandonment records must be submitted to the Solid Waste Section in accordance with 15A NCAC 2C .0114(b) and be certified by a Licensed Geologist.

Erosion and Sedimentation Control Requirements

16. All required sedimentation and erosion control measures must be installed and operable to mitigate excessive on-site erosion and to prevent silt from leaving the area of the landfill unit during the service life of the facility.

17. All earth disturbing activities must be conducted in accordance with the Sedimentation Pollution Control Act of 1973 (15 NCAC 4) and consistent with any other local, state or federal requirements.

18. Facility construction, operations or practices must not cause or result in a discharge of pollution, dredged material, and/or fill material into waters of the state in violation of the requirements under Sections 401 and 404 of the Clean Water Act, as amended.

19. Modifications to the approved sedimentation and erosion control activities require approval by the North Carolina Land Quality Section. The Section must be notified of any sedimentation and erosion control plan modifications.

PART II: CONSTRUCTION AND DEMOLITION DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

Not Applicable

PART III: LAND CLEARING AND INERT DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

Not Applicable

PART IV: MISCELLANEOUS SOLID WASTE MANAGEMENT SPECIFIC CONDITIONS

Not Applicable

ATTACHMENT 3
CONDITIONS OF PERMIT TO OPERATE

PART I: GENERAL FACILITY CONDITIONS

1. The Permit to Operate shall expire November 8, 2011. Pursuant to 15A NCAC 13B .0201(e), no later than July 8, 2011, the owner or operator must submit a request to the Section for permit review and must update pertinent facility plans including, but not limited to, the facility operation and waste screening plans.

2. All sedimentation and erosion control activities must be conducted in accordance with the Sedimentation Control Act N.C.G.S. 113A-50, et seq., and rules promulgated under 15A NCAC 4.

Operational Requirements

3. This facility is permitted to receive solid waste generated within Haywood County, consistent with the local government waste management plan and with local government approval and as defined in G.S. 130-290 (a)(35), except where prohibited by the N. C. General Statues Article 9 of Chapter 130A, and the rules adopted by the Commission for Health Services.

4. The facility operator must complete an approved operator training course in compliance with G.S. 130A-309.25.

   a. A responsible individual certified in landfill operations must be on-site during all operating hours of the facility at all times while open for public use to ensure compliance with operational requirements.

   b. All pertinent landfill-operating personnel must receive training and supervision necessary to properly operate the landfill units in accordance with G.S. 130A-309.25 and addressed by memorandum dated November 29, 2000.

5. The use of different alternative daily cover requires approval, prior to implementation, by the Solid Waste Section. Requests for alternative daily cover approval must include a plan detailing the comprehensive use and a demonstration of the effectiveness of the alternative daily cover. The plan must be developed according to Section guidelines. Plans which are approved by the Section will be incorporated into, and made a part of, the approved documents listed in Attachment 1.

a. The use of a fabric tarp as an alternate daily cover is approved and subject to the terms and conditions of operation as set forth in the plan. Soil cover shall be applied at a minimum of one time per week in accordance with Rule .1626 (2). Soil shall be applied more frequently, if needed, to control disease vectors, fires, odors, blowing litter and scavenging.

b. The use of a 3:1 Soil/Mulch mixture as an alternative daily cover is pending approval of a Demonstration Report submitted in accordance with the Alternative Cover Material (ACM) Demonstration Authorization Letter.

6. The facility must maintain records for all solid waste materials accepted as alternative cover material and used as alternate daily cover. The records must include: the date of receipt, weight of material, general description of the material, identity of the generator and transporter, and county of origin. Such records must be made available to the Solid Waste Section upon request.

Monitoring and Reporting Requirements

7. Groundwater, surface water, and methane monitoring locations must be established and monitored as identified in the approved plans.

8. A licensed geologist must be present to supervise the installation of groundwater monitoring wells. The exact locations, screened intervals, and nesting of the wells must be established after consultation with the SWS Hydrogeologist at the time of well installation.

9. Ground water monitoring wells and surface water sampling locations must be sampled for Appendix I constituents at least semi-annually according to the specifications outlined in the approved water quality monitoring plan and the current policies and guidelines of the Section in effect at the time of sampling.

10. Reports of the analytical data for each monitoring event must be submitted to the Section within 120 days of the respective sampling event. Analytical data must be submitted in a manner prescribed by the Section. Records of all groundwater, surface water, and leachate analytical data must be kept as part of the permanent facility record.

11. The four independent samples which comprise the initial baseline sampling event must be collected from each groundwater monitoring well and the report must be submitted to the Section within six months after issuance of the Permit to Operate.

12. Untreated leachate must be sampled and analyzed at least semi-annually concurrently with the groundwater water and surface water sampling, one sample per event. The leachate must be analyzed for all Appendix I constituents, pH, specific conductance, BOD, COD, nitrates, sulfates, and phosphates. Test results must be submitted to the

Section along with groundwater and surface water test results. In the event leachate is recirculated, additional leachate sampling may be required.

13. A readily accessible unobstructed path must be cleared and maintained so that four-wheel vehicles may access monitoring well locations at all times.

14. A field log book which details all development, sampling, repair, and all other pertinent activities associated with each monitoring well and all sampling activities associated with each surface water and leachate sampling location must be kept as part of the permanent facility record.

15. All well construction records and soil boring logs for new wells must be submitted to the Solid Waste Section Hydrogeologist for review within 30 days of completion.

16. Copies of this permit, the approved plans, and all records required to be maintained by the permittee must be maintained at the facility and made available to the Section upon request during normal business hours.

17. The owner or operator must maintain a record of the amount of solid waste received at the landfill unit, compiled on a monthly basis. Scales must be used to weigh the amount of waste received.

18. On or before August 1 annually, the Permittee must submit an annual facility report to the Solid Waste Section, on forms prescribed by the Section.

    a. The reporting period shall be for the previous year beginning July 1 and ending June 30.

    b. The annual facility report must list the amount of waste received and landfilled in tons and be compiled:
        i) On a monthly basis.
        ii) By county, city or transfer station of origin.
        iii) By specific waste type.
        iv) By disposal location within the facility.
        v) By diversion to alternative management facilities.

    c. A measurement of volume utilized in the landfill cells must be performed during the second quarter of the calendar year. The date and volumes, in cubic yards, must be included in the report.

d. The amount of waste, in tons from scale records, disposed in landfill cells from October 8, 1993 through the date of the annual volume survey must be included in the report.

e. The completed report must be forwarded to the Regional Waste Management Specialist for the facility by the date due on the prescribed annual facility report form.

f. A copy of the completed report must be forwarded to each county manager for each county from which waste was received at the facility. Documentation that a copy of the report has been forwarded to the county managers must be sent to the Regional Waste Management Specialist by the date due on the prescribed annual facility report form

PART II: MUNICIPAL SOLID WASTE LANDFILL UNIT SPECIFIC CONDITIONS

19. This permit approves the continued operation of Phase 2 of the municipal solid waste landfill, as well as the onsite environmental management and protection facilities as described in the approved plans.

20. The following table lists the dimensions and details for the MSW landfill units. The following waste volumes include waste, daily cover, and intermediate cover, but do not include final cover.

MSW Unit	Acres	Gross capacity (cubic yards)
Phase 1	11.4	718,800
Phase 2	10.2	830,000
Total	21.6	1,548,800

21. The facility is approved to accept approximately 60,000 tons per year, approximately 164 tons per day (365 days per year), with a maximum variance in accordance with GS 130A-294(b1)(1) as listed in Attachment 1, Part II.

22. The following, at a minimum, must not be accepted for disposal at the facility: hazardous waste, yard trash, liquid wastes, regulated medical waste, sharps not properly packaged, PCB waste as defined in 40 CFR 761, and wastes banned from disposal in North Carolina by G.S. 130A-309.10(f).

23. The permittee must not knowingly dispose of any type or form of municipal solid waste that is generated within the boundaries of a unit of local government that by ordinance:

    a. Prohibits generators or collectors of municipal solid waste from disposing of that type or form of municipal solid waste.

    b. Requires generators or collectors of municipal solid waste to recycle that type or form of municipal solid waste.

24. The use of leachate recirculation as a leachate management tool requires approval by the Section prior to implementation. Requests for leachate recirculation approval must include a comprehensive management plan developed according to Section guidelines and which is consistent with the approved operation plan. Plans which are approved by the Section will be incorporated into, and made a part of, the approved documents listed in Attachment 1.

25. The facility is permitted to co-dispose of wastewater treatment sludge generated within the facility's approved service area, and subject to the terms and procedures of the approved plan.

26. The leachate collection system must be maintained in accordance with 15A NCAC 13B.1626(12)(a). The plan shall include provisions for periodic cleaning and visual inspection. Documentation of the inspections, and cleaning and monitoring must be included in the operating records of the facility and provided to the Department upon request.

27. Financial assurance as required by state rules and statutes must be continuously maintained for the duration of the facility in accordance with applicable rules and statutes. Closure and Post-Closure cost estimates and financial instruments must be updated annually pursuant to 15A NCAC 13B .1628.

28. Closure or partial closure of any MSWLF unit must be in accordance with the Closure Plans described in the approved plans and 15A NCAC 13B .1629. Final Closure Plans must be submitted to the Division at least 90 days prior to implementation.

PART III: CONSTRUCTION AND DEMOLITION DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

29. The C&D landfill unit stopped receiving waste June 30, 2008. Closure in accordance with Rule .0505 must be completed no later than May 30, 2009.

30. Haywood County must maintain the integrity and effectiveness of the cap system, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and prevent surface water from impounding over waste and run-on and run-off from eroding or otherwise damaging the cap system.

31. Post-closure use of the property is subject to review and approval by the Division and must not disturb the integrity of the cap system, or the function of the monitoring systems. The Division may approve any other disturbance if the owner or operator demonstrates that disturbance of the cap system, including any removal of waste, will not increase the potential threat to human health or the environment.

32. For the closed C&D landfill unit, the permittee must conduct groundwater and surface water sampling in accordance with the post-closure water quality monitoring plan of the approved Closure Plan, Document 11, Part II, Attachment 1. Ground water monitoring wells and surface water sampling location(s) must be sampled on a semi-annual basis, for a minimum of five years from closure (five years from July 2008). After five years of monitoring, the Solid Waste Section will determine if further monitoring will be required.

33. The permittee must maintain a record of all monitoring events and analytical data. Reports of the sampling events and analytical data must be submitted to the Section in a timely manner.

34. Any proposed expansion to the closed C&D landfill unit will be considered a new landfill for purposes of Solid Waste Management permitting.

PART IV: LAND CLEARING AND INERT DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

General

35. The land clearing and inert debris landfill is permitted to receive for disposal only land-clearing waste, concrete, brick, concrete block, uncontaminated soil, gravel and rock, untreated and unpainted wood, and yard trash, in accordance with Rule .0101 (22) and .1010 (23).

36. This permit is for the construction and operation of the landfill in accordance with the approved plans, Attachment 1, Part II, Document 8. Any revision to the construction or operation of the facility requires written approval by the North Carolina Solid Waste Section. Construction or operation of future cells or phases will require written approval of the Section.

Pre-Operational

37. The following requirements shall be met prior to receiving solid waste at the unit:
    a. A site inspection and pre-operative meeting shall be conducted by a representative of the Solid Waste Section. The permittee shall notify the Section's Waste Management Specialist and make arrangements for the site inspection and pre-operative meeting.
    b. A sign shall be posted at the unit as required by the NC Solid Waste Management Rules Operational Requirements, 15A NCAC 13B .0566 (16).
    c. A certification letter, from a Registered Professional Engineer, shall be submitted to the Section stating that the facility has been constructed in accordance with the approved plans.
    d. Survey stakes shall be installed to delineate the approved limits of the waste.

Operational

38. This facility shall conform to the operational requirements of the NC Solid Waste Management Rules, 15A NCAC 13B .0566, and to the operational plan identified in Attachment 1, Part II, Document 8.

PART V: MISCELLANEOUS SOLID WASTE MANAGEMENT SPECIFIC CONDITIONS

General Conditions

39. Wastes received and product stored shall be maintained in reasonably sized piles with adequate fire breaks and lanes in accordance with the approved operational plans and the pertinent rules.

40. Surface water shall be diverted from all operational and storage areas to prevent standing water in operational areas and under or around storage piles. Water that comes in contact with solid waste shall be contained on-site or properly treated prior to discharge.

41. These areas shall be operated and maintained with sufficient dust control measures to minimize airborne emissions and to prevent dust from becoming a nuisance or safety hazard.

42. These areas shall be operated and maintained in a manner so as to minimize odors, prevent the creation of a nuisance, potential health hazard, or a potential fire hazard.

43. Effective vector control measures shall be applied as necessary to control flies, rodents, insects, or vermin.

Operational Conditions – Treatment & Processing (Wood Grinding)

44. The facility is permitted to operate a treatment and processing facility as defined in 15A NCAC 13B, Rule .0101(49).

45. The facility is permitted to receive land clearing waste as defined in 15A NCAC 13B, Rule .0101(23).

46. The facility is permitted to receive wooden pallets constructed of unpainted and untreated natural wood.

47. The facility is permitted to receive yard trash as defined in 15A NCAC 13B, Rule .0101(55). However, this ground material containing yard trash may not be distributed to the public unless it has been composted in accordance with Rule .1400.

48. The facility must manage the treatment and processing according to the Operation Plan included in Attachment 1, Part II: "List of Documents for the Approved Plan". This document is included in the approved plan. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

Operational Conditions – Type 2 Composting Unit

49. The facility is permitted to operate a compost facility as defined in 15A NCAC 13B, Rule .0101(7).

50. The facility is only permitted to receive waste materials described in 15A NCAC 13B, Rule .1402(f)(1) and (2).

51. The facility must monitor and maintain records to demonstrate the requirements of 15A NCAC 13B, Rule .1406 are continually being met. In addition, the facility is required to maintain records on the following information:

    a. The amount of waste received into the facility,
    b. the amount of compost land applied as a soil amendment,
    c. the area of land compost was applied to as a soil amendment, and
    d. the amount and final termination of any remaining compost.

52. The facility must analyze, classify and distribute the compost material in accordance with 15A NCAC 13B, Rules .1407 and .1408.

53. The use of compost as a soil amendment is pending approval of a Demonstration Report submitted in accordance with the Soil Amendment Demonstration Authorization letter. The compost may only be broadcast and incorporated at a rate not to exceed 100 tons per acre.

- *End of Permit Conditions* –

North Carolina Department of Environment and Natural Resources
Division of Waste Management

Beverly Eaves Perdue, Governor
Dexter R. Matthews, Director
Dee Freeman, Secretary

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION

MUNICIPAL SOLID WASTE LANDFILL FACILITY
Permit No. 44-07

HAYWOOD COUNTY
is hereby issued a

PERMIT TO OPERATE
WHITE OAK MUNICIPAL SOLID WASTE LANDFILL
PERMIT TO CONSTRUCT
MUNICIPAL SOLID WASTE LANDFILL PHASE 3

Located at 3898 Fines Creek Road, SR 1338, in Haywood County, North Carolina, in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The legal description of the site is identified on the deeds recorded for this property listed in Attachment No. 1 of this permit.

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

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-508-8400 \ FAX 919-733-4810 \ Internet: www.wastenotnc.org/swhome

ATTACHMENT 1

PART I: PERMITTING HISTORY

1. On June 30, 1999 an amendment was made to the Permit to Operate for a five-year renewal of the MSW landfill unit.
2. On November 27, 2001 an amendment was made to the Permit to Operate for the operation of Phase 2.
3. On November 18, 2002 an amendment was made to the Permit to Operate for the operation of a C&D landfill unit.
4. On November 8, 2008 an amendment was made to the Permit to Operate for a five-year renewal of the MSW landfill unit and the addition of a LCID landfill unit.
5. On May 5, 2009 an amendment was made to the Permit to Construct. Conditions were added for the construction of MSW Unit Phase 3. In addition, a modification was made to the Permit to Operate for the addition of a Processing (mulching and grinding of land clearing waste) unit, a small Type II Composting unit, tarp and soil/mulch mixture alternative daily covers as well as Type II composting for use as a soil amendment.
6. On October 7, 2009 a modification was made to the Permit to Construct for the addition of a GCL alternative base-liner system.

Permit Type	**Date Issued**	**DIN**
Original Permit to Construct	July 22, 1992	
Original Permit to Operate	October 8, 1993	
Permit Amendment	June 30, 1999	
Permit Amendment	November 27, 2001	
Permit Amendment	November 8, 2006	595
Permit Amendment /Modification	May 5, 2009	7070
Permit Modification	October 7, 2009	8720

PART II: LIST OF DOCUMENTS FOR THE APPROVED PLAN

NO.	**DOCUMENT DESCRIPTION**	**DOCUMENT ID NO.**
1.	*MSWLF Facility Permit To Construct, Phase 2*. Prepared by Municipal Engineering. Prepared for Haywood County. March 2000.	
2.	*Design Hydrogeologic Study, Phase 2, White Oak Subtitle D Landfill*. Prepared by Municipal Engineering. Prepared for Haywood County. June 2000.	

3.	*Alternate Liner System Modifications / Permit to Construct for Haywood County Municipal Solid Waste Landfill Facility, Phase 2*. Prepared by Municipal Engineering, Prepared for Haywood County. October, 2000.	
4.	*Site Hydrogeologic Study, Haywood County Construction & Demolition Landfill, Waynesville, North Carolina*. Prepared by Municipal Engineering. Prepared for Haywood County. June 4, 2001.	
5.	*Construction Quality Assurance Report, Municipal Solid Waste Landfill Facility, Phase 2, Haywood County.* Prepared by Municipal Engineering. Prepared for Haywood County. August, 2001.	
6.	*Plans entitled As-Built for Haywood County C&D Landfill*. Prepared by Municipal Engineering. Prepared for Haywood County. October 22, 2002.	
7.	*Letter with reference: Geologic Conditions Haywood County C&D Landfill*. Prepared by Edward Custer, L.G. Prepared for Haywood County. November 5, 2002.	
8.	*Land Clearing and Inert Debris Landfill Facility, Haywood County*. Prepared by Municipal Engineering. Prepared for Haywood County. September, 2006.	
9.	*Permit Renewal Proposed Fill Plan, Municipal Solid Waste Landfill Facility, Phase 2, Haywood County*, Prepared by: Municipal Engineering. Prepared for: Haywood County. October 31, 2006.	
10.	*Alternative Daily Cover Demonstration Authorization Letter, Polypropylene Tarp*. Prepared by: James Patterson. Prepared for: Solid Waste Section. June 28, 2007.	3924
11.	*Email: Haywood County Construction & Demolition Landfill Closure*. Prepared by: McGill Associates. Prepared for: Haywood County. March 31, 2008.	4286
12.	*Modifications to the Operations Plan, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: McGill Associates. Prepared for: Haywood County. June 6, 2008.	4929
13.	*White Oak Operations Plan Modification Response Letter*. Prepared by: Allen Gaither. Prepared for: Solid Waste Section. June 30, 2008.	4930
14.	*Closure Plan, Construction & Demolition Landfill Phase 1*. Prepared by: McGill Associates. Prepared for: Haywood County. June 27, 2008.	5031
15.	*Permit to Construct Submittal, MSW Phases 3 & 4, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: McGill Associates. Prepared for: Haywood County. September 12, 2008.	5806

16.	*Design Hydrogeologic Report, Phases 3 and 4, White Oak MSW Landfill, Haywood County, North Carolina*. Prepared by: Bunnell-Lammons Engineering. Prepared for: McGill Associates. July 11, 2008	5807
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23.	*Revised CQA Plan*. Prepared by: McGill Associates. Prepared for: Haywood County. April 1, 2009.	7307
24.	*Response to Technical Review: Revised Operations Plan*. Prepared by: McGill Associates. Prepared for: Haywood County. April 9, 2009.	7308
25.	*Permit to Construct MSW Phase 3, Modifications for GCL Liner*. Prepared by: McGill Associates. Prepared for: Haywood County. September 18, 2009.	8660

PART III: PROPERTIES APPROVED FOR THE SOLID WASTE FACILITY

Haywood County, N.C. Register of Deeds				
Book	Page	Grantee	Grantor	Parcel No.
424	204	Haywood County	Leatherwood & Monson	8712-30-1872
403	1374	Haywood County	Davis, Davis & Raulerson	8712-11-8775
461	1036	Haywood County	Bramlett	8712-00-6575
				Total Site Acreage: ±268.4 acres

Notes:
1. Deed book references are from the Haywood County Register of Deeds office (http://maps.haywoodnc.net/gisweb/default.aspx).

PART IV: GENERAL PERMIT CONDITIONS

1. This permit is issued by the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Section (Section). In accordance with North Carolina Solid Waste Management Rule 15A NCAC 13B .0201(d), a solid waste management facility permit shall have two parts: a Permit to Construct and a Permit to Operate. The Permit to Construct shall expire on November 5, 2010. The Permit to Construct must be implemented in accordance with Attachment 2 of this permit. The Permit to Operate shall expire November 8, 2011. The Permit to Operate must be implemented in accordance with Attachment 3 of this permit.

2. The persons to whom this permit is issued ("permittee") are the owners and operators of the solid waste management facility.

3. (Intentionally blank)

4. When this property is sold, leased, conveyed, or transferred in any manner, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument, a statement that the property has been used as a sanitary landfill and a reference by book and page to the recordation of the permit.

5. By initiating construction or receiving waste at this facility the permittee shall be considered to have accepted the terms and conditions of this permit.

6. Construction and operation of this solid waste management facility must be in accordance with the Solid Waste Management Rules, 15A NCAC 13B, Article 9 of the Chapter 130A of the North Carolina General Statutes (NCGS 130A-290, et seq.), the conditions contained in this permit; and the approved plan. Should the approved plan and the rules conflict, the Solid Waste Management Rules shall take precedence unless specifically addressed by permit condition.

7. This permit is issued based on the documents submitted in support of the application for permitting the facility including those identified in Attachment 1, "List of Documents for Approved Plan," and which constitute the approved plan for the facility. Where discrepancies exist, the most recent submittals and the Conditions of Permit shall govern.

8. This permit may be transferred only with the approval of the Section, through the issuance of a new or substantially amended permit in accordance with applicable statutes and rules. In accordance with NCGS 130A-295.2(g) the permittee must notify the Section thirty (30) days prior to any significant change in the identity or business structure of either the owner or the operator, including but not limited to a proposed transfer of ownership of the facility or a change in the parent company of the owner or operator of the facility.

9. The permittee is responsible for obtaining all permits and approvals necessary for the development of this project including approval from appropriate agencies for a General or Individual NPDES Stormwater Discharge Permit. Issuance of this permit does not remove the permittee's responsibilities for compliance with any other local, state or federal rule, regulation or statute.

- End of Section -

ATTACHMENT 2
CONDITIONS OF PERMIT TO CONSTRUCT

PART I: MUNICIPAL SOLID WASTE LANDFILL UNIT SPECIFIC CONDITIONS

1. Pursuant to the NC Solid Waste Management Rules (Rule) 15A NCAC 13B .0201(c) and (d)(1), this permit approves construction for MSW Phase 3 consisting of approximately 8.8 acres with a projected operating capacity of 686,000 cubic yards of airspace.

2. The initial, substantial, construction authorized by this Permit to Construct must commence within 18 months from the issuance date of this permit. If substantial construction does not begin within 18 months from the issuance date of this permit, then the permit to construct shall expire. Substantial construction includes, but is not limited to, issuance of construction contracts, mobilization of equipment on site, and construction activities including installation of sedimentation and erosion control structures. The permittee may reapply for the permit to construct prior to the expiration date. The re-application will be subject to the statutes and rules in effect on that date and may be subject to additional fees.

3. Construction of all solid waste management units within this facility must be in accordance with the pertinent approved plans and only for those phases of development approved for construction as described in Attachment I, Part II List of Documents for the Approved Plan.

4. The permittee must conduct a preconstruction meeting at the facility prior to initiating construction of any unit/cell and must notify the Section at least 10 days prior to the meeting.

5. Modifications or revisions of the approved documents or changes during construction of any landfill unit/cell require approval by the Section, and may constitute a permit modification and be subject to a permitting fee.

6. The following conditions must be met prior to operation of the Phase 3:

   a. The Permittee must obtain a Permit to Operate for Phase 3 from the Section in accordance with 15A NCAC 13B .0201(d).

   b. Construction Quality Assurance (CQA) documentation as well as a certification by the project engineer that the landfill was built in accordance with approved plans and the conditions of the permit must be submitted to the Section for review and approval.

c. The Permittee must contact the appropriate regional environmental specialist and permitting engineer to determine whether the Section chooses to hold a pre-operative meeting with key landfill personnel and representatives of the Section.

d. The edge of the waste footprint must be identified with permanent physical markers.

Geologic, Ground Water and Monitoring Requirements

7. Prior to issuing the Permit to Operate, samples from new ground water monitoring wells and surface water stations shall be sampled for the Appendix I constituent list.

8. Prior to construction of the phase or cell(s) within the phase, all piezometers, borings, and groundwater monitoring wells within the footprint must be properly abandoned in accordance with 15A NCAC 2C .0113 (b)(1), entitled "Abandonment of Wells."

9. In areas where soil is to be undercut, abandoned piezometers, monitoring wells and borings must not be grouted to pregrade land surface, but to the proposed base grade surface to prevent having to cut excess grout and possibly damage the wells.

10. A Licensed Geologist must report any pertinent geological feature(s) exposed during phase or cell excavation. Prior to placing any landfill liner, the geologist must submit to the Section hydrogeologist a written report that includes an accurate description of the exposed geological feature(s) and effect of the geological feature(s) on the design, construction, and operation of the cell, phase, or unit.

11. A Licensed Geologist must supervise installation of groundwater monitoring wells and surface water sampling stations.

12. Any modification to the approved water quality monitoring, sampling, and analysis plan must be submitted to the Section Hydrogeologist for review.

13. Within 30 days of completed construction of each new groundwater monitoring well, a well construction record (GW-1 form), typical well schematic, boring log, field log and notes, and description of well development activities must be submitted to the Section.

14. The permittee must provide a plan sheet-sized, scaled topographical map, showing the location and identification of new, existing, and abandoned wells and piezometers after installation of groundwater monitoring wells.

15. Within thirty (30) days of the completed permanent abandonment of a ground-water monitoring well, the well abandonment record (GW-30 form) and any additional information included in the abandonment record) must be submitted to the Section. The well abandonment records must be submitted to the Solid Waste Section in accordance with 15A NCAC 2C .0114(b) and be certified by a Licensed Geologist.

Erosion and Sedimentation Control Requirements

16. All required sedimentation and erosion control measures must be installed and operable to mitigate excessive on-site erosion and to prevent silt from leaving the area of the landfill unit during the service life of the facility.

17. All earth disturbing activities must be conducted in accordance with the Sedimentation Pollution Control Act of 1973 (15 NCAC 4) and consistent with any other local, state or federal requirements.

18. Facility construction, operations or practices must not cause or result in a discharge of pollution, dredged material, and/or fill material into waters of the state in violation of the requirements under Sections 401 and 404 of the Clean Water Act, as amended.

19. Modifications to the approved sedimentation and erosion control activities require approval by the North Carolina Land Quality Section. The Section must be notified of any sedimentation and erosion control plan modifications.

PART II: CONSTRUCTION AND DEMOLITION DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

Not Applicable

PART III: LAND CLEARING AND INERT DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

Not Applicable

PART IV: MISCELLANEOUS SOLID WASTE MANAGEMENT SPECIFIC CONDITIONS

Not Applicable

ATTACHMENT 3
CONDITIONS OF PERMIT TO OPERATE

PART I: GENERAL FACILITY CONDITIONS

1. The Permit to Operate shall expire November 8, 2011. Pursuant to 15A NCAC 13B .0201(e), no later than July 8, 2011, the owner or operator must submit a request to the Section for permit review and must update pertinent facility plans including, but not limited to, the facility operation and waste screening plans.

2. All sedimentation and erosion control activities must be conducted in accordance with the Sedimentation Control Act N.C.G.S. 113A-50, et seq., and rules promulgated under 15A NCAC 4.

Operational Requirements

3. This facility is permitted to receive solid waste generated within Haywood County, consistent with the local government waste management plan and with local government approval and as defined in G.S. 130-290 (a)(35), except where prohibited by the N. C. General Statues Article 9 of Chapter 130A, and the rules adopted by the Commission for Health Services.

4. The facility operator must complete an approved operator training course in compliance with G.S. 130A-309.25.

   a. A responsible individual certified in landfill operations must be on-site during all operating hours of the facility at all times while open for public use to ensure compliance with operational requirements.

   b. All pertinent landfill-operating personnel must receive training and supervision necessary to properly operate the landfill units in accordance with G.S. 130A-309.25 and addressed by memorandum dated November 29, 2000.

5. The use of different alternative daily cover requires approval, prior to implementation, by the Solid Waste Section. Requests for alternative daily cover approval must include a plan detailing the comprehensive use and a demonstration of the effectiveness of the alternative daily cover. The plan must be developed according to Section guidelines. Plans which are approved by the Section will be incorporated into, and made a part of, the approved documents listed in Attachment 1.

   a. The use of a fabric tarp as an alternate daily cover is approved and subject to the terms and conditions of operation as set forth in the plan. Soil cover shall be

applied at a minimum of one time per week in accordance with Rule .1626 (2). Soil shall be applied more frequently, if needed, to control disease vectors, fires, odors, blowing litter and scavenging.

b. The use of a 3:1 Soil/Mulch mixture as an alternative daily cover is pending approval of a Demonstration Report submitted in accordance with the Alternative Cover Material (ACM) Demonstration Authorization Letter.

6. The facility must maintain records for all solid waste materials accepted as alternative cover material and used as alternate daily cover. The records must include: the date of receipt, weight of material, general description of the material, identity of the generator and transporter, and county of origin. Such records must be made available to the Solid Waste Section upon request.

Monitoring and Reporting Requirements

7. Groundwater, surface water, and methane monitoring locations must be established and monitored as identified in the approved plans.

8. A licensed geologist must be present to supervise the installation of groundwater monitoring wells. The exact locations, screened intervals, and nesting of the wells must be established after consultation with the SWS Hydrogeologist at the time of well installation.

9. Ground water monitoring wells and surface water sampling locations must be sampled for Appendix I constituents at least semi-annually according to the specifications outlined in the approved water quality monitoring plan and the current policies and guidelines of the Section in effect at the time of sampling.

10. Reports of the analytical data for each monitoring event must be submitted to the Section within 120 days of the respective sampling event. Analytical data must be submitted in a manner prescribed by the Section. Records of all groundwater, surface water, and leachate analytical data must be kept as part of the permanent facility record.

11. The four independent samples which comprise the initial baseline sampling event must be collected from each groundwater monitoring well and the report must be submitted to the Section within six months after issuance of the Permit to Operate.

12. Untreated leachate must be sampled and analyzed at least semi-annually concurrently with the groundwater water and surface water sampling, one sample per event. The leachate must be analyzed for all Appendix I constituents, pH, specific conductance, BOD, COD, nitrates, sulfates, and phosphates. Test results must be submitted to the Section along with groundwater and surface water test results. In the event leachate is recirculated, additional leachate sampling may be required.

13. A readily accessible unobstructed path must be cleared and maintained so that four-wheel vehicles may access monitoring well locations at all times.

14. A field log book which details all development, sampling, repair, and all other pertinent activities associated with each monitoring well and all sampling activities associated with each surface water and leachate sampling location must be kept as part of the permanent facility record.

15. All well construction records and soil boring logs for new wells must be submitted to the Solid Waste Section Hydrogeologist for review within 30 days of completion.

16. Copies of this permit, the approved plans, and all records required to be maintained by the permittee must be maintained at the facility and made available to the Section upon request during normal business hours.

17. The owner or operator must maintain a record of the amount of solid waste received at the landfill unit, compiled on a monthly basis. Scales must be used to weigh the amount of waste received.

18. On or before August 1 annually, the Permittee must submit an annual facility report to the Solid Waste Section, on forms prescribed by the Section.

    a. The reporting period shall be for the previous year beginning July 1 and ending June 30.

    b. The annual facility report must list the amount of waste received and landfilled in tons and be compiled:
        i) On a monthly basis.
        ii) By county, city or transfer station of origin.
        iii) By specific waste type.
        iv) By disposal location within the facility.
        v) By diversion to alternative management facilities.

    c. A measurement of volume utilized in the landfill cells must be performed during the second quarter of the calendar year. The date and volumes, in cubic yards, must be included in the report.

    d. The amount of waste, in tons from scale records, disposed in landfill cells from October 8, 1993 through the date of the annual volume survey must be included in the report.

e. The completed report must be forwarded to the Regional Waste Management Specialist for the facility by the date due on the prescribed annual facility report form.

f. A copy of the completed report must be forwarded to each county manager for each county from which waste was received at the facility. Documentation that a copy of the report has been forwarded to the county managers must be sent to the Regional Waste Management Specialist by the date due on the prescribed annual facility report form

PART II: MUNICIPAL SOLID WASTE LANDFILL UNIT SPECIFIC CONDITIONS

19. This permit approves the continued operation of Phase 2 of the municipal solid waste landfill, as well as the onsite environmental management and protection facilities as described in the approved plans.

20. The following table lists the dimensions and details for the MSW landfill units. The following waste volumes include waste, daily cover, and intermediate cover, but do not include final cover.

MSW Unit	Acres	Gross capacity (cubic yards)
Phase 1	11.4	718,800
Phase 2	10.2	830,000
Total	21.6	1,548,800

21. The facility is approved to accept approximately 60,000 tons per year, approximately 164 tons per day (365 days per year), with a maximum variance in accordance with GS 130A-294(b1)(1) as listed in Attachment 1, Part II.

22. The following, at a minimum, must not be accepted for disposal at the facility: hazardous waste, yard trash, liquid wastes, regulated medical waste, sharps not properly packaged, PCB waste as defined in 40 CFR 761, and wastes banned from disposal in North Carolina by G.S. 130A-309.10(f).

23. The permittee must not knowingly dispose of any type or form of municipal solid waste that is generated within the boundaries of a unit of local government that by ordinance:

a. Prohibits generators or collectors of municipal solid waste from disposing of that type or form of municipal solid waste.

b. Requires generators or collectors of municipal solid waste to recycle that type or form of municipal solid waste.

24. The use of leachate recirculation as a leachate management tool requires approval by the Section prior to implementation. Requests for leachate recirculation approval must include a comprehensive management plan developed according to Section guidelines and which is consistent with the approved operation plan. Plans which are approved by the Section will be incorporated into, and made a part of, the approved documents listed in Attachment 1.

25. The facility is permitted to co-dispose of wastewater treatment sludge generated within the facility's approved service area, and subject to the terms and procedures of the approved plan.

26. The leachate collection system must be maintained in accordance with 15A NCAC 13B.1626(12)(a). The plan shall include provisions for periodic cleaning and visual inspection. Documentation of the inspections, and cleaning and monitoring must be included in the operating records of the facility and provided to the Department upon request.

27. Financial assurance as required by state rules and statutes must be continuously maintained for the duration of the facility in accordance with applicable rules and statutes. Closure and Post-Closure cost estimates and financial instruments must be updated annually pursuant to 15A NCAC 13B .1628.

28. Closure or partial closure of any MSWLF unit must be in accordance with the Closure Plans described in the approved plans and 15A NCAC 13B .1629. Final Closure Plans must be submitted to the Division at least 90 days prior to implementation.

PART III: CONSTRUCTION AND DEMOLITION DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

29. The C&D landfill unit stopped receiving waste June 30, 2008. Closure in accordance with Rule .0505 must be completed no later than May 30, 2009.

30. Haywood County must maintain the integrity and effectiveness of the cap system, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and prevent surface water from impounding over waste and run-on and run-off from eroding or otherwise damaging the cap system.

31. Post-closure use of the property is subject to review and approval by the Division and must not disturb the integrity of the cap system, or the function of the monitoring systems. The Division may approve any other disturbance if the owner or operator demonstrates that disturbance of the cap system, including any removal of waste, will not increase the potential threat to human health or the environment.

32. For the closed C&D landfill unit, the permittee must conduct groundwater and surface water sampling in accordance with the post-closure water quality monitoring plan of the approved Closure Plan, Document 11, Part II, Attachment 1. Ground water monitoring wells and surface water sampling location(s) must be sampled on a semi-annual basis, for a minimum of five years from closure (five years from July 2008). After five years of monitoring, the Solid Waste Section will determine if further monitoring will be required.

33. The permittee must maintain a record of all monitoring events and analytical data. Reports of the sampling events and analytical data must be submitted to the Section in a timely manner.

34. Any proposed expansion to the closed C&D landfill unit will be considered a new landfill for purposes of Solid Waste Management permitting.

PART IV: LAND CLEARING AND INERT DEBRIS LANDFILL UNIT SPECIFIC CONDITIONS

General

35. The land clearing and inert debris landfill is permitted to receive for disposal only land-clearing waste, concrete, brick, concrete block, uncontaminated soil, gravel and rock, untreated and unpainted wood, and yard trash, in accordance with Rule .0101 (22) and .1010 (23).

36. This permit is for the construction and operation of the landfill in accordance with the approved plans, Attachment 1, Part II, Document 8. Any revision to the construction or operation of the facility requires written approval by the North Carolina Solid Waste Section. Construction or operation of future cells or phases will require written approval of the Section.

Pre-Operational

37. The following requirements shall be met prior to receiving solid waste at the unit:
    a. A site inspection and pre-operative meeting shall be conducted by a representative of the Solid Waste Section. The permittee shall notify the Section's Waste

Management Specialist and make arrangements for the site inspection and pre-operative meeting.

b. A sign shall be posted at the unit as required by the NC Solid Waste Management Rules Operational Requirements, 15A NCAC 13B .0566 (16).

c. A certification letter, from a Registered Professional Engineer, shall be submitted to the Section stating that the facility has been constructed in accordance with the approved plans.

d. Survey stakes shall be installed to delineate the approved limits of the waste.

Operational

38. This facility shall conform to the operational requirements of the NC Solid Waste Management Rules, 15A NCAC 13B .0566, and to the operational plan identified in Attachment 1, Part II, Document 8.

PART V: MISCELLANEOUS SOLID WASTE MANAGEMENT SPECIFIC CONDITIONS

General Conditions

39. Wastes received and product stored shall be maintained in reasonably sized piles with adequate fire breaks and lanes in accordance with the approved operational plans and the pertinent rules.

40. Surface water shall be diverted from all operational and storage areas to prevent standing water in operational areas and under or around storage piles. Water that comes in contact with solid waste shall be contained on-site or properly treated prior to discharge.

41. These areas shall be operated and maintained with sufficient dust control measures to minimize airborne emissions and to prevent dust from becoming a nuisance or safety hazard.

42. These areas shall be operated and maintained in a manner so as to minimize odors, prevent the creation of a nuisance, potential health hazard, or a potential fire hazard.

43. Effective vector control measures shall be applied as necessary to control flies, rodents, insects, or vermin.

Operational Conditions – Treatment & Processing (Wood Grinding)

44. The facility is permitted to operate a treatment and processing facility as defined in 15A NCAC 13B, Rule .0101(49).

45. The facility is permitted to receive land clearing waste as defined in 15A NCAC 13B, Rule .0101(23).

46. The facility is permitted to receive wooden pallets constructed of unpainted and untreated natural wood.

47. The facility is permitted to receive yard trash as defined in 15A NCAC 13B, Rule .0101(55). However, this ground material containing yard trash may not be distributed to the public unless it has been composted in accordance with Rule .1400.

48. The facility must manage the treatment and processing according to the Operation Plan included in Attachment 1, Part II: "List of Documents for the Approved Plan". This document is included in the approved plan. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

Operational Conditions – Type 2 Composting Unit

49. The facility is permitted to operate a compost facility as defined in 15A NCAC 13B, Rule .0101(7).

50. The facility is only permitted to receive waste materials described in 15A NCAC 13B, Rule .1402(f)(1) and (2).

51. The facility must monitor and maintain records to demonstrate the requirements of 15A NCAC 13B, Rule .1406 are continually being met. In addition, the facility is required to maintain records on the following information:

    a. The amount of waste received into the facility,
    b. the amount of compost land applied as a soil amendment,
    c. the area of land compost was applied to as a soil amendment, and
    d. the amount and final termination of any remaining compost.

52. The facility must analyze, classify and distribute the compost material in accordance with 15A NCAC 13B, Rules .1407 and .1408.

53. The use of compost as a soil amendment is pending approval of a Demonstration Report submitted in accordance with the Soil Amendment Demonstration Authorization letter. The compost may only be broadcast and incorporated at a rate not to exceed 100 tons per acre.

- *End of Permit Conditions* –

Section 2

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DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - SITE WORK AND UTILITY PIPING

DIVISION 3 - CONCRETE

DIVISION 11 - EQUIPMENT

DIVISION 16 - ELECTRICAL

PART 1: GENERAL

1.01 SUMMARY OF WORK

A. This project generally includes the following:

The construction of approximately 8.8 acres of lined landfill, including earthwork, low-permeable soil liner, high-density polyethylene liner, leachate collection system, three (3) leachate pumping stations, leachate force main and gravity sewer, modifications to the existing leachate storage lagoon, access roads, and erosion control measures.

1.02 PROJECT MEETINGS

A. PRECONSTRUCTION CONFERENCE

A preconstruction conference will be scheduled by the Engineer after issuance of the Notice of Award. The Contractor and his major subcontractors shall attend the meeting, which will be chaired by the Engineer or his representative. The purpose of the pre-construction conference will be to discuss administration of the Contract and the execution of work, and to answer any questions relative to performance of work under these Contract Documents. All decisions, instructions and interpretations made at this conference shall be binding and conclusive. The proceedings of this conference will be recorded and copies of the proceeding minutes will be issued to the Contractor for his use and distribution to his subcontractors.

B. PROGRESS MEETINGS

The Contractor and any subcontractors, material suppliers or vendors whose presence is necessary or requested shall attend meetings, referred to as Progress Meetings, when requested by the Engineer or his representative for the purpose of discussing the execution of work. Each meeting will be held at the time and place designated by the Engineer or his representative at these meetings shall be binding and conclusive on the Contractor and such decisions, instructions and interpretations shall be confirmed in writing by the Engineer or his representative. The proceedings of these meetings will be recorded and the Contractor will be furnished with a reasonable number of copies for his use and for his distribution to the subcontractors, material suppliers and vendors involved.

1.03 PROJECT PAYMENTS AND RETAINAGE

A. The Owner may retain a portion of the amount otherwise due the Contractor. Except as provided elsewhere, the amount retained by the Owner shall be limited to the following:

1. Withholding of not more than 5% of the payment claimed until work is 50% complete.

2. When the contract is 50% complete no further retainage shall be withheld from periodic payments. However, the Owner may reinstate retainage (up to 5%) if they feel the work is unsatisfactory. The Owner may withhold additional retainage as necessary from periodic payments in a sum necessary to maintain total retainage of 2.5% of contract cost through the completion of the project.

3. When the work is substantially complete (operational or beneficial occupancy), the withheld amount shall be further reduced below 5% to only that amount necessary to assure completion.

4. The Owner may accept securities negotiable without recourse, conditions or restrictions, a release of retainage bond or an irrevocable letter of credit provided by the Contractor in lieu of all or part of the cash retainage.

B. For unit price projects, the Contractor may use the "Unit Bid Item Summary" form included at the end of this section, or a similar form that provides the required information.

C. SALES TAX STATEMENT

When requested by the Owner, each request for progress payment submitted by the Contractor shall include a sales tax reimbursement statement. The Contractor shall utilize the form provided at the end of this section, or a similar form that provides the required information and certification.

1.04 SUBMITTALS

A. GENERAL

All transmittals from the Contractor shall be accompanied by a transmittal cover form that includes pertinent information related to the project and the particular transmittal.

B. CONSTRUCTION SCHEDULE

The Contractor shall, within thirty (30) days after receipt of the Notice of Award, prepare and submit to the Engineer for approval a practicable construction schedule showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features and the contemplated dates for completing such salient features. The schedule may be in any form, at the option of the Contractor, but shall maintain current with each submittal for progress payment, at least the following information.

1. The various classes and area of work broken down into times projected for submittals, approvals and procurement; times for installation and erection; and times for testing and inspection.

2. The work completed and the work remaining to complete the project.

3. Any items of work which will delay the start or completion of other major items of work so as to delay completion of the whole project.

C. SCHEDULE OF VALUES

For lump sum projects, the Contractor shall, within thirty (30) days after the Notice of Award and prior to submitting the first Application for Payment, submit to the Engineer for approval a Schedule of Values for the project. The Schedule of Values shall establish the actual value of the components of the work and, after approval by the Engineer, shall be the basis for the Contractor's Applications for Payment. The Schedule of Values shall include separate line items for all major portions of the work.

D. MATERIAL SUPPLIERS AND SUBCONTRACTOR LISTINGS

As soon as possible, but in no case more than 30 days after receipt of the Notice of Award, the Contractor shall supply the names and addresses of all major material suppliers and subcontractors to the Engineer.

E. SHOP DRAWINGS AND SAMPLES

The Contractual requirements for shop drawings and samples are specified in the General Conditions and in the individual specification sections for each item. Resubmissions, where required, shall be in accordance with the procedures established for the initial submittal.

F. RECORD DOCUMENTS

Record drawings will not be required of the Contractor; however, to enable the Owner to prepare record drawings, the Contractor shall keep a complete and accurate record of changes and/or deviations from the Contract Documents and shop drawings, indicating the work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using prints of the Drawings affected, or the Specifications, with appropriate supplementary notes. The record set of marked-up Drawings, shop drawings, and Specifications shall be kept at the job site during construction and be available for inspection by the Engineer and the Owner. These marked prints shall be included in the package of final documentation submitted before final payment is required. The Contractor shall provide horizontal coordinates and elevation of any structures where the location was changed from the original construction drawings.

1.05 INSURANCE REQUIREMENTS

Satisfactory certificates of insurance shall be filed with the Owner through the Engineer prior to starting any construction work on this contract. Haywood County will be named as an additional insured on all policies of insurance and all certificates shall contain a 60-day Notice of Cancellation. In connection with the provisions set forth in the General Conditions Article 2.7, the Notice to Proceed will not be issued until satisfactory certificates of insurance are filed.

A. Workers' Compensation and Employers' Liability.

1. This insurance shall protect the Contractor and Owner against all claims under applicable state workmen's compensation laws. The Contractor and Owner shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This policy shall include an "all states" endorsement.

2. Workers' Compensation as required by the State of North Carolina and Employers' Liability Limits shall be no less than $1,000,000 for bodily injury per accident.

B. Comprehensive Automobile Liability.

1. This insurance shall be written in comprehensive form and shall protect the Contractor and Owner against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned or hired.

2. The limits of Auto Liability insurance shall be no less than $1,000,000, with $2,000,000 being the preferred limit per occurrence combined single limit per accident for bodily injury and property damage.

C. Comprehensive General Liability.

1. This insurance shall be written in comprehensive form and shall protect the Contractor and Owner against all claims arising from injuries to persons other than his employees or damage to property of the Owner or others arising out of any act or omission of Contractor or his agents, employees, or Subcontractors. The policy shall also include protection against claims insured by usual personal injury liability coverage and shall include a "protective liability" endorsement to insure the contractual liability assumed by the Contractor under the indemnification provisions in the General Conditions, and "Completed Operations and Products Liability" coverage (to remain in force during the correction period).

2. To the extent that the Contractor's work, or work under his direction, may require blasting, explosive conditions, or underground operations, the comprehensive general liability coverage shall contain no exclusion relative to blasting, explosion, collapse of building, or damage to underground property.

3. The insurance limits for General Liability shall be no less than $1,000,000, with $2,000,000 being the preferred

limit per occurrence for bodily injury, personal injury, and property damage. General aggregate limit shall apply separately to each project/location and limit shall not be less than the required occurrence limit.

D. Umbrella Liability Policy.

This insurance shall protect the Contractor against all claims in excess of the limits provided under the workmen's compensation and employer's liability, comprehensive automobile liability, and general liability policies. The liability limits of the umbrella liability policy shall not be less than $5,000,000.

E. Deductibles and Self-Insured Retention

Any deductible or self-insured retention must be declared to and approved by the County.

F. Other Insurance Provisions

The policy or policies are to contain, or be endorsed to contain, the following provisions:

1. Contractor insurance is to be considered primary for losses that occur as a direct result of the contractor's actions. The policy should cover the County for any liability arising out of the activities performed by or on behalf of the contractor, including products and completed operations of the contractor; or automobiles owned, leased, hired or borrowed by the contractor. The coverage shall contain no special limitations on the scope of protection afforded to the County, it's officers, officials, employees or volunteers.

2. Coverage shall state that the contractor's insurance shall not be suspended, voided, cancelled, reduced in coverage or in limits except after 30 days written notice.

G. Verification of Coverage

The contractor shall furnish the County with certificates of insurance and with original endorsements. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

The certificates and/or endorsements are to be provided to the County on standard form before a contract is valid.

1.06 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for delivery, storage and handling of all materials and equipment, unless otherwise noted. All material and equipment shall be shipped to arrive at the job site on the dates indicated on the purchase order. The following information shall be supplied:

1. The contents and bill of lading, number of shipments.
2. The method of shipments.
3. The date of shipment.
4. The name of the construction project.

B. Prior to shipment, all items shall be properly prepared to protect all critical areas from the effects of weather, normal expected transport and on site handling.

C. Items shall be tagged and marked with equipment and/or motor numbers as per the manner stipulated in the purchase order.

D. All spare parts and expendable supplies shall be properly crated, marked, and shipped to the job site on the date specified.

PART 2: PRODUCTS

2.01 EQUIPMENT AND MATERIAL STANDARDS

A. All equipment and materials of construction described in this specification shall meet the more stringent requirements of the applicable codes listed below:

1. OSHA - Occupational Safety and Health Administration.
2. ASTM - American Society for Testing Materials.
3. ANSI - American National Standards Institute.
4. AGMA - American Gear Manufacturers Association.
5. AISC - American Institute of Steel Construction.
6. AWS - American Welding Society.
7. NEC - National Electric Code.
8. NEMA - National Electrical Manufacturers Association.
9. API - American Petroleum Institute.

2.02 QUALITY ASSURANCE

A. All equipment shall, after installation by the Contractor, shall be inspected, tested and started up by a qualified representative of the equipment manufacturer. The Contractor and the manufacturer's representative shall complete the "Equipment Start-up Form" provided at the end of this section and submit the completed form to the Engineer.

B. The listing of a manufacturer in the specifications does not necessarily imply that the manufacturer's standard equipment meets the requirements of the specifications, but that the manufacturer listed has the capability to meet the requirements of the specifications.

PART 3: EXECUTION

3.01 SPECIAL REQUIREMENTS

A. LIMITS OF CONSTRUCTION

The Contractor shall confine all operations and personnel to the limits of construction as shown on the plans. There shall be no disturbance whatsoever of any areas outside the limits of construction nor shall the workmen be allowed to travel at will through the surrounding private property.

B. CONSTRUCTION SUPERINTENDENT

The Contractor shall place in charge of the work a competent and reliable superintendent, who shall have the authority to act for the Contractor and who shall be accountable to the Engineer. The Contractor shall, at all times, employ labor and equipment sufficient to accomplish the several classes of work to full completion in the manner and time specified.

C. SITE CONDITIONS

1. The Contractor shall maintain the work and project grounds free from rubbish, debris and waste materials during all phases of the work.

2. Immediately upon completion of the work and prior to final acceptance, the Contractor shall remove all rubbish, debris, temporary structures, equipment, excess or waste materials and shall leave the work and project grounds in a neat and orderly condition that is satisfactory to the Engineer and Owner.

D. RIGHT OF ENTRY

The Engineer and his representative will at all times have access to the work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

E. TEMPORARY CONSTRUCTION SERVICES AND FACILITIES

The Contractor shall obtain all necessary permits, licenses, etc. and shall pay all costs incident to the furnishing, installing and maintenance of temporary utility services and facilities required for the duration of the work.

F. CONTROL OF EROSION, SILTATION AND POLLUTION

1. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes or drains, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum. Fills and waste areas shall be constructed by selective placement to eliminate silts or clays on the surface that will erode and contaminate adjacent streams.

2. The Contractor shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The Contractor shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Contractor shall keep himself fully informed of all such regulations which in any way affect the conduct of the work, and shall at all times observe and comply with all such regulations. In the event of conflict between such regulations and the requirements of the specifications, the more restrictive requirements shall apply.

3. The Engineer shall have the authority to limit the area over which clearing and grubbing, excavation, borrow, and embankment operations are performed whenever the Contractor's operations do not make effective use of construction practices and temporary measures which will minimize erosion, or whenever construction operations have not been coordinated to effectively minimize

erosion, or whenever permanent erosion control features are not being completed as soon as permitted by construction operations.

4. The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project, including, but not specifically limited to, unpaved secondary roads, haul roads, access roads, disposal sites, borrow and material pits, and production sites. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property.

5. The Contractor will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items.

G. DISPOSAL OF MATERIALS

Debris and waste materials, including all combustibles, shall be removed by the Contractor from the construction area and placed in the Mulching & Grinding Area or Municipal Solid Waste Landfill at the direction of the owner, unless otherwise approved by the Owner or his Representative. In order to maintain accurate landfill records, the Contractor may be directed by the Owner to drive disposal loads across the scales, however; the Contractor will not pay any tipping fees for disposal.

H. QUANTITIES OF ESTIMATE

The estimated quantities of work to be done and materials to be furnished under this Contract shown in any of the documents, including the proposal, are given for use in comparing bids and to indicate approximately the total amount of the contract; and the right is especially reserved, except as herein otherwise specifically limited to, to increase or diminish the quantities as may be reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract.

I. UTILITY COORDINATION

The Contractor shall make all necessary arrangements with private and public utility companies to avoid any possible damage to or interruption of utility equipment or service. The Contractor shall be responsible for all inquiries concerning locations of utility lines. Repair of any damage to public or private utilities resulting from this work shall be the responsibility of the Contractor.

J. CONSTRUCTION SURVEYING

All work shall be constructed in accordance with the lines, grades and elevations shown on the plans or as given by the Engineer in the field. The Contractor shall be fully responsible for maintaining alignment and grade. All principal controlling points and base lines for locating the principal components of the work together with a suitable number of benchmarks adjacent to the work will be provided by the Engineer. From this information, the Contractor shall verify benchmarks and develop and make all detail surveys needed for construction. The Contractor shall protect and safeguard all points, stakes, grade marks, monuments, and benchmarks at the site of the work and shall re-establish, at his own expense, any marks which are removed or destroyed due to his construction operations.

The Contractor shall coordinate all survey activities with the CQA Resident Engineer, Project Engineer, and surveyor. Survey services will be required for initial site layout, replacement of existing leachate gravity sewer beneath MSW Phase 3, subgrade elevations, clay liner grade verification, leachate collection layer grade verification (includes piping, sumps, and force main), and geomembrane as-built survey. All grade surveying shall be conducted on a 50-foot grid and survey data shall be collected at a minimum frequency of every 50 linear feet along the toe and top of slopes and any other point of grade transition. The certification surveys will be as directed by the Project Engineer and shall include the following items:

- Location survey of replacement leachate gravity sewer beneath MSW Phase 3
- Topographic survey of sub grades
- Topographic survey of top of clay liner
- Panel placement and seaming locations of geomembrane
- Location of destructive testing samples of geomembrane
- Location of all significant repairs of geomembrane
- Inverts of all piping, sumps, manholes, riser pipes, etc
- Topographic survey of top of drainage layer

The surveys will be conducted in such a way that survey points for each of the three (3) grade verification surveys will be located at the same horizontal location to allow verification of layer thickness.

K. LAYING OUT WORK

A. It is imperative that the Contractor work within the shown rights of way or easements at all times, unless approved otherwise by the property owner and the Engineer.

B. The Contractor shall, at his expense, provide competent engineering survey services and shall provide and maintain accurate, detailed, survey work.

C. The plans and supplementary drawings shall not be scaled and the Contractor must verify all dimensions and elevations at the site prior to proceeding with the work. The Contractor shall also verify existing utility locations prior to purchasing materials affected by these locations.

L. USE OF EXPLOSIVES

1. If the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives. Such responsibility shall include, but shall in no way be limited to, all damages arising from all forms of trespass to adjacent property as a result of blasting by the Contractor.

2. All explosives shall be stored in a secure manner, in compliance with all laws, and all such storage places shall be marked clearly "DANGEROUS EXPLOSIVES".

M. USE OF CHEMICALS

All chemicals used during project construction, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in conformance with instructions.

N. SAFETY AND HEALTH REGULATIONS

1. The Contractor shall comply with all Federal, State and Local Safety and Health Regulations including the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (P.L. 91 - 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (P.L. 91-54).

2. The Contractor shall provide continuous, safe access to all properties, both public and private, along the project in all cases where such access will be provided by the completed facility and shall conduct his operations in such a manner that inconvenience to the property owners will be held to a minimum.

O. EQUIPMENT AND MATERIAL STORAGE

The Contractor shall plan his activities so that all materials and equipment can be stored within the project limits. There shall be no disturbance whatsoever of any areas outside the project limits without the prior approval of the Engineer.

P. DISTURBED AREAS

All areas disturbed as a result of the work of the Contractor shall be restored to the original or better condition. Reasonable care shall be taken during construction to avoid damage to the Owners property or that of any adjacent property owner(s).

Q. TREE AND PLANT PROTECTION

No trees or shrubs except those specifically indicated, shall be removed or trimmed without prior approval from the Engineer. All trees and shrubs within the construction limits to be retained by the Owner shall be properly protected by fencing, posts or other means approved by the Engineer. Where any trees or shrubs are damaged or where limbs are required to be trimmed or removed because of operations under this Contract a qualified horticulturist shall be consulted and the trimming performed in the proper manner. Any landscape plantings severely damaged or which die as a result of the Contractor's operations shall be replaced at no additional cost to the Owner.

R. TEMPORARY SANITARY FACILITIES

The Contractor shall be solely responsible for furnishing and maintaining temporary sanitary facilities during the construction period. Such facilities shall include but not be limited to, potable water supply and toilet facilities. Such facilities shall be in compliance with all applicable state and local laws, codes, and ordinances and shall be placed convenient to work stations and secluded from public observation. Once the project is completed all temporary sanitary facilities shall be removed by the Contractor.

S. TRAFFIC MAINTENANCE

1. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient warning lights, danger signals, and signs, shall provide a sufficient number of flagmen to direct the traffic and shall take all necessary precautions for the protection of the work and the safety of the public.

2. All barricades and obstructions or hazardous conditions shall be illuminated as necessary to provide for safe traffic conditions.

3. Warning and caution signs shall be posted throughout the length of any portion of the project where traffic flow is restricted.

T. SPECIAL PROVISIONS: NC DEPARTMENT OF TRANSPORTATION

1. All Contractors doing work within the Department of Transportation right of way are to have a copy of the approved encroachment agreement, plans and special provisions on the job site.

2. The travelling public shall be warned of the construction with signing that is in accordance with the latest Manual on Uniform Traffic Control Devices.

3. Contact the appropriate utility company(ies) involved and make satisfactory arrangements to adjust utilities in conflict with the proposed work prior to construction.

4. Materials and workmanship shall conform to the North Carolina Department of Transportation's Standards and Specifications Manual.

5. Strict compliance with the Policies and Procedures for Accommodating Utilities on Highway Rights of Way Manual shall be required.

6. All water hydrants are to be placed a minimum of 6 feet behind the curb and gutter or 4 feet behind the ditch line in cut sections and 1 foot back of the beginning of slope in fill sections.

7. All water valves and manholes are to be placed according to existing road, ground elevation.

8. Placement of valves and hydrants on D.O.T. right of way shall not in any way interfere with drainage or maintenance of the drainage.

9. Trenching, bore pits and/or other excavations shall not be left open or unsafe overnight.

10. All earth areas disturbed shall be regraded and seeded in accordance with the North Carolina Department of Transportation standards and specifications.

11. Complete restoration including reestablishing ditch line, fertilizing, seeding, mulching, tacking of straw and all areas disturbed during construction will follow within a maximum of thirty (30) working days of the initial disturbing activity.

12. All open cuts shall conform to the North Carolina Department of Transportation Policies and Procedures for Accommodating Utilities on Highway Rights of Way Manual (pages 37-39).

13. All roadway signs which are removed due to installation will be reinstalled on the same day or as soon as possible.

14. You must notify your local North Carolina Department of Transportation office at least 24 hours prior to construction.

U. SITE SPECIFIC CONSTRUCTION QUALITY ASSURANCE PLAN (SSCQA)

The Contractor will be required to comply with and help execute the requirements of the SSCQA Plan. However, if discrepancies are discovered between the SSCQA Plan and the technical specifications, the technical specifications will take precedence.

V. WORKING HOURS

The contractor shall coordinate the work schedule with the White Oak Landfill Staff. The Owner will allow long hours on weekdays and Saturdays; however, the Owner will not allow work on Sundays, holidays, and non-daylight hours, unless extreme circumstances arise. Work on Sundays, holidays, and non-daylight hours will have to be pre-approved on a case-by-case basis. This supersedes General Conditions 6.02B.

3.02 PROJECT CLOSE-OUT

A. FINAL DOCUMENTATION

Prior to final payment, and before the issuance of a final certificate for payment in accordance with the provisions of the General Conditions, the Contractor shall file with the Engineer the documents listed hereinafter:

1. Guarantees - The Contractor's one (1) year guarantee required by the General Conditions and all other guarantees stated in the Specifications.

2. Affidavit and Waiver of Liens - As required by General Conditions. The Contractor shall utilize the form provided at the end of this section.

3. Consent of Surety Company to Final Payment.

4. Certified Final Sales Tax Statement (as required)

5. Certified Payroll Records (as required)

6. Project Record Documents - Record documents shall be as specified in Section 01200-1.04.D.

7. Operation and Maintenance Manuals – Submit at least three (3) sets of operation and maintenance manuals for all equipment, electrical valve actuators, electrical devices, and all other materials or devices with special operating and maintenance requirements.

B. SUBMITTALS

The above records shall be arranged in order, in accordance with the various sections of the Specifications, and properly indexed. At the completion of the work, the Contractor shall certify by endorsement thereof that each of the revised and marked-up prints of the Drawings and Specifications is complete and accurate.

C. No review or receipt of such records by the Engineer or the Owner shall be a waiver of any change from the Contract Documents or the shop drawings, or in any way relieve the Contractor of his responsibility to perform the work as required by the Contract Documents, and the shop drawings to the extent they are in accordance with the Contract Documents.

END OF SECTION

(Recommended Standard Forms follow)

SECTION 01700 MEASUREMENT AND PAYMENT

01700.1 SCOPE

This section covers methods of measurement and payment for items of work under this contract.

01700.2 GENERAL

The total Bid Price for each section of the contract shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

01700.3 ESTIMATED QUANTITIES

All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only; a) as a basis for estimating the probable cost of the work, and b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. The Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts thereof.

01700.4 WORK ITEMS

01700.4.1 Mobilization

All work covered by this section will be paid for at the contract lump sum price for "Mobilization". The lump sum bid price shall not exceed 3% of the total project bid.

Partial payments for the item of "Mobilization" will be made with the first and second partial pay estimates paid on the contract, and will be made at a rate of 50 percent of the lump sum price for "Mobilization" on each of these partial pay estimates.

01700.4.2 Erosion and Sedimentation Control

a. Silt Fence

The quantity of silt fence to be paid for will be in actual measured length of silt fence installed at the unit price per linear foot. The unit price will be the full compensation for all work including but not limited to material, installation, and maintenance during construction period and removal.

b. Grassing.

The quantity of grassing to be paid for will be the actual measured acres of grassing installed per grassing schedule at the unit price per acre, rounded to the nearest 0.1 of an acre. The unit price will be the full compensation for all work including, but not limited to seed, fertilizer, mulching and installation. The areas included in this item are all disturbed (outside proposed liner edges, excluding gravel access roads, riprap ditches, and permanent sediment basins) areas including stockpile areas.

c. **Slope Matting on Slopes Steeper than 2.5:1 and Erosion Control Matting in Ditches**

The quantity of erosion control matting to be paid for will be the actual measured acres of matting installed per the slope stabilization detail and ditch detail, at the unit price per acre, rounded to the nearest 0.1 of an acre. The unit price will be the full compensation for all work including, but not limited to installation and materials. Slope matting will be required on all slopes 2.5:1 or steeper. An allowance for a 1' overlap on the outside of ditches designated to receive matting is included in this item. Any additional overlaps are considered incidental to this item.

d. Stone Check Dams.

The quantity of stone check dams to be paid for will be the actual number of stone check dams installed per the drawings at the unit price for each stone check dam. The unit price will be the full compensation for all work including material, installation and maintenance during the construction period.

e. Sediment Basins 5, 6, and 7

The quantity of sediment basins will be paid for each sediment basin installed at the unit price for each as given in the bid schedule. The unit price will be the full compensation for all work including riser pipe and skimmer, and maintenance of these items during the construction period. **Also included in this item are the porous baffles**. Barrel piping will be paid for under storm drainage piping. Earthwork quantities as part of the construction of the sediment basin are included under the earthworks item. Riprap for emergency spillway channels and outlet protection are paid for under separate items.

f. Sediment Basin 4

This item shall be paid for on a lump sum basis. Included in this item is the earthwork (approximately 25,000 cubic yards cut and fill, as shown on the grading plan), riser pipe, and skimmer associated with the construction of the basin. **Also included in this item are the porous baffles.** Barrel piping and riprap for emergency spillway channel and outlet protection is included under a separate item.

g. Temporary Sediment Trap

The construction of temporary sediment traps will be considered incidental to the Contract, as it is part of the earthworks. The option of the installation of a temporary riser/barrel at temporary sediment trap 1 is considered incidental to this item. Riprap at the outlet of the traps will be considered incidental to this item.

h. Riprap

The quantity of riprap to be paid for will be for the actual cubic yardage of riprap installed (per the detail) at unit price per cubic yard. Riprap is used as riprap inlet/outlet protection and in riprap ditches. The unit price will be the full compensation for all work including, but not limited to material, installation and maintenance during the construction period. This bid item shall include ditch excavation and filter fabric beneath the riprap. Stone check dams utilizing riprap are paid under a separate item.

01700.4.3 Site Preparation

a. Clearing and Grubbing

Clearing and Grubbing will be paid on a lump sum basis. All the area which requires clearing and grubbing to complete the work will be paid for as a lump sum. The lump sum will be the full compensation for all work including labor and disposal of material. Included are the areas where clay borrow materials will be obtained. Incidental to this item is transportation of wood material to either the mulching and grinding or LCID area on the landfill property.

b. Gravel Access Roads

This bid item will be paid for the actual square yardage of access road constructed per the details. Compensation will be paid for the actual square yardage installed, per the details, including sub-grade preparation, railroad ballast, and compacted aggregate base course, all materials and labor. Grading of shoulders is considered incidental to this bid item.

c. Truck Wash Area

This bid item will be paid for the actual square yardage of truck wash area constructed per the details, if directed by the Engineer. Included in this item is all concrete and stone required. Incidental to this item is grading in the vicinity of the existing sediment basin to ensure that all runoff from the truck wash area enters the basin.

d. Underdrain Installation

This bid item will be paid for the actual linear footage of underdrain installed, per the details. Included in this item is all materials and labor, including 8" perforated hdpe pipe, stone backfill, and geotextile wrap. Incidental to this item is any temporary capping of the underdrain pipe necessary in order to keep sediment from entering the pipe, connection to energy dissipater structure S-2 at the downstream end, connection to the existing underdrain at the upstream end, and any fittings required to join the three underdrain pipes.

01700.4.4 Earthwork

a. Earthwork

This item will be paid for on a lump sum basis. The lump sum will be the full compensation for excavating, transporting, and stockpiling soil materials, including placing Structural Fill. Select backfill for the

Temporary Liner Edges is included in a separate item. Removal and replacement of unsuitable materials is included under a separate item. The grading associated with Sediment Basin 4 is included under a separate item.

b. 24-inch Compacted Clay

The quantity of compacted clay to be paid for will be the actual measured surface area of material placed as compacted clay to the full thickness at the unit price per square foot, rounded to the nearest square foot. The area will be to the proposed and existing certified liner edge, as shown on the liner edge details and the connection to existing liner edge detail. The unit price will be the full compensation for all work associated with clay placement including material (on-site or off-site), the addition of bentonite, if required, compaction, and verification survey. Payment will not be made until clay has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. Additional clay required for raising the existing leachate storage lagoon will be paid for under that item. Additional clay (beyond the 2' thickness) required at the connection to existing liner edge will be paid for under a separate item.

c. 24-inch Washed Stone

The quantity of washed stone to be paid for will be the actual measured area of material placed to the full thickness at the unit price per square foot. The unit cost will include all cost associated with furnishing and placement of the washed stone on the lined area and verification survey. The washed stone material will be furnished by the Contractor. The limit of the 24-inch washed stone to be measured and paid will be to the certified liner edges, as shown in the details. Additional stone beyond the 2' thickness necessary to construct the temporary liner edges will be paid under separate item. Stone outside of the certified liner edge shall be paid for under the liner edge item.

d. Clay Liner Test Pad

The clay liner test pad will be paid on a unit price basis, up to a total of two (2) clay liner test pads. All cost associated with the placement of the clay liner test pad will be included in the unit price. Additional clay liner test pads will be considered incidental to this item.

e. Geogrid

The quantity of geogrid to be paid for will be for the actual square footage of geogrid installed at the direction of the engineer at the unit price per square foot. The unit price will be the full compensation for all work including, but not limited to material, installation and maintenance during the construction period.

01700.4.6 Leachate Containment System

a. 60-mil HDPE textured geomembrane

The quantity of 60 mil HDPE geomembrane to be paid for will be the actual measured square footage of surface area for material placed and seamed together at the unit price per square foot. The unit cost for HDPE geomembrane will include all costs associated with the purchase, delivery and placement of the geomembrane including, but not limited to, material, labor, seaming, sand bags, etc. The actual measured square footage will be based on field measurements of completed liner placement. Payment will not be made for this item until the geomembrane has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. The certified HDPE liner edge will be the perimeter boundary for measuring geomembrane quantities. All geomembrane material used for constructing the liner edges (including flaps and anchors) will be paid for under the respective liner edge bid item.

b. 16-ounce Geoxtile

The quantity of Geotextile to be paid for will be the actual measured square footage of surface area for material placed and seamed together at the unit price per square foot. The unit cost for Geotextile will include all costs associated with the purchase, delivery and placement of the Geotextile including, but not limited to, material, labor, seaming, sand bags, etc. The actual measured square footage will be based on field measurements of completed geotextile placement. Payment will not be made for this item until the Geotextile has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. The certified HDPE liner edge will be the perimeter boundary for measuring Geotextile quantities. The Geotextile material used in the anchor trench will be considered incidental to this item.

c. Liner Edge. (All Types)

The quantity of liner edge to be paid for will be the lump sum price listed in the bid schedule for each type of liner edge installed. The lump sum price will be the full compensation for all work associated

with the liner edge construction per the details, including but not limited to the anchor trench, select backfill, any HDPE, 16-ounce geotextile, or 20-mil stormwater control liner material beyond certified liner edge, treated plywood, caution tape, and any additional drainage layer stone not considered part of the base drainage layer. Incidental to this item is the 60-mil HDPE geomembrane flap near the certified liner edge for Temporary Liner Edge #2. Liner edge markers are included under separate item. Leachate systems cleanouts are included under a separate item. The construction of temporary drainage swales near liner edges to ensure stormwater runoff does not enter beneath liner during construction is considered incidental to this item.

d. Connection to Existing Liner Edge

This item will be paid for on a lump sum basis for both types of Connection to the Existing Liner Edge. The work for this item will include all materials and labor necessary in order to connect the proposed geomembrane to the existing Phase 1 and Phase 2 liner edge per the details. This item includes the additional work as shown in the Connection details, including select backfill, HDPE Flap, and additional geotextile over flap. HDPE geomembrane and 16-oz geotextile will be paid for under separate item. Twenty-four (24) inches of low permeable soils shall be paid for under separate item, additional low permeable soils beyond 2' of depth (approximately 1,275 cubic yards) shall be considered incidental to this item. Removal of existing MSW wastes from the liner edge area to be paid for under separate item. Existing liner edge coordinates and elevations are approximate only (±1'), no adjustments will be made to earthworks totals for actual location of existing liner edge.

e. Stormwater Control Liner

The stormwater control liner to be paid for will be the actual measured square footage of surface area for stormwater control liner installed at the unit price per square foot. The unit price will be the full compensation for all work including material, installation, seaming, and proper ballasting. The limits of measurement for this item will be to the certified liner edge. Any material located in the anchor trench or along the existing liner edge beyond the certified liner edge for MSW Phase 3 shall be considered incidental to this bid item.

01700.4.7 <u>HDPE Leachate Collection System</u>

a. Leachate Pump Station

Pump Station 1

The leachate pump station will be paid for each station installed at the unit price. The unit price will include all materials and installation including but not limited to pump, electrical control panel and junction box, control wiring from control panel to pump, line voltage wiring from control panel to pump, check valve, disconnects, gate valve, force main piping within the side slope riser, and connection to power supply. Force main piping from the exit point of the existing side slope riser to the discharge point in the leachate gravity system is included under a separate item.

Pump Stations 2 & 3

The leachate pump station will be paid for each station installed at the unit price. The unit price will include all materials and installation including but not limited to pump, **24" HDPE riser pipe**, electrical control panel and junction box, control wiring from control panel to pump, line voltage wiring from control panel to pump, check valve, disconnects, gate valve, force main piping within the side slope riser, and connection to power supply. Sump construction, including required #5 stone, 8-oz geotextile overlay, secondary layer of 60-mil geomembrane, and all fabric connections is considered incidental to this item. Piping within the sump is included under separate items. Force main piping from the exit point of the side slope riser to the discharge point in the leachate gravity system is included under a separate item.

b. Leachate Collection System Perforated HDPE Piping

The perforated HDPE piping will be paid for by the actual footage of each size of pipe installed at the unit price per linear foot. The unit price will include material and the installation of the piping, purchase, delivery, and placement of the No. 5 washed stone, and Geotextile wrap. Leachate piping in the sump area (except for 18" leachate pump station side slope riser) is included in this item. This item shall include the cost of welded caps where required.

c. Leachate Cleanouts

The leachate cleanouts will be paid for by the actual number of each size of cleanouts installed at the unit price for each. The unit cost will include the material and installation. The solid HDPE piping located on the slopes shall be considered incidental to the unit price for leachate cleanout.

d. Leachate Head Test Well

This item will be paid for the actual number of leachate head test wells installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to leachate collection piping within the sump. The leachate head test well measurement ends at the toe of the slope within the sump.

e. 3-inch Dual-Contained Force Main

The quantity of dual-contained force main to be paid for will be the actual linear footage of installed and tested force main at the unit price per foot, for each pipe size. The unit price will include the material, installation, and testing of the force main. HDPE force main is measured from the exit point of the 24" side slope riser to the connection point at proposed leachate collection system Manhole 2. Thrust blocks are considered incidental to this item. Additional force main within the side slope riser is included under separate item.

f. 8-inch Dual-Contained Gravity Sewer

The quantity of dual-contained gravity sewer to be paid for will be the actual linear footage of installed and tested force main at the unit price per foot. The unit price will include the material, installation, and testing of the pipe. HDPE gravity sewer shall be installed from the connection points adjacent to existing MSW Phase 2 and MSW Phase 1, Cell 4 to the discharge at the leachate storage lagoon. The cost of the connection to the existing gravity sewers shall be paid separately. The approximate 20 linear feet of dual-contained gravity sewer connecting the existing MSW Phase 1, Cells 1-3 gravity sewer to proposed Manhole 1 is included under a separate item.

g. Connection to Existing Dual-Contained Gravity Sewer

The item will be paid for on a lump sum basis for the connection to existing dual-contained gravity sewer at two connections, near existing MSW Phase 2 and existing MSW Phase 1, Cell 4. The lump sum price will include all materials and labor for connecting the proposed sewer to the existing sewer. Testing of dual-contained sewer is under a separate item. Connection of the existing gravity sewer near proposed Manhole 1 will be included under that item.

h. Leachate Gravity Sewer Manhole 1

This item will be paid for on a lump sum basis. The lump sum price will include all material and installation of Manhole 1, including the manhole, epoxy lining and connection to the proposed and existing gravity sewers, including the piping and connection from the existing gravity manhole, approximately 20 feet to the south of Manhole 1. Incidental to this item is a temporary plug and pump that will be used to pump leachate to the transport tanker while the leachate storage lagoon is off line. The County will provide the transport tanker and will be responsible for disposal of leachate.

i. Leachate Gravity Sewer Manhole 2

This item will be paid for on a lump sum basis. The lump sum price will include all material and installation of Manhole 2, including the manhole, epoxy lining and connection to the proposed gravity sewers and force main.

j. Leachate Storage Lagoon Modifications

This item will be paid for on a lump sum basis. The work associated with this item includes all of the materials and labor for raising the existing leachate lagoon approximately 3.25', as shown on the plans. Included in this item are the following: low permeable soils to meet hydraulic conductivity requirements, additional soils needed to reach final grade, all required 60-mil textured HDPE liner, all required 8-oz double-sided geocomposite, abandonment of existing leachate manholes, grouting of abandoned leachate sewer lines, installation and operation of temporary leachate pump installed in proposed manhole 1. The Owner will provide two 20,000 gallon Frac Tanks for the storage of leachate for a period of 30 calendar days after the leachate lagoon goes off-line. The Owner will be responsible for transporting leachate to the disposal point. After 30 calendar days that the leachate storage lagoon is off-line, the Contractor shall provide two 20,000 gallon Frac Tanks for the storage of leachate. The Owner will be responsible for transporting leachate to the disposal point during this time.

k. **Removal of Existing Leachate Collection System Manholes**

This item will be paid for the actual number of leachate collection system manholes removed at the unit price for each. The unit price will be the full compensation for removal of the structures and transporting the removed material to the location on site designated by the Landfill Manager. Incidental to this item is grouting the incoming and outgoing piping, all materials and labor. Also, incidental to this item is removal of the existing leachate collection system valve, located at the northeast margin of MSW Phase 3.

01700.4.8 Storm Drainage

a. Piping

The storm drain piping will be paid for by the actual footage installed at the unit price per linear foot for each size and type listed in the Bid Schedule. The unit cost will include the material and installation.

b. **Energy Dissipater, Structure S-2**

This item will be paid for the actual number of energy dissipater structures installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to inlet and outlet piping. Included in this item is the pre-cast drainage structure, #57 stone surrounding structure, filter fabric, ENFM grate will fasteners and supports, 4" discharge piping, and metal flashing and fasteners. Riprap and filter fabric at discharge will be paid for under riprap item. Piping other than 4" discharge will be paid for under storm drainage piping.

c. **Storm Drainage Structure S-3**

This item will be paid for the actual number of storm drainage structures installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to inlet and outlet piping. Included in this item are the pre-cast drainage structure and frame and cover.

d. **Concrete Endwalls (Headwalls)**

This item will be paid for the actual number of concrete endwalls installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to inlet and outlet piping.

e. Dri-Prime Diesel-Operated Stormwater Pump

The quantity of stormwater pump will be paid for on a lump sum basis, for the specified trailer-mounted diesel-operated pump and all appurtenances, including but not limited to, fittings, hoses, pump controller, and float assembly, if directed by the Engineer.

01700.4.9 Fencing

a. Removal of Existing Fencing

The quantity of existing fencing to be removed will be the actual linear footage removed and will be paid for at the unit price per linear foot listed in the Bid Schedule. Incidental to this item is cutting the fence posts and bundling the fencing. Removed posts and fencing shall be disposed on site at the location chosen by the Owner. The removal of concrete foundation and transportation to the location on-site designated by the Owner shall be considered incidental to this item.

b. Installation of New Fencing

This item shall be paid in accordance with the unit price listed in the Bid Schedule for the installation of new fencing. This shall include all materials, equipment, and labor for a complete installation of a new 8' chain link fence, per the detail.

c. Gates

This item shall be paid in accordance with the unit price listed in the Bid Schedule for each gate installed. This shall include all materials, equipment, and labor for a complete installation of a new 20' double-swing gate, per the detail.

01700.4.10 Liner Edge Markers

Liner edge markers will be paid for by the actual number installed at the unit price for each. The unit cost will include the material and installation.

01700.4.12 Electrical Installation

This item will be paid for on a lump sum basis. The lump sum price will include all materials and installation of the electrical service to the pump station control panels from the existing utility service pole.

01700.4.13 Removal and Replacement of Unsuitable Material

The quantity of removed and replaced unsuitable material to be paid for will be the actual quantity, in cubic yards, of unsuitable material removed and replaced that is below the subgrade elevation. This work shall not be performed unless directed by the Engineer. The Contractor will provide sufficient topographic survey before and after removal of unsuitable materials in order to make an accurate calculation of the unsuitable material removed and replaced. This item shall be paid for at the price per cubic yard given in the Bid Schedule for replacement with suitable earth fill or crushed stone, according to the material the Engineer directs the Contractor to use.

01700.4.14 Erosion Control Cash Allowance

An erosion control cash allowance of $25,000.00 has been included in the Bid Schedule to cover the cost of adding erosion control measures, unforeseen at this time. This could include temporary sediment traps, stormwater culverts, riprap for ditches and pipe outlets, and erosion control matting. The contractor will not be eligible for compensation of this allowance unless a proposal of cost for completing the work is submitted to the Engineer prior to beginning construction. The Contractor will be required to provide documentation for all expenses incurred.

01700.4.15 Rock Excavation

The quantity of excavated rock to be paid for will be the actual quantity, in cubic yards, of rock excavated, as defined in the specifications. This work shall not be performed unless directed by the Engineer. The Contractor will provide sufficient topographic survey before and after rock excavation in order to make an accurate calculation of the quantity removed.

END OF SECTION

01705.1 DESCRIPTION

The work covered by this section consists of preparatory work and operations, including but not limited to those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, building, and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site. Included in this item will be the erection of all construction signs and signals, traffic warning devices, project sign and other preparatory signs.

01705.2 COMPENSATION

See Section 01700 Measure and Payment.

END OF SECTION

SECTION 02102 CLEARING AND GRUBBING

02102.1 SCOPE

Clearing and grubbing shall consist of the removal and satisfactory disposal of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, posts, fences, concrete, stubs, rubbish and all other objectional matter resting on or protruding through the original ground surface and occurring within the construction limits.

02102.2 GENERAL

Clearing and grubbing operations shall be completed sufficiently in advance of grading operations as may be necessary to prevent any of the debris from the clearing and grubbing operations from interfering with the excavation or embankment operations. All work under this section shall be performed in a manner which will cause minimum soil erosion. The Contractor shall perform such erosion control work, temporary or permanent, as may be directed by the Engineer in order to satisfactorily minimize erosion resulting from clearing and grubbing operations.

02102.3 CLEARING

The work of clearing shall be performed within the limits established by the plans, specifications, or the Engineer.

Clearing shall consist of the felling and cutting up, or the trimming of trees, and the satisfactory disposal of the trees and other vegetation together with the down timber, snags, brush and rubbish occurring within the areas to be cleared. Trees and other vegetation, except such individual trees, groups of trees, and vegetation, as may be indicated on the plans to be left standing, and all stumps, roots and brush in the areas to be cleared shall be cut off six inches above the original ground surface.

Individual trees and groups of trees designated to be left standing within cleared areas shall be trimmed of all branches to such heights and in such manner as may be necessary to prevent interference with construction operations. All limbs and branches required to be trimmed shall be neatly cut close to the whole of the tree or to main branches, and the cuts thus made shall be painted with an approved tree wound paint. Individual trees, groups of trees, and other vegetation, to be left standing shall be thoroughly protected from damage incident to construction operations by the erection of barriers or by such other means as the circumstances require.

The Engineer will designate all areas of growth or individual trees which are to be preserved due to their desirability for landscape or erosion control purposes. When the trees to be preserved are located within the construction limits, they will be shown on the plans or designated by the Engineer.

Clearing operations shall be conducted so as to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and so as to provide for the safety of employees and others. When such damages occur, all damaged areas shall be repaired, removed or otherwise resolved utilizing generally accepted practices at the Contractor's expense.

02102.4 GRUBBING

Grubbing shall consist of the removal and disposal of all stumps, roots and matted roots from all cleared areas, except as herein specified.

In embankment areas, when the depth of embankment exceeds 3 feet 6 inches in height sound stumps shall be cut off not more than 6 inches above the existing ground level and not grubbed. Unsound or decayed stumps shall be removed to a depth of approximately two feet below the natural ground surface.

All depressions excavated below the natural ground surface for or by the removal of stumps and roots shall be refilled with suitable material and compacted to make the surface conform to the surrounding ground surface.

02102.5 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

Saw logs, pulp wood, cord wood or other merchantable timber removed incidental to clearing and grubbing shall remain the property of the Owner. All combustible matter shall be deposited at locations approved by the Engineer. Combustible matter may be burned or may be disposed of as stated above. Debris shall not be burned unless written permission or permit is issued by the Fire Marshall having jurisdiction in the area if applicable. The Contractor shall adhere to all limitations and conditions set forth in the permit. Burning shall be done at such time and such manner as to prevent fire from spreading and to prevent any damage to adjacent cover and shall further be subject to all requirements of State or Federal Governments pertaining to the burning. Disposal by burning shall be kept under constant attendance until all fires have burned out or have been extinguished.

02102.6 MEASUREMENT AND PAYMENT

See Section 01700.

END OF SECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. General: The work included in this section consists of the grading of the project area. The work includes:

1. Site clearing and on-site disposal of all debris and unsuitable material.

2. Removal of all topsoil, organically contaminated soil and existing unsuitable fill. Topsoil shall be stockpiled on site in a location supplied by the owner.

3. Proofrolling and grading of the property to the prescribed elevations.

4. Stockpiling or wasting on site of any excess cut material for providing acceptable material as required to obtain the desired grades.

5. Construction of earthen embankments.

6. Placement of Fill Material in order to bring the site to subgrade elevations, prior to placement of landfill components.

7. **Contractor shall stockpile all excess soil materials meeting clay liner requirements separately in soil stockpile area #2.**

1.02 SITE CONDITIONS

A. Site Information: The boring logs and related information depict approximate subsurface conditions only at these specific locations and at the particular time designated on the logs. Subsurface conditions at other locations may differ from those reported at the boring locations. It is expressly understood that neither the Owner nor the Engineer will be responsible for interpretations or conclusions drawn from the boring data by the Contractor. The data are made available for the convenience of the Contractor. Test borings and other exploratory operations may be undertaken by the Contractor at his own expense, provided such operations are acceptable to the Owner.

PART 2: PRODUCTS

2.01 MATERIALS

A. Unstable Material:

1. The entire area within the limit of work shall be cleared and grubbed and shall be cleaned of all debris. Under the structures, paved, and fill areas; stumps, roots, logs, matted roots and other debris not suitable for foundations purposed shall be removed to a minimum depth of eighteen (18) inches below any subgrade. The resulting excavation shall be backfilled with suitable material and compacted as specified hereinafter for Fill Material. Cleared materials shall be completely removed from within the limits of work and disposed of on site by the Contractor at a location approved by the Owner.

2. Topsoil shall be carefully stripped to its full depth from all areas indicated to be graded, or to be built upon. Stripped topsoil shall be stockpiled on site at a location supplied by the Owner and protected for reuse later.

3. All areas to receive fill shall be stripped of root mat five (5) feet beyond toe of anticipated fills. Topsoil, all vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish and other debris within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill placement begins. In no case will such objectionable material be allowed to remain in or under the fill area.

4. Soft or excessively yielding material shall be removed and replaced with suitable soil or crushed stone.

B. Structural Fill Material:

1. Material to be used for structural fill shall be approved by the Project Engineer.

2. All roots, organic matter, trash, debris, and other unsuitable materials that may find their way into otherwise acceptable structural fill material shall be removed during the dumping and spreading operations.

3. Broken rock and boulders larger than six inches (6") in any dimension may not be used as structural fill without the specific approval of the Project Engineer.

4. Frozen soil shall not be used for fill.

5. Structural Fill material shall meet the following minimum requirements and/or be tested for the following criteria in accordance with the Site Specific Construction Quality Assurance Plan:

Test	Test Method	Frequency	Acceptable Values
Minimum Laboratory Dry Weight	ASTM D-698	1/5,000 YD^3	> 100 lbs. / FT^3
Natural Moisture Content	ASTM D-2216	1/5,000 YD^3	Reference Only
Laboratory Compaction	ASTM D-698	1/5,000 YD^3	95% Maximum Dry Density

PART 3: EXECUTION

3.01 PREPARATION

A. Subgrade Preparation:

1. After removal of all existing topsoil, debris, and other undesirable material, the areas which are to receive fill, which have been cut to the desired grade, or which are at the approximate required subgrade elevation without additional earthwork, should be proofrolled to locate any soft or yielding area. Proofrolling shall be done with a smooth-drum roller (minimum 20 tons) making a minimum of two passes in each direction or other procedures and equipment approved by the Project Engineer. In addition, the following tests shall be performed at the frequencies indicated:

Test	Test Method	Frequency	Acceptable Values
Field Density	ASTM D-6938, ASTM D-1556, ASTM D-2937	1/5,000 YD^3	95% Maximum Dry Density
Field Moisture	ASTM D-2216, ASTM D-6938, ASTM D-4643	1/5,000 YD^3	+/- 4% Optimum

2. Any soft, or excessively yielding material revealed by the proofrolling shall be removed and replaced with inert controlled fill. The bid includes removal and replacement of unsuitable material with either suitable soil or crushed stone with the possible addition of a geo-grid. The Engineer shall be the sole judge of what constitutes soft or excessively yielding material.

3. Drainage from existing watercourses, springs or other sources should be rerouted out of the earthwork area. The Contractor shall take special care to remove all organically contaminated sediment, saturated soil, and other undesirable material from existing watercourses.

B. Blasting and Damages: Where blasting is done, it shall be done by qualified personnel and in accordance with all federal, state or local requirements and procedures. The Contractor shall be responsible for any damage done to adjoining properties, or to persons, by reason of the blasting or other earthwork operations. The Contractor shall also be responsible for damage to embankments and cut areas, and sewer, water, gas or other underground lines which may result from blasting or earthwork operations. All such damage shall be repaired and made good by the Contractor in a timely manner.

3.02 INSTALLATION

A. Filling and Compaction:

1. After a stable non-yielding surface has been established, the surface of the area to be filled shall be scarified with a disc or harrow to a depth of four inches (4") to six inches (6"). An initial three inch (3") layer of fill material shall then be spread over the scarified surface and the entire area compacted as specified below.

2. No fill shall be placed on any area until that area has been inspected and approved by the Engineer. Fill shall not be placed on a snow covered or frozen surface. Fill materials shall be spread in uniform horizontal layers not exceeding 8" in uncompacted thickness. Alternating layers of cohesive and granular fill soils shall not be permitted. Spreading and compacting of fill material should be started at the lowest portion of the site. All fill must be placed in horizontal layers. Sloping fill planes will not be permitted. Fill material shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form.

3. Keyways shall be provided at the toe of each fill slope as shown on the drawings. As each layer of fill meets the natural grade of a slope, a bench, approximately 7 to 8 feet wide, shall be cut into the existing grade with each layer of newly placed fill. If rock is encountered at the face of the natural grade, the original ground shall be cut in vertical steps of 4 to 5 feet and a horizontal bench cut into the rock at the top of each vertical increment. A horizontal plateau, approximately 15 to 20 feet wide, should be provided in the existing slope at vertical intervals of roughly 25 feet. Subsurface

drains shall be installed at the toe of the slope and wherever springs or excessive seepage are encountered. Drains should be led to the outside face of the embankment and the water picked up and carried away in such a manner as to avoid softening the embankment or its toe, or producing erosion gullies.

4. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction. This may require aerating the material if it is too wet, or the addition of water if it is too dry. If additional water is required, it should be uniformly distributed and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.

5. The standard Proctor method of moisture-density relationship test, ASTM D 698, shall be used to determine the maximum laboratory dry density and the optimum moisture content of the material which is to be used for fill.

6. The fill material shall be compacted and tested in accordance with the following requirements:

Test	Test Method	Frequency	Acceptable Values
Field Density	ASTM D-6938, ASTM D-1556, ASTM D-2937	1/5,000 YD^3	95% Maximum Dry Density
Field Moisture	ASTM D-2216, ASTM D-6938, ASTM D-4643	1/5,000 YD^3	+/- 2% Optimum

7. The above compaction requirements are to be satisfied for all soil and weathered or soft rock fills. Weathered or soft rocks are those that can be broken down and disintegrated under normal compaction procedures and equipment.

8. At the close of each day's work, or where work is to be interrupted for a period of time, the surface of the site shall be shaped to drain freely, and sealed. If after a prolonged rainfall, the surface of the area to be filled or cut is too wet to work properly, the unsuitable material shall be removed to expose workable soil. The wet material removed may be dried and reused. Construction traffic shall be controlled so as to prevent rutting of graded areas and to avoid overrolling of any section.

9. All cut areas shall be rolled and compacted to produce a compaction equal to that of the filled area. If soft or yielding material is

encountered in cuts, or fills as a result of trapping water, overrolling or improper control of construction traffic, and cannot be satisfactorily stabilized by moisture control, compaction or other means approved by the Engineer, the unstable material shall be excavated to the depth required by the Engineer. The excavation shall then be filled with suitable compacted material in accordance with the requirements outlined above.

B. Grading:

1. Elevations shown on the plans are finished ground unless otherwise noted. Grading shall be maintained in such a manner as to provide free surface drainage of the site at all times without any ponding of water.

2. Provide ditches and swales to the cross-sections and grades shown on the drawings. Cut ditch subgrades four inches (4") below the grades shown and provide four inches (4") of topsoil where the plans call for seeding or sodding of the ditch. Keep ditches and swales free of accumulations of debris or washed in material until final acceptance of work by the Engineer.

3. Shape all surfaces to within not more than 0.10 feet above or below the required subgrade elevations and free from irregular surface changes.

C. Control and Testing:

1. The services of qualified soils testing personnel will be employed by the Owner for the making of tests to determine the moisture-density relationships, relative densities, plastic and liquid limits and suitability of materials for compaction and for inspection and control of the site preparation, selection, placing and compaction of the fill. A copy of the testing personnel's daily field report including results of in-place density and moisture content tests should be forwarded to the Owner and the Engineer at the end of each working day. If an independent testing firm is hired by the Contractor for the purpose of testing soil used in the construction of the landfill, the testing firm shall submit a field report to the Owner and Engineer at least once per week.

2. The Contractor shall cooperate with the testing personnel so as to permit proper inspection and control of the work without unnecessary delays.

D. Maintenance:

1. The Contractor shall be responsible during construction and until final acceptance for the maintenance of all embankments made under the Contract.

2. During construction and until final acceptance; the Contractor shall construct temporary or permanent earth berms along the outer edges of the top surface of the embankment, construct temporary ditches, shape the embankment surface to provide for the drainage of surface runoff along and throughout the length of the embankments, and use any other methods necessary to maintain the work covered by this section so that the work will not contribute to excessive soil erosion. The Contractor shall construct brush dikes, or install temporary or permanent slope drains or other drainage features to assist in controlling erosion.

3. The Contractor shall replace, at no cost to the Owner, any portion of embankment which have become displaced or damaged due to carelessness or neglect on the part of the Contractor. Where the work has been properly constructed, completely drained and properly maintained, and damage occurs due to natural causes, the Contractor will be paid at the Contract unit price for the excavated material required to make necessary repairs to such damage.

4. All embankments shall be brought to the grade and cross section shown on the plans or established by the Engineer, prior to final inspection and acceptance by the Engineer.

END OF SECTION

SECTION 02222 ROCK EXCAVATION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. The work covered by this section consists of the blasting and excavation of rock material in cut areas. Rock excavation shall be classified material which cannot be removed with normal construction equipment such as hydraulic excavators, bulldozers with "rippers" and requires the construction practice of blasting.

1.02 DEFINITIONS

A. Rock is defined as being sandstone, limestone, flint, graphite, quartzite, slate, hard shale, or similar material that cannot be excavated without systematic drilling and blasting.

B. Should rock be encountered in two or more ledges, each ledge being not less than 3" thick and with interlying strata of earth, clay or gravel not more than 12" thick in each stratum, the entire volume between the top of the top ledge and the bottom of the bottom ledge will be classified as rock.

PART 2: NOT USED

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Blasting: The use of explosives shall conform to be in strict accordance with all Federal, State, County and local regulations and only after the approval of the Engineer. The Contractor shall be responsible for all damage caused by blasting operations. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of excavation or trench.

B. When rock is encountered, all lines and grades will be held in accordance with the plans or adjusted only after approval of the Engineer.

C. When rock is encountered within the limits of construction, the Contractor shall notify the Engineer prior to any removal. Upon the Engineer's authorization, the Contractor shall remove the rock. The Contractor shall not be paid for rock removed without prior approval from the Engineer.

D. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

END OF SECTION

SECTION 02230 AGGREGATE BASE COURSE

PART 1: GENERAL

1.01 SCOPE OF WORK

A. The work covered by this Section consists of the construction of a base composed of an approved aggregate material hauled to the site, placed on the site, compacted, and shaped to conform to the lines, grades, depths, and typical sections shown on the plans or established by the Engineer.

PART 2: PRODUCTS

2.01 MATERIALS

A. Aggregate base course materials shall consist of crushed stone or uncrushed gravel, or other similar material having hard, strong, durable particles free of adherent coatings.

C. The Contractor shall furnish aggregate base course material produced in accordance with the requirements indicated herein for Type A aggregate unless otherwise specified in the special provisions.

D. All aggregates shall be from approved sources. Sources will not be approved unless the material has satisfactory soundness and satisfactory resistance to abrasion. Satisfactory soundness will be considered to be a weighted average loss of not greater than 15% when subjected to five (5) alternations of the sodium sulfate soundness test in accordance with AASHTO T104. Satisfactory resistance to abrasion will be considered to be a percentage of wear of not greater than 55% when tested in accordance with AASHTO T96.

E. Aggregates shall be handled in such a manner as to minimize segregation.

F. Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground surface shall be firm, smooth, and well drained. A cover of at least three inches (3") of aggregate shall be maintained over the ground surface in order to avoid the inclusion of soil or foreign material. Stockpiles shall be built in such a manner as to minimize segregation. When it is necessary to operate trucks or other equipment on a stockpile in the process of building the stockpile, it shall be done in a manner approved by the Engineer.

G. Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or else separated by suitable walls or partitions, to prevent the mixing of the aggregates.

H. Any method of stockpiling aggregates which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has been operated, and failure of such samples to meet all grading requirements for the aggregate will be considered cause for discontinuance of such stockpiling procedure.

I. GRADATION

All standard sizes of aggregates shall meet the gradation requirements when tested in accordance with AASHTO T27.

PART 3: EXECUTION

3.01 CONSTRUCTION OF STONE BASE

A. The aggregate material shall be spread on the subgrade to a uniform loose depth and without segregation.

B. The base material shall be placed in two (2) separate lifts, unless the total thickness of the base is 4" or less. The base material shall be placed with a spreader and rolled with a vibratory roller and the final compacted thickness must be in accordance with the details. Each separate aggregate material placed to construct the road base shall be placed in the previously described manner. Therefore, a road base constructed of a layer of surge stone and a layer of CABC shall be placed in four (4) separate lifts if the thickness of the layer exceeds 4 inches. The compacted density of the surge stone shall be 125 pcf. The CABC stone layer shall be compacted to 100% standard proctor.

C. Each layer of material shall have been sampled, tested, compacted, and approved prior to placing succeeding layers of base material or pavement. Such tests will be provided and paid for by the Owner, except that tests which reveal non-conformance with the Specifications and all succeeding tests for the same area, until conformance with the Specifications is established, shall be at the expense of the Contractor. The Owner will be responsible for paying for **only** the successful tests. The minimum compaction for each layer shall be 100% standard proctor.

D. No base material shall be placed on frozen subgrade or base. Hauling equipment shall not be operated on subgrade or a previously completed layer of base material soft enough to rut or weave beneath the equipment.

E. The maximum speed of trucks hauling or traveling over any part of the subgrade or base shall be five (5) miles per hour.

F. The Contractor shall utilize methods of handling, hauling, and placing which will minimize segregation and contamination. If segregation occurs, the Engineer may require that changes be made in the Contractor's methods to minimize segregation, and may also require mixing on the road which may be necessary to correct any segregated material. No additional compensation will be allowed for the work of road mixing as may be required under this provision. Aggregate which is contaminated with foreign materials to the extent the base course will not adequately serve its intended use shall be removed and replaced by the Contractor at no additional cost to the Owner. The above requirements will be applicable regardless of the type of aggregate placed and regardless of prior acceptance.

3.02 QUALITY CONTROL

A. TOLERANCES

1. After final shaping and compacting of the base, the Engineer will check the surface of the base for conformance to grade and typical section and will determine the base thickness.

2. The thickness of the base shall be within a tolerance of plus or minus 1/2" of the base thickness required by the plans.

B. MAINTENANCE

Where the base material is placed in a trench section, the Contractor shall provide adequate drainage through the shoulders to protect the subgrade and base until such time as the shoulders are completed. The Contractor shall maintain the surface of the base by watering, machining, and rolling or dragging when necessary to prevent damage to the base by weather or traffic.

PART 4: MEASUREMENT AND PAYMENT

See Section 01700.

END OF SECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. The work covered by this section consists of the construction of plain rip rap in accordance with the requirements of the plans and these specifications and at the locations designated by the Engineer.

PART 2: PRODUCTS

2.01 DEFINITIONS

A. PLAIN RIP RAP

Plain rip rap shall consist of quarry run stone, or field stone or granite stone, etc., and shall be classified by size into Class B, Class 1, or Class 2. The class and thickness to be used will be called for on the plans.

B. CLASS B RIP RAP

Class B rip rap stone shall vary in weight from 5 to 180 lbs. and have dimensions of 5" to 15." At least 30% of the total weight of the rip rap shall be in individual pieces weighing a minimum of 45 pounds each. Not more than 10% of the total weight of the rip rap may be in individual pieces weighing less than 15 pounds each.

C. CLASS 1 RIP RAP

Stone shall vary in weight from 15 to 200 pounds. At least 30% of the total weight of the rip rap shall be in individual pieces weighing a minimum of 60 pounds each. Not more than 10% of the total weight of the rip rap may be in individual pieces weighing less than 25 pounds each.

D. CLASS 2 RIP RAP

Stone shall vary in weight from 25 to 250 pounds. At least 60% of the total weight shall be in individual pieces weighing a minimum of 100 pounds each and not more than 100 pounds each and not more than 5% of the total weight may be individual pieces weighing less than 50 pounds each.

PART 3: EXECUTION

3.01 PLACEMENT OF RIP RAP

A. Unless otherwise indicated or directed by the Engineer, the stone shall be placed upon a slope which shall be no steeper than the angle of repose. The stone shall be graded so that the smaller stones are uniformly distributed throughout the mass. The area and thickness shall be as shown on the plans or as designated by the Engineer.

The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary, provided that when the rip rap is completed it forms a properly graded, dense, neat layer of stone.

PART 4: MEASUREMENT AND PAYMENT

See Section 01700.

END OF SECTION

02300.1 Scope of Work

The landfill cell shall include a 24-inch compacted clay liner or a geosynthetic clay liner (GCL) system that includes an 18-inch compacted clay liner overlain by a GCL material. The Contractor shall furnish all labor, material, supervision, and equipment to complete the Compacted Clay Liner for the cell, including hauling, sieving, raking, discing, compacting, drying, wetting, removal of rainwater and removal of all previously placed material rendered unsuitable due to weather conditions or construction operations, final grading and sealing and all necessary and incidental items as detailed or required to complete the compacted liner, all in accordance with the Contract Documents, and the Site Specific Construction Quality Assurance Plan.

02300.2 Materials

Soil that meets the following requirements of clay liner fill shall be used for construction of the Compacted Clay Liner:

Preconstruction Qualification			
Test	**ASTM Method**	**Frequency**	**Acceptable Values**
Natural Moisture Content	D2216	1/1,000 YD^3 or Change in Material	Reference
Grain Size Analysis	D422 or D1140	1/5,000 YD^3 or Change in Material	< 3" in the lower 18", < ¼" in the upper 6", < 5% greater than No. 4 sieve
Classification	D2487	1/5,000 YD^3 or Change in Material	CL,CH,ML,MH, or SM
Atterberg Limits	D4318	1/5,000 YD^3 or Change in Material	Plasticity Index (PI) > 10
Laboratory Compaction	D698 – Standard	1/5,000 YD^3 or Change in Material	95% Maximum Dry Density
Permeability ** 24-inch compacted clay liner	D5084	1/10,000 YD^3 or Change in Material	Less than or equal to 1 x 10^{-7} cm/sec
Permeability** 18-inch compacted clay liner utilized with GCL system	D5084	1/10,000 YD^3 or Change in Material	Less than or equal to 1 x 10^{-5} cm/sec

* Preconstruction test samples shall be taken from the borrow source and or clay stockpiled prior to construction.

** The Moisture-Density Curve shall show the region in which the required maximum permeability is met. A minimum of three (3) permeability tests shall be performed per curve to establish the zone of acceptable moistures and densities at which the required maximum permeability may be achieved. If the Contractor elects to run multiple curves to enlarge the zone of acceptance, all curves must be submitted.

All clay clods will be broken down with tillers and discs to provide a homogeneous clay soil.

The Compacted Clay Liner may consist of fill material modified by the addition of powdered bentonite in sufficient quantity to meet the specifications. Clay liner material modified with bentonite will be subject to the same testing criteria and frequencies as natural clay liner material, with the addition of percentage of bentonite used. If a bentonite admix is used, the mixing procedure shall be approved by the Engineer prior to construction. Material to be placed within the cell, either natural or augmented, shall have a minimum effective internal friction angle of twenty-five (25) degrees. The internal friction angle of the clay liner material shall be verified by the Contractor. The Contractor shall submit such verification prior to beginning construction. The test method used to verify the internal friction angle of the clay liner material shall be ASTM D4767 *Standard Test Method for Consolidated Undrained Triaxial Compression Test on Cohesive Soils.* The specimens must be compacted to design criteria for dry density and moisture content as determined by preconstruction testing. Test parameters require stepped confinement @ 1, 3, and 5ksf (nominally 5, 15 and 30 psi effective confining pressure).

Continuous and repeated visual inspection of the materials will be performed by the Contractor to ensure proper soils are being used. In addition, the Engineer will make frequent inspections of the clay liner placement operations and materials, and will consult with the Contractor on suitable liner fill and locations of such. All soil liner fill proposed shall be inspected by the Engineer prior to actual use.

02300.3 Construction

The following testing requirements and acceptable values shall apply to the construction of the Compacted Clay Liner unless specified otherwise as in the case of the construction of the required Test Pads:

Construction Testing			
Test	**ASTM Method**	**Frequency**	**Acceptable Values**
Field Density	D6938, D1556, D2973	1/10,000 FT^2/Lift	95% Maximum Dry Density
Field Moisture	D2216, D6938, D4643	1/10,000 FT^2/Lift	+0% - +5% optimum- Cell Floor +2% - +6% optimum – Side Slopes
Classification	D2487	1 per acre per lift	CL,CH,ML,MH, or SM
Permeability	Extracted per D1587 Tested per D5084	1/40,000 FT^2/Lift	Less than or equal to 1 x 10^{-7} cm/sec
Atterberg Limits	D4318	1/5,000 YD^3	Plasticity Index (PI) > 10
Grain Size	D422 or D1140	1/5,000 YD^3	< 3" in the lower 18", < ¼" in the upper 6", < 5% greater than No. 4 sieve
Soil Layer Thickness For 24-inch compacted clay liner	Observation, Field Measurement	Continuous Observation, Minimum of Five (5) per Lift	Minimum two (2) foot thick
Soil Layer Thickness For 18-inch compacted clay liner used with GCL	Observation, Field Measurement	Continuous Observation, Minimum of Five (5) per Lift	Minimum 18 inches thick

TEST PADS

Test pads, a minimum of 20 ft x 50 ft in area shall be constructed prior to beginning installation of the compacted clay liner and whenever there is a significant change in soil material properties or the borrow source is changed. The equipment used, liner thickness, subgrade slope, and all other conditions shall be representative of full scale construction. For each lift of the test pad, a minimum of three (3) test locations shall be established for testing moisture content and density. At least one (1) shelby tube sample for lab permeability testing and one (1) composite sample for recompacted lab permeability shall be obtained per lift/test pad. One test pad shall be constructed which shall be representative of the side slope clay liner and one for the cell floor. The test pads can be constructed independent of each other or in such a manner so that one

test pad lies on the cell bottom and the other test pad lies on the side slope. Compaction and soil moisture content shall be in accordance with the previously approved moisture-density-permeability relationship. Field moisture and density tests and laboratory permeability tests will be performed by the Resident CQA Engineer for each lift placed on the test pads to verify the construction method, equipment, and material necessary to achieve the required permeability not greater than 1.0×10^{-7} cm/sec for the 24-inch clay liner or 1.0×10^{-5} for the 18-inch clay liner associated with a GCL system. The Contractor shall allow sufficient time for construction and testing of the test pad prior to placement of the Compacted Clay Liner.

LINER CONSTRUCTION

Prior to fill placement, the prepared subgrade shall be proofrolled with a smooth-drum roller (minimum 20 tons) by a minimum of two passes in each direction. Proofrolling shall be conducted at the discretion of the Engineer or his representative. Any soft, saturated or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate soil at no additional cost to the Owner.

02300.4 Final clay liner lift thickness, after compaction, shall be a maximum of six (6) inches. Thinner lifts are permissible to achieve design grade.

02300.5 Equipment or truck traffic shall not be permitted during the period between scarifying and compaction of a lift unless approved by the Engineer.

02300.6 After the lift to be compacted is conditioned, representative samples will be taken by the Resident CQA Engineer and tested for moisture content prior to any compactive efforts. If the moisture content is within the range specified by the moisture-density-permeability relation, compaction may begin. If the moisture content is outside of this range, the clay liner fill will be wetted or dried and reworked accordingly. The soil fill should be sprinkled or sprayed with water utilizing equipment creating a uniform application and dozed, wind-rowed, and/or disc-plowed to uniformly increase the moisture content of the soil if the material moisture content is too low. The soil fill shall be dozed, wind-rowed, and/or disc-plowed to help air dry the soil if the moisture content is too high.

02300.7 Each lift shall be thoroughly compacted to satisfy moisture and density controls through field testing before a subsequent lift is placed.

02300.8 Compaction of lifts shall be as follows:

1) Compaction of lifts shall be performed with an appropriately heavy, properly ballasted compactor. A minimum of four (4) passes will be required on each lift regardless of whether the lift meets density specifications. A pass is defined as one trip of the compacting equipment over the lift and back to the starting point by a single drum roller or one trip across the lift surface from one side to the other if the compacting equipment has front and back compacting rollers. This requirement is to allow thorough remolding of the soil by kneading action.

2) The daily work area shall extend a distance so as to maintain moist soil conditions (facilitate bonding) and continuous operations.

Desiccation and crusting of the lift surface shall be avoided as much as possible. Each lift shall be protected, at all times after placement, from desiccation and crusting.

3) If desiccation and crusting of the lift surface occurs before placement of the next lift, this area shall be scarified to a sufficient depth to mix with moist materials, or sprinkled with water and then scarified at the direction of the Engineer.

4) The transition between the bottom and side slopes shall be accomplished by compacting parallel (bottom to top) to the slope.

5) Dozer equipment shall not be used for primary compaction efforts.

6) The surface of the underlying lift shall be scarified a minimum of 2 inches prior to compaction of each subsequent lift (i.e., Lift 2 to Lift 3) to facilitate bonding of the lifts.

02300.9 During compaction of the soil liner material, the soil moisture content and dry density shall be maintained within the limits specified below.

1) To assure the moisture content and dry density requirements of the compacted soil are being satisfied, field and laboratory tests shall be made at minimal intervals as specified. Additional testing may be requested at the discretion of the Engineer.

2) Compaction moisture content shall be between 2 and 6 percent wet of optimum moisture content (OMC) on the side slopes.

3) The clay liner shall be compacted to a minimum of 95 percent of the maximum dry density. Where densities are less than 95 percent of the maximum dry density, the soil liner shall be recompacted and/or removed and reworked to meet density objectives.

02300.10 The clay liner, in addition to the other provisions of this section, shall have a permeability not greater than 1.0×10^{-7} cm/sec on thin wall tube samples taken from the completed clay liner for use with the 24-inch compacted clay liner or a permeability not greater than 1.0×10^{-5} cm/sec on thin wall tube samples taken from the completed clay liner for use with the 18-inch compacted clay liner associated with the construction of a GCL system. If representative permeability tests do not achieve the required permeability, the clay liner shall be reworked to meet permeability requirements regardless of its previously achieved density. Representative soil samples taken from the clay liner that fail laboratory permeability testing must be re-sampled until passing results are achieved. Each failing sample must be replaced by one successful sample. The Owner will pay

for the permeability testing at the frequency required by the Site Specific Construction Quality Assurance Plan. The Contractor will be responsible for all costs associated with re-sampling and re-testing for failing samples beyond a 5% failure rate by quantity. This includes the cost of lab and Construction Quality Assurance personnel. The minimum charge for re-sampling and re-testing for failing permeability tests exceeding 5% failure rate will be $500.00 per occurrence.

02300.11 Soil fill shall not be placed or compacted during sustained periods with air temperature below 32°F. Soil fill may be placed and compacted during periods of early morning and early evening freezing temperatures with warming trends above 45°F during the day. No fill shall be placed on frozen subgrade. If the clay liner or structural fill freezes or ices the fill section shall be rescarified and recompacted, at the discretion of the Engineer.

02300.12 During construction, finished lifts or sections of compacted clay liner shall be sprinkled with water a minimum of twice per day depending on weather conditions.

02300.13 At the end of each construction day's activities, completed lifts or sections of compacted clay liner shall be sealed by rolling with a rubber tired or smooth drum rollers and sprinkled with water as needed.

02300.14 The compacted clay liner shall be a minimum of twenty-four (24) inches at a permeability no greater than 1.0×10^{-7} cm/sec, or eighteen (18) inches at a permeability no greater than 1.0×10^{-5} cm/sec when used with an overlying GCL material. Thickness of the compacted soil liner on the side slopes shall be measured perpendicular to the slope face.

02300.15 The as-built thickness of the compacted clay liner shall be determined by survey methods (non-destructive) as described below. An individual lift may be sampled upon completion (but prior to subsequent lift placement) with an approved sampler or other investigative tool. Any penetration within any portion or lift of the clay liner shall be promptly backfilled by the Contractor with a 50/50 mix of hand tamped soil and bentonite fill. Samples of the in place compacted soil liner shall be tested and evaluated in accordance with provisions of the Construction Quality Assurance Plan. All test locations shall be filled with a homogeneous mixture of one part bentonite and three parts soil.

02300.16 After completion of a segment of compacted clay liner, but before installation of the geomembrane liner, the surface of the clay liner shall be surveyed by the Contractor to ensure the specified thickness of Compacted Clay Liner (24 inches, or 18 inches with GCL) has been achieved. The survey must be performed and stamped by a registered Professional Land Surveyor in the State of North Carolina. The survey

information shall be provided to the Engineer in a format pre-approved by the Engineer and acceptable to the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Section. At a minimum, survey data shall be collected on a 50-foot grid and at least every 50-foot along all changes in grade.

02300.17 The surface of the compacted clay liner shall be smooth drum rolled and maintained free of rocks, organics, voids and sharp edges.

No vehicles other than a smooth-drum roller will be allowed on the Compacted Clay Liner once the Compacted Clay Liner has been approved. This includes equipment used to deploy geomembrane material. Any exceptions should have prior approval from the Project Engineer.

02300.18 The minimum interface friction angle between the Compacted Clay Liner and the 60 mil textured geomembrane shall be seventeen (17) degrees. This shall be verified by the Contractor and supporting documentation submitted to the Engineer prior to beginning construction.

The test method used to verify the interface friction angle between the clay liner and the 60-mil textured geomembrane shall be ASTM D5321 *Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method*. Soil specimens must be compacted to design criteria for dry density and moisture content as determined by preconstruction testing. Test parameters are to provide 3 points to range over minimum and maximum expected normal loads. Minimum will be a construction load of 260 psf. Maximum will be at the landfill's final filled condition or approximately 1,423 psf. The normal loadings used shall be 250, 750 and 1,500 psf.

END OF SECTION

02320.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision and equipment to complete the Geosynthetic Clay Liner (GCL) including, but not limited to, anchor trench excavation and backfill, GCL panel layout, seam preparation, patching, and all necessary and incidental items required to complete the Work, in accordance with the Contract Documents and these Specifications.

02320.2 Submittals

A. Contractor shall furnish the following information:

1. Conceptual description of the proposed plan for placement of the GCL panels over the area of installation.
2. GCL manufacturer's Manufacturer's Quality Control (MQC) Plan for documenting compliance to Sections 02320.7 and 02320.8 of these specifications.
3. GCL manufacturer's historical data for a) 10,000-hour creep shear testing per Section 02320.7 E and b) seam flow data at 2 psi confining pressure per Section 02320.7 F.
4. The manufacturer's last 20 weekly values for index flux and permeability prior to the end of the production date of the supplied GCL.
5. A copy of GCL manufacturer's ISO quality Certificate of Registration.

B. At the Engineer's or Owner's request the Contractor shall furnish:

1. A representative sample of the GCLs.
2. A project reference list for the GCL(s) consisting of the principal details of at least ten projects totaling at least 10 million square feet in size.

C. Upon shipment, the Contractor shall furnish the GCL manufacturer's Quality Assurance/Quality Control (QA/QC) certifications to verify that the materials supplied for the project are in accordance with the requirements of this specification.

D. As installation proceeds, the Contractor shall submit certificates of subgrade acceptance, signed by the Contractor and CQA Inspector for each area that is covered by the GCL.

E. The friction angle between the non-woven cover geotextile on the GCL and the geomembrane and the woven base cover and the clay liner shall be a minimum of 20 degrees. The Contractor shall verify and submit to the Engineer proper documentation prior to beginning construction. The test method used to verify the interface friction angle between the 60-mil

geomembrane and the non-woven cover geotextile and the interface friction angle between the woven base cover and the clay liner shall be ASTM D 5321 *Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method*. Test parameters are to provide 3 points to range over minimum and maximum loads. Minimum will be a construction load of 260 psf. Maximum will be at the landfill's final filled condition or approximately 1,423 psf. The normal loadings shall be 250, 750 and 1,500 psf.

02320.3 Manufacturer's and Installer's Qualifications

A. GCL Manufacturer must have produced at least 300 million square feet of GCL within the past three years, including at least 30 million square feet with 3.5 lb/in peel strength.

B. The GCL Installer must either have installed at least 1 million square feet of GCL, **or** must provide to the Engineer satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed in a competent, professional manner.

02320.4 Construction Quality Assurance (CQA)

A. All GCL sheet will be evaluated prior to and after installation.

B. The Owner and Engineer shall provide a third-party inspector for CQA of the GCL installation. The inspector shall be an individual or company who is independent from the manufacturer, Contractor and Installer, who shall be responsible for monitoring and documenting activities, related to the CQA of the GCL, throughout installation. The inspector shall have provided CQA services for the installation of the proposed or similar GCL for at least 5 completed projects totaling not less than 1 million square feet.

C. Testing of the GCL, as necessary to support the CQA effort, shall be performed by a third party laboratory retained by the Owner and independent from the GCL manufacturer, Contractor and Installer. The laboratory shall have provided GCL CQA testing of the proposed or similar GCL for at least 5 completed projects totaling not less than 1 million square feet.

D. The GCL Installer will be required to adhere to the requirements of the Site Specific Construction Quality Assurance Plan.

02320.5 Products

A. The GCL shall consist of a layer of granular sodium bentonite clay needlepunched between two geotextiles and shall comply with all of the criteria listed in this Section.

B. Bentonite shall be a high-swelling sodium bentonite, with a minimum swell index of 24 mL/2g and a maximum fluid loss of 18 mL. Bentonite shall be CG-50 granular bentonite, mined and processed by American Colloid Company, or an approved equal.

C. Bentonite shall have a granular consistency (1 percent max. passing a No. 200 sieve, to ensure uniform distribution throughout the GCL and minimal edge loss during handling and installation.

D. The cover geotextile shall be, at a minimum, a 6.0 oz/yd^2 non-woven geotextile. The base geotextile shall be, at a minimum, a 3.2 oz/yd^2 woven geotextile.

02320.6 Materials

A. Acceptable GCL products are Bentomat® ST, as manufactured by CETCO, 2870 Forbs Avenue, Hoffman Estates, Illinois 60192 USA (800-527-9948), or an engineer-approved equal.

B. The GCL shall meet, at a minimum, the properties shown in Table 1, Minimum Required Physical Properties of Geosynthetic Clay Liner.

C. The moisture content of the bentonite in the finished GCL shall be between 20 and 40 percent, to ensure uniform bentonite distribution, consistent needlepunch density, and adequate electrical conductivity to maximize leak location survey sensitivity.

D. GCL shall be needlepunch-reinforced, with a minimum peel strength of 3.5 lb/inch. To maximize large-displacement shear strength, GCL reinforcement shall be achieved solely through needlepunching, without any supplemental heat treatment.

E. The GCL shall have 10,000-hour test data for large-scale constant-load (creep) shear testing under hydrated conditions. The displacement shall be 0.11 in. or less at a constant shear load of 250 psf and a normal load of 500 psf.

F. The GCL shall have seam test data from an independent laboratory showing that the seam flow with a grooved cut in the nonwoven geotextile is less than 1 x 10^{-8} $m^3/m^2/s$ at 2 psi hydraulic pressure.

G. The minimum acceptable dimensions of full-size GCL panels shall be 150 feet in length.

H. A 6-inch overlap guideline shall be imprinted on both edges of the upper geotextile component of the GCL as a means for providing quality assurance of the overlap dimension. Lines shall be printed in easily visible, non-toxic ink.

Table 1
Minimum Required Physical Properties of Geosynthetic Clay Liner

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY $ft^2(m^2)$	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 ml/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 ml max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2) min
GCL Tensile Strength[3]	ASTM D 6768	200,000 ft^2 (20,000 m^2)	30 lbs/in (53 N/cm) MARV
GCL Peel Strength[3]	ASTM D 6496	40,000 ft^2 (4,000 m^2)	3.5 lbs/in (6.1 N/cm) min
GCL Index Flux[4]	ASTM D 5887	Weekly	1×10^{-8} m^3/m^2/sec max
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly	5×10^{-9} cm/sec max
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typ @ 200 psf

Notes

[1] Bentonite property tests performed at a bentonite processing facility before shipment to CETCO's GCL production facilities.

[2] Bentonite mass/area reported at 0 percent moisture content.

[3] All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496.

[4] Index flux and permeability testing with dealred distilled/deionized water at 80 psi cell pressure, 77 psi headwater pressure and 75 psi tailwater pressure.

[5] Peak values measured at 200 psf normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

02320.7 Product Quality Documentation

The GCL manufacturer shall provide the Owner or other designated party with manufacturing QA/QC certifications for each shipment of GCL. The certifications shall be signed by a responsible party employed by the GCL manufacturer and shall include:

A. Certificates of analysis for the bentonite clay used in GCL production demonstrating compliance with the swell index and fluid loss values shown in Table 1, Minimum Required Physical Properties of Geosynthetic Clay Liner.

B. Manufacturer's test data for the finished GCL product demonstrating compliance with the values shown in Table 1, Minimum Required Physical Properties of Geosynthetic Clay Liner.

C. GCL lot and roll numbers supplied for the project (with corresponding shipping information).

02320.8 Product Labeling

A. Prior to shipment, the GCL manufacturer shall label each roll, identifying:

1. Manufacturer's name and address
2. Brand Product Code
3. Lot Number
4. Roll Number
5. Roll Length and width
6. Roll Weight

02320.9 Packaging

A. The GCL shall be wound around a rigid core whose diameter is sufficient to facilitate handling. The core is not necessarily intended to support the roll for lifting but should be sufficiently strong to prevent collapse during transit.

B. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet (UV) light.

02320.10 Accessory Bentonite

A. The granular bentonite sealing clay used for overlap seaming, penetration sealing and repairs shall be made from the same natural sodium bentonite as used in the GCL and shall be as recommended by the GCL manufacturer. Seaming of GCLs shall be conducted in accordance with the manufacturer's guidelines for each particular GCL.

02320.11 Shipping and Handling

A. The manufacturer assumes responsibility for initial loading the GCL. Shipping will be the responsibility of the party paying the freight. Unloading, on-site handling and storage of the GCL are the responsibility of the Contractor.

B. A visual inspection of each roll should be made during unloading to identify if any packaging has been damaged. Rolls with damaged packaging should be marked and set aside for further inspection. If the geotextile under the torn packaging sleeve is also torn, the outermost wrap of GCL on the roll should be unwound and discarded when the roll is installed. The roll should be marked accordingly so as to alert the Installer that the initial wrap should be cut away and discarded. Upon

inspection, at the time of installation, additional rolls may be required to be cut away and discarded. The packaging should be repaired prior to being placed in storage.

C. Rolls of GCL that are accidentally dropped and/or bent during unloading and/or transportation to the installation site should be marked and moved away from the storage site and/or installation site. These rolls will not be installed on the project.

D. The party responsible for unloading the GCL should contact the Manufacturer prior to shipment to ascertain the appropriateness of the proposed unloading methods and equipment.

02320.12 Storage

A. Storage of the GCL rolls shall be the responsibility of the Contractor. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry and well drained.

B. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks. Rolls should be stacked at a height no higher than that at which the lifting apparatus can be safely handled (typically no higher than four).

C. All stored GCL materials and the accessory bentonite must be covered with a plastic sheet or tarpaulin until their installation.

D. The integrity and legibility of the labels shall be preserved during storage.

2320.13 GCL Placement

A. Any earthen surface upon which the GCL is installed shall be prepared and compacted in accordance with the Project Specifications and Drawings. The surface shall be smooth, firm, and unyielding, and free of:

1. Vegetation.
2. Construction Debris.
3. Sticks.
4. Sharp rocks.
5. Void spaces.
6. Ice.
7. Abrupt elevation changes.
8. Standing water.
9. Cracks larger than one-quarter inch (6 mm) in width.
10. Any other foreign matter that could contact the GCL.

B. Full length panels (150 feet long) will be used on all cell side slopes.

C. The Installer shall certify in writing that the surface on which the GCL will be installed is acceptable.

D. GCL rolls should be delivered to the working area of the site in their original packaging. Immediately prior to deployment, the packaging should be carefully removed without damaging the GCL. The orientation of the GCL (i.e., which side faces up) should be in accordance with the Engineer's recommendations.

E. Equipment which could damage the GCL shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.

F. Care must be taken to minimize the extent to which the GCL is dragged across the subgrade in order to avoid damage to the bottom surface of the GCL. A temporary geosynthetic subgrade covering commonly known as a slip sheet or rub sheet may be used to reduce friction damage during placement.

G. The GCL panels shall be placed parallel to the direction of the slope.

H. All GCL panels should lie flat on the underlying surface, with no wrinkles or fold, especially at the exposed edges of the panels.

I. Only as much GCL shall be deployed as can be covered at the end of the working day with a geomembrane. The GCL shall not be left uncovered overnight. If the GCL is hydrated when no confining stress is present, it may be necessary to remove and replace the hydrated material. The project Engineer, CQA inspector, and GCL supplier should be consulted for specific guidance if premature hydration occurs.

02320.14 Anchorage

A. As directed by the Project Specifications and Drawings, the end of the GCL roll shall be placed in an anchor trench at the top of the slope or an equivalent runout design shall be utilized. When utilizing an anchor trench design, the front edge of the trench should be rounded so as to eliminate any sharp corners. Loose soil should be removed from the floor of the trench. The GCL should cover the entire trench floor but does not extend up the rear trench wall.

02320.15 Seaming

A. The GCL seams are constructed by overlapping their adjacent edges. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.

B. The minimum dimension of the longitudinal overlap should be 6 inches. If the GCL is manufactured with a grooved cut in the nonwoven geotextile that allows bentonite to freely extrude into the longitudinal overlap then no

supplemental bentonite is required for this overlap. If the GCL does not have a grooved cut in the nonwoven geotextile longitudinal overlap, then bentonite-enhanced seams are required as described below.

C. End-of-roll overlapped seams should be constructed with a minimum overlap of 24 inches. Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone. End-of-roll overlapped seams require bentonite-enhanced seams as described below.

D. Bentonite-enhanced seams are constructed between the overlapping adjacent panels as follows. The underlying edge of the longitudinal overlap is exposed and then a continuous bead of granular sodium bentonite is applied along a zone defined by the edge of the underlying panel and the 6-inch line. The granular bentonite shall be applied at a **minimum** application rate of one quarter pound per lineal foot. A similar bead of granular sodium bentonite is applied at the end-of-roll overlap.

E. Cyclical wetting and drying of GCL covered only with a geomembrane can cause overlap separation. The leachate collection system layer (16 oz/yd^2 non-woven geotextile, leachate collection piping and the 24 inch leachate drainage layer) should be placed without delay to minimize the intensity of wet-dry cycling. If there is the potential for unconfined cyclic wetting and drying over an extended period of time, the longitudinal seam overlaps should be increased based on the Engineer's recommendations.

F. To avoid seam separation, the GCL should not be put in excessive tension by the weight or expansion of textured geomembrane on steep slopes.

02320.16 Damage Repair

A. Slopes flatter than or equal to 10H:1V: If the GCL is damaged (torn, punctured, perforated, etc.) during installation, it may be possible to repair it by cutting a patch to fit over the damaged area. The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 24 inches is achieved around all of the damaged area. Granular bentonite or bentonite mastic should be applied around the damaged area prior to placement of the patch. An adhesive will be used to affix the patch in place so that it is not displaced during geomembrane or cover material placement.

If the damaged area is along the side of the panel or at the Installers option, the panel may be cut off above and below the damaged area and a horizontal seam constructed in accordance with Section 02320.15.

B. Slopes steeper than 10H:1V: Patches will not be allowed on the slopes exceeding a 10H:1V slope.

02320.17 Cover Placement

A. Only as much GCL shall be deployed as can be covered at the end of the day with a properly installed (all seams completed) geomembrane.

B. The leachate collection system layer (16 oz/yd^2 non-woven geotextile, leachate collection piping and the 24 inch leachate drainage layer) should be placed on top of the geomembrane without delay to minimize the intensity of wet-dry cycling.

C. The 24 inch leachate drainage layer shall be pushed up slopes, not down slopes, to minimize tensile forces on the GCL.

D. Although direct vehicular contact with the GCL is to be avoided, lightweight, low ground pressure vehicles (such as 4-wheel all-terrain vehicles) may be used to facilitate the installation of any geosynthetic material placed over the GCL. The GCL supplier or CQA engineer should be contacted with specific recommendations on the appropriate procedures in this situation.

E. When a textured geomembrane is installed over the GCL, a temporary geosynthetic covering known as a slip sheet or rub sheet will be used to minimize friction during placement and to allow the textured geomembrane to be more easily moved into its final position.

02320.18 Geosynthetic Clay Liner Warranty

The installation of the Geosynthetic Clay Liner shall be warranted against defects in workmanship for a period of 1 year from the date of substantial project completion.

END OF SECTION

SECTION 02400 LEACHATE COLLECTION REMOVAL SYSTEM (LCR)

02400.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, and equipment necessary to complete the LCR System including trench excavation, hauling, spreading, grading, rolling and all necessary and incidental items required to complete the Work, all in accordance with the Contract Drawings and these Contract Specifications.

02400.2 Materials

Pipe for the LCR System shall be High Density Polyethylene (HDPE) pipe.

1. HDPE piping shall have nominal diameters as noted on the Contract Drawing.

2. HDPE piping shall have a maximum Standard Dimension Ratio (SDR) of 17 or as specified on the Contract Drawings.

3. The HDPE pipe shall be manufactured from first quality virgin polyethylene with the following nominal properties.

Property	ASTM Method	Frequency	Acceptable Value
Relative Density	D1505	Per Shipment	.95 gms/cm^3
Melt Index	D1238	Per Shipment	0.08 gms/10 min.
Carbon Black Content	D3350	Per Shipment	Min. 2%
Tensile Strength @ Yield	D638, Type IV	Per Shipment	3200 psi
Elastic Modulus	D638	Per Shipment	> 150,000 psi

The HDPE pipe section to be perforated shall be as follows or approved by the Engineer:

1) Four rows of perforations; Two rows on each side of pipe at approximately 45° and between 75° and 90° from bottom of pipe.

2) Each row of perforations shall have holes approximately 6 inches on center; and

3) Each hole shall be 1/2-inch diameter.

The dual contained force main shall consist of HDPE carrier pipe inside HDPE containment pipe. The carrier pipe shall be concentrically located within containment pipe with spacers. The force main within the tank containment area shall consist of schedule 10 or schedule 40, 304 SS with lap joint stub end flange connections. Back up flanges are galvanized. Bolting is zinc plated grade 5. All necessary pipe supports to prevent sagging or movement shall be furnished.

All proposed exposed piping shall be heat traced and insulated, and any existing piping disturbed during construction shall be restored to original condition with insulation and heat tracing.

The chemical resistance of the HDPE pipe and all fittings shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources. All mechanical fasteners or fittings shall be stainless steel.

02400.3 Stone bedding surrounding the perforated HDPE piping shall be No. 5 washed stone. The Contractor shall be responsible for providing the stone bedding material.

02400.4 Non-woven Filter Geotextile shall be as indicated below:

Non-woven Geotextile

The geotextile used shall be ultraviolet stabilized 1) a non-woven, needlepunched, continuous filament polyester material or, 2) a non-woven, needlepunched continuous filament polypropylene material or, 3) a non-woven, needlepunched staple fiber polypropylene material.

A 16 oz. Geotextile cushion will be placed between the geomembrane and the drainage layer. The friction angle between the geotextile and the geomembrane shall be a minimum of 20 degrees. The Contractor shall verify and submit to the Engineer proper documentation prior to beginning construction. The test method used to verify the interface friction angle between the 60-mil geomembrane and the geotextile shall be ASTM D5321 *Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method.* Test parameters are to provide 3 points to range over minimum and maximum expected normal loads. Minimum will be a construction load of 260 psf. Maximum will be at the landfill's final filled condition or approximately 1,423 psf. The normal loadings used shall be 250, 750 and 1,500 psf.

A 6 oz. Geotextile will be used to wrap the leachate lines and the #5 stone bedding.

The non-woven material shall meet or exceed the following criteria using Minimum Average Values:

Property	ASTM Method	Frequency	Acceptable Values	
			6 oz. Geotextile	16 oz. Geotextile
Grab Tensile Strength	D4632	Every 5th Roll	160 lbs.	370 lbs.
Grab Tensile Elongation	D4632	Every 5th Roll	50 Percent	50 Percent
Puncture (pin) Strength	D4833	Every 5th Roll	110 lbs.	**170 lbs.**
Mass per Unit Area	D5261	Each Roll	6.0 oz.	**16 oz.**
Apparent Opening Size (AOS)	D4751	Every 5th Roll	.212 mm (70 Sieve max.)	0.150 mm (100 Sieve max.)

02400.5 HPDE Sumps, Catch Basins

All HDPE pipe and fittings (both interior carrier and exterior containment pipe) shall be manufactured from first quality virgin polyethylene with the following nominal properties:

Property	ASTM Method	Frequency	Acceptable Value
Relative Density	D1505	Per Shipment	.95 gms/cm^3
Melt Index	D1238	Per Shipment	0.08 gms/10 min.
Carbon Black Content	D3350	Per Shipment	Min. 2%
Tensile Strength @ Yield	D638, Type IV	Per Shipment	3200 psi
Elastic Modulus	D638	Per Shipment	> 150,000 psi

The chemical resistance of the HDPE pipe, welding rod and all fittings shall be equal or greater than that of the 60 mil. HDPE liner specified.

All interior pipe welds must be machine butt fusion welded and demonstrated to be watertight and sufficiently strong to develop the full strength of the joined sections, e.g. failure should not occur in a weld. Air testing of the pipe seams must be performed in accordance with the contract documents before acceptance by the Engineer.

02400.6 Drainage Layer

The drainage layer material shall consist of washed aggregate material meeting the NCDOT specification for #57 stone. The chemical properties of the stone shall not be adversely affected by waste placement or leachate generated by the landfill. The aggregate material shall contain less the than one percent (1%) Calcium Carbonate by weight. The aggregate material shall have a minimum permeability of 1.0×10^{-2} cm/sec that allows lateral drainage through the drainage layer and along the surface of the base liner. The drainage layer material shall contain no more than 5% fines by weight.

The friction angle shall between the geotextile and the drainage layer shall be a minimum of 24 degrees. The friction angle shall be verified by Direct Shear Box testing prior to construction. The testing shall be performed using representative bulk samples from the proposed construction materials.

02400.7 Construction

The geotextile for the bottom of the cell shall be installed as follows:

The specified geotextile shall be placed over the HDPE liner. The geotextile shall be immediately sewn by a methodology approved by the Engineer. The geotextile shall be extended up the side slopes and placed in the anchor trench as indicated on the Contract Drawings.

The perforated high density polyethylene collector pipe shall be as shown on the Contract Drawings.

a) The pipe section connections shall be made by:

(1) Heat fusion weld;
(2) Material extrusion weld;
(3) Threaded connection;
(4) Snap-couplings (approved mechanical); and/or
(5) Combination of any two or more of the above. No solvent or glued joints are allowed.
(6) The two main 8" leachate collection system trunk lines shall be video-inspected after the stone drainage materials have been installed over the piping, prior to acceptance by the County. Additionally, the leachate gravity sewer beneath MSW Phase 3 shall be video inspected and approved by the Engineer prior to the clay liner placement.

02400.8 The top of the gravel sump shall be completely covered with a 6 oz. filter geotextile to avoid "clogging" during placement of the first two lifts of the operational cover.

1) The sections of the geotextile shall be installed with a minimum overlap of 2 inches and field sewn together;

2) The overlapped edges of the geotextile shall be temporarily secured during periods of windy weather;

02400.9 The drainage layer shall be placed with a minimum compacted thickness of 24 inches with an overfill variance of + 0.2 feet allowed for a total allowable thickness of 2.2 feet. Any areas of the completed drainage layer that exceed this thickness will be measured and the volume of overfill calculated by the engineer. The Contractor will be required to compensate the owner for the overfill volume, calculated at a rate of $24.00 per cubic yard. The surface of the drainage layer shall be surveyed by the Contractor to ensure the specified thickness. The survey must be performed and stamped by a registered Professional Land Surveyor in the State of North Carolina. The survey information shall be provided to the Engineer in a format pre-approved by the Engineer and acceptable to the North Carolina DEHNR, Division of Waste Management, Solid Waste Section. All inverts, intersections, connection points and cleanouts for the LCS piping shall also be surveyed. At a minimum, survey data shall be collected at a 50-foot grid and every 50 feet along changes in grade.

Equipment used during placement of the drainage layer shall not be allowed to operate directly on the geomembrane. Equipment will not be allowed on any portion of the geomembrane without the protective geotextile and a minimum of 18 inches of stone material in place. The drainage layer shall be stable when placed on the interior slopes of the landfill.

Drainage layer material shall not be pushed along the surface of the geomembrane or geotextile under any circumstances. Pushing of drainage material will only be allowed on areas where the material has a depth greater than 24 inches.

END OF SECTION

02620.1 Scope of Work

The Installer shall furnish all labor, materials, supervision and equipment to complete the HDPE Geomembrane Liner including, but not limited to, anchor trench excavation and backfill, liner layout, seaming, patching, and all necessary and incidental items required to complete the Work, in accordance with the Contract Drawings and these Specifications.

02620.2 Materials

The geomembrane liner shall be made of high-density polyethylene (HDPE) that has an absolute minimum thickness of 60 mils. This means that the geomembrane shall have a thickness of 60 mils at any point measured on the sheet. An average minimum thickness will not be considered. If during conformance testing or on-site testing and inspection, a thickness measurement is found to be less than 60 mils, the material will be rejected for use during construction.

The geomembrane used shall meet, at a minimum, the standards included in Tables 1, 2 and 3 located at the end of this section.

The chemical resistance of the geomembrane liner shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources.

Geomembrane liner shall be shipped rolled with a protective wrap around each roll, labeled with roll number and manufacturer's batch number. Manufacturer's quality control documentation shall be included with each roll.

The geomembrane shall be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. Any such defect shall be repaired in accordance with the geomembrane manufacturer's recommendations. The Engineer may reject all or portions of units (or rolls) of the geomembrane if in his opinion significant quantities of production or transporting flaws are observed.

The Installer shall submit proposed geomembrane panel layouts to the Engineer at least 14 days prior to mobilization of crews (2 copies). Once the panel layout is approved, the Installer may not change the layout without permission of the Engineer.

02620.3 Construction

The geomembrane liner shall be installed by a specialty contractor, and that specialty contractor must have installed a minimum of 5,000,000 square feet of geomembrane liner since November, 1998.

The geomembrane liner shall be constructed as soon as practical after completion and approval of the compacted clay liner or portion thereof. The top of the compacted clay liner will be surveyed to ensure adequate thickness of clay material and proper grades toward the collection sump area have been achieved. The Contractor shall be responsible for providing survey information for all panel locations, seam locations, destructive testing locations, repairs, and liner flap used to construct the temporary liner edge. The survey must be performed and stamped by a registered Professional Land Surveyor in the State of North Carolina. The survey information shall be provided to the Engineer in a format pre-approved by the Engineer and acceptable to the North Carolina DEHNR, Division of Waste Management, Solid Waste Section. The geomembrane is to cover the bottom of the cell and the side slopes in accordance with the Contract Drawings.

Areas to receive liner installation shall be relatively smooth and even, free of ruts, voids, etc., to the extent required by the Engineer. This shall be accomplished by final dressing of the compacted liner with smooth drum rollers. No vehicles are permitted on final dressed surfaces unless authorized by the Engineer.

An anchor trench (as illustrated on the Contract Drawings) will be required to secure the geomembrane. No loose soil will be allowed to underlie the geomembrane in the anchor trenches. The time schedule for excavation and backfilling of the anchor trenches is to be approved by the Engineer so that desiccation of trench soils does not occur prior to backfilling.

02620.4 Installation of the geomembrane shall be as follows:

All geomembrane installed on side slopes will be 60 mil textured material. The textured material shall be extended a minimum of ten (10) feet beyond the toe of slope.

Unroll only those sections that are to be seamed together in one day. Panels should be positioned with the overlap recommended by the manufacturer, but not less than 4 inches. The side slope geomembrane will be placed in an anchor trench that is then backfilled with soil and compacted as shown on the Contract Drawings.

After panels are initially in place, remove wrinkles as directed by the Engineer. Unroll several panels and allow the liner to "relax" before beginning field seaming. The purpose of this is to make the edges, which are to be bonded, as smooth and free of wrinkles as possible.

Once panels are in place and smooth, commence field seaming operations.

The Installer's Field Superintendent will complete a Daily Report at the end of each day and submit the form daily to the Engineer.

Field seaming shall be in accordance with EPA Technical Guidance document: "The Fabrication of Polyethylene FML Field Seams" EPA/530/SW-89/069 or as follows. Where conflicts exist between the two guidance specifications, the most stringent specification prevails or as directed by the Engineer.

02620.5 All foreign matter (dirt, water, oil, etc.) shall be removed from the edges to be bonded. For extrusion welds, the bonding surfaces must be thoroughly cleaned by mechanical abrasion or alternate methods approved by the Engineer to remove surface cure and prepare the surfaces for bonding. All abrasive buffing shall be performed using No. 80 grit or finer sandpaper. The grinding shall be performed so that any and all grind marks are perpendicular to the edge of sheet. No grinding greater than 1/8 inch outside the welds is permitted or the Engineer can require patching. No solvents shall be used to clean the geomembrane liner.

02620.6 As much as practical, field seaming shall start from the top of the slope down. This will minimize large wrinkles from becoming trapped, which requires cutting and patching. Tack welds (if used) shall use heat only; no double sided tape, glue, or other method will be permitted. The geomembrane should be seamed completely to the ends of all panels to minimize the potential of tear propagation along the seam.

The completed liner shall not exhibit <u>any</u> "trampolining" during any daylight hours (6:00 a.m. to 8:00 p.m.). All areas exhibiting trampolining must be repaired as directed by the Engineer. Additional slack (i..e., 1-3 percent) shall be allowed on the side slopes to reduce the potential for trampolining.

Seaming of the cell bottom membrane to the sidewall membrane (toe seam) shall be conducted when conditions minimize thermal expansion effects. All toe seams must be a minimum of 10 feet horizontally from the toe of the slope. Horizontal seams will not be allowed on the side slopes unless approved by the Engineer.

02620.7 At the end of each day or installation segment, all unseamed edges shall be anchored by sand bags or other approved device. Sand bags securing the geomembrane on the side slopes should be connected by a rope fastened at the top of the slope by a temporary anchor. If high winds are expected, boards along the edge of unseamed panels, with weighted sand bags on top, may be used to anchor the geomembrane on the bottom of the cell. Sand bags fastened by rope should be used to secure unseamed edges on the side slopes. Staples, U-shaped rods or other penetrating anchors shall not be used to secure the geomembrane on the side slopes. Any damage to the liner or clay liner including damage due to wind, rain, hail, or other weather shall be the sole responsibility of the Contractor.

02620.8 Field seaming may be extrusion or fusion welding or a combination of these methods. Solvent welding is not acceptable. The Engineer reserves the right to reject any proposed seaming method they believe unacceptable. Double hot wedge fusion welding shall be the predominant seaming method and shall be used when possible. Additional concepts and requirements of proper field seaming include the following.

02620.9 Extrusion welding applies a molten bead of material to preheated sheets of geomembrane. The sheets are then joined by pressure.

02620.10 The fusion welding process heats the area to be joined to the melting point and then applies pressure to join the melted surfaces.

02620.11 The sheets to be joined shall be overlapped at least four (4) inches after the necessary cleaning, aligning and cutting.

02620.12 The seams should be oriented parallel to the line of maximum slope, i.e., oriented up and down, not across, the slope. In corners and odd shaped geometric locations, the number of field seams shall be minimized.

02620.13 No horizontal seams shall be within ten (10) feet from the toe of the slope. No horizontal seams will be allowed on the side slopes unless approved by the Engineer.

02620.14 No seaming shall be attempted above 40°C (104°F) ambient air temperature. Below 5°C (41°F) ambient air temperature, preheating of the geomembrane will be required, unless it is demonstrated that this is not necessary (i.e., acceptable test (start-up) seams which duplicate, as closely as possible, actual field conditions can be achieved). Preheating may be achieved by natural and/or artificial means (shelters and heating devices). Ambient temperature is measured 18 inches above the liner surface. The Installer shall supply instrumentation for measurement of ambient temperature.

02620.15 A moveable protective layer of plastic or approved material may be placed directly below each overlap of geomembrane that is to be seamed. This is to prevent any moisture build-up between the sheets to be welded. The protective layer must be removed after welding.

02620.16 Seaming will extend to the outside edge of panels to be placed in anchor trenches.

02620.17 If required, a firm substrata should be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

02620.18 Grinding prior to welding shall be done perpendicular to the sheet edge. Overgrind greater than 1/8 inch beyond the welded seam or improperly ground areas shall be replaced at the Installer's expense.

02620.19 **Seams at the Panel Corners**

Seams at the panel corners of 3 or 4 sheets shall be completed with a circular patch approximately 12 inches in diameter, extrusion welded to the parent sheets.

02620.20 **Quality Control**

All geomembrane sheet, seams, and patches will be tested and evaluated prior to acceptance. In general, testing of the sheet will be conducted by the manufacturer. Testing of the seams will be conducted by the Installer under observation by the Engineer. The Engineer or a designated, independent geosynthetics laboratory may perform additional testing, as required by these detailed Specifications or as required in the judgment of the Engineer or Authorized Representative to verify that the HDPE sheet and seams meet the specifications. The geosynthetics installer will be required to adhere to the requirements of the Site Specific Construction Quality Assurance Plan. Testing requirements are detailed in the following subsections:

02620.21 **Pre-shipping Sheet Tests**

The Installer or supplier (manufacturer) will be required to submit his Quality Control Program to the Owner prior to initiating field work. At a minimum, the Manufacturer will perform the tests, at the frequencies given in Table 3, on the HDPE sheet prior to shipping HDPE material to the site.

02620.22 **Test Seams (Destructive Tests)**

The Installer shall maintain and use equipment and personnel at the site to perform testing of test seams. These seams will be made on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. At a minimum, test seams shall be made upon each start of work for each seaming crew, upon every four hours of continuous seaming, every time seaming equipment is changed or if significant changes in geomembrane temperature and weather conditions are observed. The technician shall complete the Test Seam Form provided by the CQA Engineer immediately after each test. Requirements for test seams are as follows:

02620.23 The test seam sample will be at least 1.8m (6 feet) long by 0.3m (1 foot) wide with the seam centered lengthwise. Six adjoining specimens 25mm (1 inch) wide each will be cut from the test seam sample. At the Engineer's option, the shear tests may be eliminated for test seams. These specimens will be tested in the field with a tensiometer and/or manual seam tester for both shear (3 specimens) and peel (3 specimens). For dual wedge both inside and outside welds should be tested in the peel. Test seams will be tested by the Installer under approval of the Engineer. The specimens should not fail in the weld. The Installer shall supply all necessary knowledgeable personnel and testing equipment. Quantitative strength measurements from a calibrated field tensiometer, supplied by the Installer, shall be obtained for all three (3) specimens in shear and peel for the test seams. A passing test seam will be achieved when the criteria described in Table 1 (located at the end of this section) are satisfied. If a test seam fails, the entire operation will be repeated. If the additional test seam fails, the seaming apparatus or seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful full test seams are achieved. Test seam failure is defined as failure of any one of the specimens tested in shear or peel.

02620.24 The Engineer will approve all test seam procedures and results. The six (6) test specimens shall be labeled with initials of the technician, date, and A.M. or P.M. as appropriate; bound together with electrical tape; and retained by the Engineer until the project is over. The Engineer will transfer these specimens to the Owner following the Engineer's acceptance of the geomembrane materials and installation.

02620.25 **Production Seams**

One hundred percent of the production seams will be tested by the Installer continuously using non-destructive techniques and at specified intervals using destructive tests.

All areas failing nondestructive test procedures described below shall be clearly marked both on the liner itself and on the Seam Inspection Quality Control Form.

02620.26 Non-Destructive Testing

Single Weld Seams: The Contractor shall maintain and use equipment and personnel at the site to perform continuous vacuum box testing on all single weld production seams except those corner seams where vacuum box testing is impossible. The system shall be capable of applying a vacuum of at least 3 psi. The vacuum shall be held for a minimum of 15 seconds for each section of seam. All vacuum boxes to be used at this job site shall have new gaskets installed prior to reaching the job site. The geosynthetics installer shall also be required to have backup vacuum testing equipment at the job site. If the geosynthetics installer fails to provide the backup equipment, and it results in delays of the project, the geosynthetics installer will be liable for all costs associated with the delay.

Double Weld Seams: The Contractor shall maintain and use equipment and personnel to perform air pressure testing of all double weld seams. The system shall be capable of applying a pressure of at least 30 psi for not less than 5 minutes. All channels between the double weld seam must first be verified that the channel is open throughout the entire test area. The air pressure test results shall be documented. Pressure loss tests shall be conducted in accordance with the procedures outlined in "Pressurized Air Channel Test for Dual Seamed Geomembranes," Geosynthetic Research Institute Test Method GM-6. As outlined by the test method, following a 2 minute pressurized stabilization period, pressure losses over a measurement period of 5 minutes shall not exceed 3 psi.

Double weld seams will also be visually inspected on 100 percent of the seam. If necessary, the outside flap can be pulled back to aid in the visual inspection.

02620.27 Destructive Testing

Laboratory destructive testing (LDT) is defined as 12" X 48" samples cut on 500 foot centers for both extrusion and double welded seams. Field destructive testing (FDT) is defined as 3" X 6" samples cut at the end of each seamed area exceeding 200 feet. Both are described below:

Laboratory destructive testing will be performed on an average of every 500 linear feet of production seam. The locations will be selected by the CQA Engineer. Samples will be 12" X 48" in order to provide one sample to the archive, one sample to the Engineer for laboratory testing, and one sample to be retained by the Installer for possible field and/or additional laboratory testing at the option of the Installer.

Before the sample is sent to the laboratory, two specimens, one from each end of the specimen will be tested in peel in a calibrated field tensiometer, supplied by the Installer. Both specimens must meet the qualitative and quantitative criteria listed in Tables 1 and 2. Testing requirements are as follows: Each sample shall be large enough to test five specimens in peel and five specimens in shear. The average values of each set of five specimens must meet the values shown in Tables 1 and 2. If the average of the five specimens is adequate, but one of the specimens is below the required value, values for the specimen must be at least 90% of the values required for the sample to pass. All samples must fail in film tear bond (FTB). Samples which do not pass the shear and peel tests will be re-sampled from locations at least 10 feet on each side of the original location. These two re-test samples must pass both shear and peel testing. If these two samples do not pass, then the entire seam represented by the test shall be capped. Tests shall be conducted using a calibrated tensiometer and must meet the criteria outlined in Tables 1 and 2 located at the end of this section. The Owner will pay for destructive testing of the original destructive samples. The geosynthetics installer will be responsible for all costs associated with resampling and retesting for failing destructive samples beyond a 5% failure rate by quantity. This includes the cost of lab and CQA personnel. The minimum charge for each destructive re-test exceeding the 5% failure rate will be $500.00 per occurrence.

Field Destructive Testing (FDT) shall be small 2" X 6" samples cut out at the beginning and end of each seam exceeding 200 feet in length. Three 1" X 6" specimens will be tested in peel from each sample using the Installer's Field Tensiometer or qualitative peel tester at the option of the Installer. No qualitative peel strength values need to be determined with the Field Destructive test, but each specimen must meet all qualitative criteria listed in Tables 1 and 2.

The Engineer will approve all seam field and laboratory test procedures and results. All laboratory destructive test specimens will be marked with the seam number and letters then bound together for a particular seam and stored in the Owner's archives. The specimens for the FDT need not be retained.

Each sample area will be clearly marked both on the liner itself (LDT or FDT).

All areas cut out for testing shall be immediately patched by the Installer.

02620.28 Repair of Damaged and Sampled Areas

Damaged and sample coupon areas of geomembrane shall be repaired by the Installer by construction of an extrusion welded cap strip. No repairs shall be made to seams by application of an extrusion bead to a seam edge previously welded by fusion or extrusion methods. Repaired areas will be tested for seam integrity as outlined in Section 02620.27 of this specification. Damaged materials are the property of the Contractor and will be removed from the site at the Contractor's expense. The Contractor will retain all ownership and responsibility for the geomembrane until acceptance by the Engineer. The geomembrane shall be accepted by the Engineer after the installation and repair are complete, and after the Engineer has received documentation for the installation.

02620.29 Potentially Damaging Activities

No support equipment of any type, which may be used by the Contractor, shall be allowed on the geomembrane. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any activity that could damage the geomembrane. No glass or sharp objects shall be allowed on the geomembrane.

02620.30 Anchor Trench Backfilling

The anchor trench will be backfilled and compacted by the Contractor to a dry density not less than 95 percent of the maximum dry density determined by the Standard Proctor (ASTM D-698). Care should be taken when backfilling the trench to prevent any damage to the geomembrane. Anchor trench soil shall be used as backfill material, wherever acceptable by the Engineer.

02620.31 Protection of Leading Edges

Between construction of partial sections of the membrane liner, excluding temporary phaselines, leading edges of the membrane may be exposed or buried for extended periods of time prior to their joining to adjacent, subsequent membrane sections. The combined action of abrasive soil and equipment impact stresses may "etch" unprotected membrane surfaces sufficiently to affect seam strengths. Therefore, it is necessary to protect leading edges in high activity areas with sacrificial layers of geotextile and HDPE sheet until they are ready for final seaming. As a

minimum, each leading edge to be seamed that must be buried or which must be exposed for periods of one month or longer shall be continuously covered by a layer of HDPE sheet. The geotextile shall be nonwoven and have a minimum weight of 8 oz. per square yard. The sacrificial HDPE sheet shall have a minimum thickness equal to that of the membrane liner to be protected. Both protective layers shall have a minimum width of 2 feet. The protective cover sheets shall be either covered with soil or weighted with sand bags to prevent displacement by wind. The edge of the sheet to be protected shall be approximately centered beneath the overlying protective layers prior to burial or weighing with sandbags. Leading edges located in areas expected to receive direct traffic from construction equipment shall be buried under a minimum thickness of one foot of buffer soil.

2620.32 Geomembrane Warranty

The installation shall be warranted against defects in workmanship for a period of 1 year from the date of substantial project completion.

Table 1

Required Physical Properties of Smooth Membrane Liner (HDPE) Sheet

Property	Test Method	Required Values (60 Mil. HDPE)
Thickness	ASTM D5199	60 mil minimum
Specific Gravity (Relative Density)	ASTM D1505	0.940 g/cm^3 min.
% Elongation at Yield (min. avg.)	ASTM D6693 Type IV	12
% Elongation at Break (min. avg.)	ASTM D6693 Type IV	700
Tensile Strength at Yield Min. Avg.)	ASTM D6693 Type IV	126 lb/in. min.
Tensile Strength at Break (min. Avg.)	ASTM D6693 Type IV	228 lb/in. min
Carbon Black Content	ASTM D-1603	2% min. - 3% max.
Carbon Black Dispersion	ASTM D-5596	**1, 2, Cat. (9 of 10 views) Cat. 3 (1 of 10 views)**
Puncture Resistance	ASTM D4833	108 lb. min.
Tear Resistance	ASTM D 1004	42 lb. min.

Seam Strengths

Shear Strength	ASTM D4437, NSF Modified	120 lb/in
Shear Strain @ Yield	ASTM D4437, NSF Modified	10% (min.)
Peel Strength (Fusion Weld)	ASTM D4437, NSF Modified	91 lb/in
Peel Strength (Extrusion Weld)	ASTM D4437, NSF Modified	78 lb/in

Non-Destructive Testing

Single Weld	Continuous Vacuum Box; Impact	Maintain vacuum of 3 psi, hold vacuum for 15 seconds.
Double Weld	Air Testing	Maintain 30 psi for no less than 5 min.; pressure loss not greater than 3 psi for last 3 minutes.

Table 2

Required Physical Properties of Textured Membrane Liner (HDPE) Sheet

Property	Test Method	Required Values (60 Mil. HDPE)
Thickness	ASTM D-5994	**60 mil minimum**
Specific Gravity (Relative Density)	ASTM D-1505	0.940 g/cm^3 min.
% Elongation at Yield	ASTM D6693 Type IV	12
% Elongation at Break	ASTM D6693 Type IV	**100**
Tensile Strength at Yield	ASTM D6693 Type IV	126 lb/in. min.
Tensile Strength at Break	ASTM D6693 Type IV	90 lb/in. min
Carbon Black Content	ASTM D-1603	2% min. - 3% max.
Carbon Black Dispersion	ASTM D-5596	**1, 2, Cat. (9 of 10 views) Cat. 3 (1 of 10 views)**
Puncture Resistance	ASTM D4833	90 lb. min.
Tear Resistance	ASTM D 1004	42 lb. min.

Seam Strengths

Shear Strength	ASTM D4437, NSF Modified	120 lb/in
Shear Strain @ Yield	ASTM D4437, NSF Modified	10% (min.)
Peel Strength (Fusion Weld)	ASTM D4437, NSF Modified	91 lb/in
Peel Strength (Extrusion Weld)	ASTM D4437, NSF Modified	78 lb/in

Non-Destructive Testing

Single Weld	Continuous Vacuum Box; Impact	Maintain vacuum of 3 psi, hold vacuum for 15 seconds.
Double Weld	Air Testing	Maintain 30 psi for no less than 5 min.; pressure loss not greater than 3 psi for last 3 minutes.

Table 3

Required Pre-Shipping Sheet Testing of Membrane Liner (HDPE)

Property	Test Method	Frequency
Thickness	ASTM D5994 (Textured) ASTM D5199 (Smooth)	Each Roll
Specific Gravity (Relative Density)	ASTM D1505	Every 5th roll
Tensile Properties	ASTM D6693 Type IV	Every 5th Roll
Tear Resistance	ASTM D1004	Every 5th Roll
Puncture Resistance	ASTM D-4833	Every 5th Roll
Carbon Black Content	ASTM D1603	Every 5th Roll
Carbon Black Dispersion	ASTM D-5596	Every 5th Roll

END OF SECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of the geocomposite drainage layer.

1.02 WARRANTY

A. Installation shall be warranted against defects in workmanship for a period of 1-year from the date of geocomposite completion.

PART 2: PRODUCTS

2.01 GEOCOMPOSITE PROPERTIES

A. A geocomposite shall be manufactured by extruding two crossing strands to form a bi-planar drainage net structure with a non-woven geotextile bonded to one or both sides.

B. The geocomposite specified shall have properties that meet or exceed the values listed in the following Table:

Standard Property Drainage Sheet			
Tested Property	**Test Method**	**MINIMUM AVERAGE VALUES[c]**	
		6 oz. Fabric	**8 oz. Fabric**
Geocomposite			
Transmissivity[a], m^2/sec	ASTM D4716	$1.0x10^{-4}$	$1.0x10^{-4}$
Ply Adhesion, lb/in	ASTM D7005	1 [b]	1 [b]
Geonett Component [b]			
Transmissivity[a], m^2/sec	ASTM D4716	$1x10^{-3}$	$1x10^{-3}$
Thickness, mil	ASTM D 5199	200	200
Density, g/cm^3	ASTM D 1505 or ASTM D792, Method B	0.94	0.94
Peak Tensile	ASTM D 5035	45	45

Strength (MD), lb/in			
Carbon Black Content, %	ASTM D 1603	2.0 – 3.0	2.0 – 3.0
Geotextile Component [(b)]			
Mass Per Unit Area, oz/yd^2	ASTM D 5261	6	8
AOS, US Sieve	ASTM D 4751	70	80
Grab Tensile Strength	ASTM D4632	160	220
Grab Tensile Elongation	ASTM D4632	50	50
Puncture Strength	ASTM D4833	90	120
Permittivity (min. avg.) (Sec^{-1})	ASTM D 4491	1.6	1.3
UV Stability, % retained (500 hr.)	ASTM D 4355	70	70

(a) Gradient of 0.1, normal load of 10,000 psf, water at 70°, between stainless steel plates and a 15-minute seat time.
(b) Component properties prior to lamination.
(c) These are MARV values that are based on the cumulative results of specimens tested.

C. Resin
1. Resin shall be new first quality, compounded polyethylene resin.

PART 3: EXECUTION

3.01 FAMILIARIZATION

A. Inspection
1. Prior to implementing any of the work in the Section to be lined, the Installer shall carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of the Section may properly commence without adverse impact.

2. If the Installer has any concerns regarding the installed work of other Sections, he shall notify the Project Engineer.

B. Confirmation Testing

The friction angle between the geocomposite and the textured geomembrane shall be a minimum of 25 degrees. The Contractor shall verify prior to beginning construction. The test method used to verify the interface friction angle between the geocomposite and the textured geomembrane shall be ASTM D5321 *Standard Test Method for*

Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method. Test parameters are to provide 3 points to range over minimum and maximum expected normal loads. Minimum will be a construction load of 260 psf. Maximum will be at the landfill's final filled condition or approximately 1,423 psf. The normal loadings used shall be 250, 750 and 1,500 psf.

3.02 MATERIAL PLACEMENT

A. The geocomposite roll should be installed in the direction of the slope and in the intended direction of flow unless otherwise specified by the Engineer.

B. If the project contains long, steep slopes, special care should be taken so that only full length rolls are used at the top of the slope.

C. In the presence of wind, all geocomposites shall be weighted down with sandbags or the equivalent. Such sandbags shall be used during placement and remain until replaced with cover material.

D. If the project includes an anchor trench at the top of the slopes, the geocomposite shall be properly anchored to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.

E. In applying fill material, no equipment can drive directly across the geocomposite. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure.

F. The cover soil shall be placed in the geocomposite in a manner that prevents damage to the geocomposite. Placement of the cover soil shall proceed immediately following the placement and inspection of the geocomposite.

3.03 SEAMS AND OVERLAPS

A. Each component of the geocomposite will be secured or seamed to the like component at overlaps.

B. Geonet Components

1. Adjacent edges of the geonet along the length of the geocomposite roll shall be placed with the edges of each geonet butted against each other.

2. The overlaps shall be joined by tying the geonet structure with cable ties. These ties shall be spaced every 3 feet along the roll length.
3. Adjoining geocomposite rolls (end to end) across the roll width should be shingled down in the direction of the slope, with the geonet portion of the top overlapping the geonet portion of the bottom geocomposite a minimum of 12

inches across the roll width.

4. The geonet portion should be tied every 6 inches in the anchor trench or as specified by the Engineer.

3.04 REPAIR

A. Prior to covering the deployed geocomposite, each roll shall be inspected for damage resulting from construction.

B. Any rips, tears or damaged areas on the deployed geocomposite shall be removed and patched. The patch shall be secured to the original geonet by tying every 6 inches with the approved tying devices. If the area to be repaired is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be joined in accordance with Subsection 3.03.

PART 4: MEASUREMENT AND PAYMENT

See Section 01700.

END OF SECTION

02630.1 The temporary cover liner for the slopes shall be comprised of a minimum of 20 mil. Medium Density Polyethylene (MDPE) material as manufactured by Raven Industries (Product No. 2010B) or equal and as approved by the Engineer. The liner should be resistant to ultra violet degradation for the operational life of the landfill or until the material is removed by the Owner (18 months minimum). The minimum material properties values must be submitted to the Engineer prior to approval of the material.

02630.2 The liner shall be delivered to the site in a minimum of 15 feet wide rolls. Prefabricated factory seams are permitted using a method approved by the Engineer. The liner will be anchored at the top in the anchor trench.

02630.3 The Installer or Fabricator shall weld all seams with the wedge welding method or as otherwise approved. The quality control testing will include visual inspection and hand pulling of the seam for 100 percent of the factory and field seams.

02630.4 The Owner will periodically remove these portions of the temporary liner where waste is being placed, from the bottom up, and discard the cut-off portion.

02630.5 The Contractor is responsible for designing and installing an appropriate ballast system of the temporary liner to protect the liner against damage from up to 100 mph winds. The liner and ballast should be protected against:

1) Liner pull out from underneath the ballast;

2) Tearing of the liner or the welded seams;

3) Excessive billowing of the liner; and

4) Damage to either the ballast weights or the ropes tying them together.

Should the ballast system not adequately protect the liner against wind damage as defined above from the time the liner is placed until the liner is completely removed by the Owner, the Contractor will replace, repair, and/or supplement the liner and ballast system at no additional cost to the Owner. As a minimum, the ballast system should consist of 50 pound sand bags tied 3' on center down or parallel to the slope and tied 10' on center across or perpendicular to the slope. One line of ballast bags should also be placed down each seam. The sandbags and ropes used for the ballast system shall be "CIA Day Bag" manufactured by Dayton Bag & Burlap of Dayton, Ohio, or approved equal. The bags shall have a minimum 3-year warranty against degradation due to ultraviolet light exposure.

02630.6 Stormwater control liner shall have a minimum five (5) year warranty against degradation of material due to ultraviolet light exposure.

END OF SECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

This section covers providing and installing the storm drainage and underdrainage collection systems, including pipe culverts, French drains and appurtenant structures. Storm drainage systems shall be constructed as shown on the Contract drawings and as specified herein.

1.02 DELIVERY, STORAGE AND HANDLING

A. UNLOADING AND HANDLING

All pipe and storm drainage material shall be unloaded and handled with reasonable care. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during unloading or handling, the undamaged portions of the joint or section may be used where partial lengths are needed, or if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation and the Contractor shall remove such rejected pipe from the project.

1.03 QUALITY ASSURANCE

A. Pipe and drainage materials shall meet the following reference requirements:

1. ASTM C76 .....Reinforced Concrete Pipe
2. AASHTO M-36.....Corrugated Metal Pipe
3. AASHTO M-294.....High Density Polyethelene Pipe

1.04 SUBMITTALS

A. The Contractor shall submit for approval of the Engineer shop drawings which describe in detail the materials to be utilized. Six (6) copies of shop drawings shall be submitted. Prior to submittal all shop drawings are to be reviewed by the Contractor, and shall be stamped and signed as to compliance with the referenced specification. Any variance to the specification shall be noted.

The following shop drawings shall be submitted:

1. Drainage Pipe
2. Underdrain Pipe

3. Underdrain or Pipe Bedding

4. Drainage Structure Castings

5. Precast Drainage Structures

1.05 WARRANTY

All pipe and materials shall be warranted for a period of one (1) year following installation and acceptance by the Owner.

PART 2: PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Reinforced concrete pipe shall conform to ASTM C-76, latest revision. Pipe shall be Class III with Wall B, unless otherwise noted. All pipe shall have interior surfaces free from roughness, projection, indentations, offset or irregularities of any kind.

B. Joint material for reinforced concrete pipe shall be either "O" ring type joints utilizing a rubber "O" ring, or bell and spigot type utilizing a mastic joint material equal to Ram-Neck.

2.02 CORRUGATED METAL PIPE

A. Corrugated metal pipe shall conform to AASHTO M-36, latest revision.

B. Corrugated metal pipe shall have 2-2/3" x 1/2" corrugations and shall be of the following minimum gauges:

18" and smaller pipes ..... 16 gauge
21" - 30" pipes ..... 14 gauge
36" - 48" pipes ..... 12 gauge
54" and larger pipes ..... 10 gauge

C. Corrugated Metal Pipe shall have rerolled ends to accommodate corrugated coupling bands. Coupling bands shall conform to NCDOT 932-3(A). Dimple bands shall not be used.

2.03 HIGH DENSITY POLYETHELENE PIPE

A. High density polyethylene pipe (HDPE) shall meet the requirements of AASHTO M294, Type S for 12" – 48" diameter and AASHTO MP7, Type S for 60" diameter. Joints shall be water-tight, per ASTM 3212, with gaskets per ASTM F477.

B. HDPE pipe shall have a bell and spigot joint, with smooth interior and annular exterior corrugations.

C. Installation shall be in accordance with ASTM D2321, except that all HDPE pipe shall have a minimum 6" washed stone (No. 57) bedding. Also, all HDPE pipe shall be backfilled with washed stone (No. 57) up to 12" over the top of the pipe. All HDPE pipe shall be laid true to grade and straight, both horizontally and vertically.

2.04 CASTINGS

Castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arises. Machined joints, where required, shall be milled to a close fit. Provide all necessary lugs and brackets so that work can be assembled in a neat, substantial manner.

2.05 AGGREGATE FOR UNDERDRAINS

Aggregate for underdrains shall be washed stone, standard size number 67 per North Carolina Department of Transportation specifications, Section 905.

PART 3: EXECUTION

3.01 PREPARATION OF PIPE FOUNDATION

A. LINES AND GRADES

The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustments will require the approval of the Engineer. When an Inspector is present on the site and is so requested by the Contractor, he shall check the position of grades and lines; but the Contractor shall be responsible for the finished drain line being laid to exact and proper line and grade.

B. PIPE FOUNDATION

1. Whenever the nature of the ground will permit, the excavation at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe.

2. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". A suitably tamped and shaped foundation of suitable earth shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

3. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within the limits established on the plans, and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.

C. WATER IN TRENCHES

The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing; and no pipes shall be laid until the water has been removed from the trench. The Contractor will not be permitted to drain water through the storm drain within a period of twenty-four (24) hours after the pipe has been laid, and the open end of the pipe in the trench shall be kept closed with a tight fitting plug to prevent washing of dirt or debris into the line. Water so removed from the trench must be disposed of in such manner as not to cause injury to work completed or in progress.

D. SPECIAL FOUNDATIONS

Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on timber or concrete cradle foundations. Such foundations whether of single plank, plank cradle, plank cradle supported on piles, or poured concrete cradle, shall be placed by the Contractor; and compensation will be allowed the Contractor for the materials so used.

3.02 LAYING PIPE

A. GENERAL

All piping is to be installed in strict accordance with the manufacturer's recommendations. Installation manuals from various material suppliers shall be furnished the Engineer for his review and approval prior to installation of any material. The Engineer may augment any manufacturer's installation recommendations, if in his opinion it will best serve the interest of the Owner.

B. LAYING PIPE

1. No pipe shall be laid except in the presence of the Engineer or his inspector, or without special permission from the Engineer. Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be carefully given a final inspection to see that it is clean, sound and free of defects. It shall be laid on the prepared foundation to produce a straight line on a uniform grade, each pipe being laid as to form a close abutted joint with a preceding pipe, so as to form a smooth and straight inside flow line. Each pipe will be tested for its exact position after it is in its final position. The pipes shall be fitted together in order to insure sufficient space for joint gaskets, and other jointing material. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

2. When cutting short lengths of pipe, a pipe cutter as approved by the Engineer will be used, and care will be taken to make the cut at right angles to the center line of the pipe, or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder, of course file to match the manufactured taper.

3. When coupling bands for annular or helical corrugated metal pipe are used, the pipe sections shall be joined and fully bolted so that the circumferencial and longitudinal strength will be sufficient to preserve the alignment, prevent separation of the sections, and to prevent infiltration of backfill material.

3.03 BACKFILLING

A. The backfill around the pipe shall be placed in layers not to exceed 6" loose and compacted to 95% Standard Proctor test for all areas directly beneath subgrade (100% for the top two (2) feet of subgrade beneath

pavements). From the bottom of the trench to the centerline of the pipe the backfill material shall be compacted by approved hand tamps. From the centerline of the pipe to the top of the trench other mechanical tamps as approved by the Engineer may be used. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when called for on the plans.

B. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable materials.

C. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

D. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

3.04 TESTING

A. Upon completion, installed lines shall show a full circle of light when "Lamped" between catch basins. This test shall be performed by the Engineer.

B. Other tests may be required by the Engineer, such as exfiltration. In this event the results shall meet the minimum standards that the manufacturer states are obtainable.

END OF SECTION

SECTION 02722 MINOR DRAINAGE STRUCTURES

PART 1: GENERAL

1.01 SCOPE OF WORK

The work covered by this section consists of the construction of reinforced concrete or brick masonry inlets, catch basins, junction boxes, and other minor drainage structures, excluding headwalls, together with all necessary metal grates, covers, frames, and other hardware, in accordance with the requirements shown on the plans and the provisions of these specifications.

1.02 QUALITY ASSURANCE

All precast concrete structures and other fabricated materials shall be manufactured by suppliers with at least five (5) years of experience in the manufacture of similar materials.

1.03 SUBMITTALS

SHOP DRAWINGS

The Contractor shall submit at least six (6) copies of shop drawings to the Engineer, including dimensional drawings, materials of construction, catalogue cut sheets, and other pertinent information.

1.04 DELIVERY, STORAGE AND HANDLING

All materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations, and in a manner which preserves the structural integrity of the materials.

1.05 WARRANTY

All materials and equipment shall be warranted to be free from defects in workmanship and materials for one (1) year after final acceptance.

PART 2: PRODUCTS

2.01 MATERIALS

A. CONCRETE AND MASONRY

1. All concrete shall be Class B 4000 psi unless otherwise indicated on the plans.

2. Where necessary to fit field conditions, the dimensions of the structure and footings shall be varied as directed by the Engineer.

B. FITTINGS AND CONNECTIONS

1. Where fittings enter the masonry, they shall be placed as the work is built up, thoroughly bonded, and accurately spaced and aligned.

2. Pipe connections shall be cut off flush with the inside wall of the drainage structure and grouted as necessary to make smooth and uniform surfaces on the inside of the structure.

3. Metal frames for grates and covers shall be set in full mortar beds or secured by methods approved by the Engineer.

C. BACKFILL

After the structure has been completed, and all forms, falsework, sheeting, and bracing have been removed, the excavation shall be backfilled with approved material compacted to a density of 95% standard proctor. Backfilling shall not be done until the concrete or brick masonry has cured for at least seven (7) curing days, unless otherwise permitted by the Engineer.

D. PIPE COLLARS AND PIPE PLUGS

Pipe collars and pipe plugs shall be constructed in accordance with the details shown on the plans or as directed by the Engineer.

PART 3: EXECUTION

3.01 INSTALLATION

A. Drainage structures shall be built to the lines, grades and dimensions as shown on the plans. The Contractor shall adjust the final grades in the field as necessary to provide positive drainage to the structures or to match final pavement or grade elevation.

B. Excavations for drainage structures shall be made with care so as not to disturb the surrounding areas more than necessary. All excavations shall be maintained water free until completion of the drainage structure, including backfilling. The Contractor shall provide adequate pumping capacity as required.

C. Where the foundation material is found to be of poor supporting value, the existing foundation material shall be removed by undercutting to the depth directed by the Engineer and backfilled with suitable material secured from locations along the project or from a borrow pit. The backfill placed in the undercut area shall be compacted to a degree satisfactory to the Engineer.

D. For cast-in-place structures the Contractor shall use care in placing rebar and concrete. Unless otherwise approved, the bottom slabs shall be poured separate from the walls. A minimum of seven (7) days cure time shall be provided between completion of pouring the bottom and the walls.

E. When drainage structures are constructed with concrete brick, only new, sound brick shall be used. Mortar mix shall be mixed on site using an approved mortar mix consisting of Portland Cement (Type S), and clean sand. Following construction of the drainage boxes, both the interior and exterior shall be plastered with a minimum 1/2" thick coat of Portland Cement and sand mixture.

3.02 QUALITY CONTROL AND FIELD TESTING

The Contractor shall demonstrate to the Owner and Engineer that all drainage structures operate as intended and designed. All drainage structures shall be field tested by the Contractor in the presence of the Engineer prior to final acceptance.

END OF SECTION

SECTION 02738 MISCELLANEOUS VALVES AND APPURTENANCES

02738.1 GENERAL

This section shall include miscellaneous valves and appurtenances not specified elsewhere. All valves and appurtenances shall be subject to approval by the Engineer and installed by the Contractor as designated on the plans in accordance with the installation specifications.

02738.2 GATE VALVES

All gate valves shall be designed for a working pressure of 200 psi unless otherwise specified and shall have a clear waterway equal to the full nominal diameter of the pipe and shall be opened by turning counterclockwise. Each valve shall have the initials of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel or operating nut as herein specified and shall have an arrow cast in the metal indicating the direction of opening. Gate valves to be installed underground shall be non-rising stem type while valves installed above ground or in buildings and structures shall have rising stems.

A. Gate Valves 2-inches and Smaller

Gate valves 2-inches and smaller shall be all brass, single disc, double seat tapered wedge type, built to manufacturer's standards with material and construction conforming to AWWA C-500. Each valve shall have a tee handle or handwheel, whichever is applicable, for valve operation. Gate valves installed that will be in contact with leachate shall be constructed of stainless steel.

02738.3 CHECK VALVES

A. Check Valves Smaller Than 3-inches

Swing check valves smaller than 3-inches shall be single disc with renewable bronze seat rings, bronze discs or disc rings and bronze disc hinges and pins and shall be designed to give a full diameter passage. Check valves installed that will be in contact with leachate shall be constructed of stainless steel.

B. Check Valves 3-inches And Larger

Swing check valves 3-inches and larger shall be constructed with heavy cast-iron or cast-steel body with a bronze or stainless steel seat ring and a non-corrosive shaft for attachment of weight and lever. The valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the outlet pressure. The valve disc shall be of cast-iron or cast-steel and shall be suspended from a non-corrosive shaft. Check valves installed that will be in contact with leachate shall be constructed of stainless steel.

02738.4 MEASUREMENT AND PAYMENT

Work covered by this section will be considered incidental to other work items and no separate payment will be made.

END OF SECTION

LEACHATE COLLECTION SYSTEM FORCE MAIN & SECTION 02750 NON-PERFORATED GRAVITY PIPING INSTALLATION

02750.1 DESCRIPTION OF WORK

The work covered under this section shall consist of furnishing all labor, equipment and services for the installation of the HDPE dual contained force main & non-perforated gravity piping for the leachate collection system as shown on the drawings and specified in Section 02400.

02750.2 HANDLING AND STORING MATERIALS

The Contractor shall unload material so as to avoid deformation or other injury thereto. Material shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the appurtenances on sills above storm drainage level and deliver for installation after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner and at his own expense.

02750.3 PIPE ALIGNMENT AND GRADE

The layout of underground force main pipe and gravity sewer lines shall be as shown on the contract drawings.

The Contractor shall do all field layout work for lines and grades from that information shown on the drawings or as furnished by the Engineer.

02750.4 PREPARATION OF PIPE FOUNDATION

The pipe foundation shall be prepared to be uniformly firm and the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the drawings. Under no circumstances shall pipe be laid in water, on rock, or when trench conditions or weather is unsuitable for such work.

The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench.

02750.5 PIPE LAYING

In all cases, pipe is to be installed in strict accordance with the manufacturer's recommendations and the contract material specifications. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

During times when pipe laying is not in progress, the open ends of pipe shall be closed and no trench water or other material shall be permitted to enter the pipe.

02750.6 BACKFILLING

All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95 percent of the Standard Proctor Test for the various types of backfill materials.

Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill materials shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer. Select material shall be defined as a finely graded material free from stones over 1/2 inch in diameter, plastic clays, organic material, frozen lumps and various debris and shall be approved by the Engineer prior to its installation.

Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectional material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans.

Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

END OF SECTION

LEACHATE COLLECTION SYSTEM FORCE MAIN & NON-PERFORATED GRAVITY PIPING INSPECTION & TESTING

SECTION 02760

02760.1 DESCRIPTION OF WORK

The work covered under this section shall consist of furnishing all labor, equipment, and services for the proper inspection and testing of the leachate collection system force main lines and non-perforated gravity piping installed in accordance with Section 02750.

02760.2 LINE CLEANING

Prior to testing of any section(s) of the leachate collection system force main and non-perforated gravity piping, the Contractor shall completely clean the lines of all debris, silt, etc. The pipe shall be proved to be ready for use by the Owner and shall be proved to be in first class condition and constructed in accordance with the drawings and specifications.

The Contractor shall maintain the project, insofar as his construction work is concerned, in first class condition for such time as is necessary to satisfy the Engineer that all installations are correct and acceptable.

02760.3 INSPECTION

When the leachate collection system force main and non-perforated gravity piping is completed, the Engineer shall inspect the line for conformance with the provisions of the drawings and specifications, particularly with respect to alignment and depth.

02760.4 TESTING

All newly constructed force mains and non-perforated gravity pipe sections shall be subjected to a hydrostatic pressure-leakage test.

Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the main is being filled with water in preparation of the test, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 100 pounds per square inch for a period of two hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines. Both the Containment pipe and the Carrier pipe shall be tested.

The rate of leakage shall be determined at 15 minute intervals by means of volumetric measure of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage tests have been performed with no leakage observed.

Cracked or defective pipe, joints, fittings, or valves discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.

Tests of insulated and concealed piping shall be made before the piping is covered or concealed.

The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water and materials, including meters and gauges, shall be furnished by the Contractor at his own expense.

02760.5 MEASUREMENT AND PAYMENT

There will be no specific quantities measured for the leachate force main & gravity sewer Inspection and Testing. The cost of providing all equipment, labor, materials, etc. required to perform the work described under this section, shall be considered incidental to that work covered under other sections of these specifications.

END OF SECTION

SECTION 02821 SEEDING, FERTILIZING AND MULCHING

02821.1 SCOPE

This section covers the furnishing of all labor, equipment and materials necessary for the landscaping of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses or legumes.

02821.2 GRADING

Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.

Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction materials. It shall also include scarifying the soil to a depth of one inch (1") by plowing, discing, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of landscaping shall be performed on a section by section basis immediately upon completion of earthwork.

Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Engineer may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Engineer.

02821.3 MATERIALS

A. Fertilizer:

The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.

Fertilizer shall be 10-10-10 grade. Upon written approval of the Engineer a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.

During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

B. Lime:

The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.

During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original condition before being used.

Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

C. Seed:

The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture.

Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Engineer before being sown, and no seed will be accepted with a date of test more than nine (9) months prior to the date of sowing. Such testing however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.

During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents, or other causes.

Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindwee, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.

D. Mulch:

Straw mulch shall be threshed straw of oats, rye or wheat free from matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.

02821.4 SEEDBED PREPARATION

The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside of the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Engineer to provide for more effective seeding and for ease of subsequent mowing operations.

The soil shall then be scarified or otherwise loosened to a depth of not less than one inch (1") except as otherwise provided below or otherwise directed by the Engineer. Clods shall be broken and the top 2 to 3 inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Engineer.

On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Engineer.

On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Engineer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.

On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in a condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.

The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.

02821.5 APPLICATION

Seed shall be applied by means of a hydro-seeder or other approved methods. The rates of application of seed, fertilizer and limestone shall be as shown on the contract drawings.

Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed. Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specific rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed.

Seed shall be distributed uniformly over the seedbed at the required rate of application, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.

Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Engineer.

When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

Such modifications may include but not be limited to the following:

1. The incorporation of limestone into the seedbed may be omitted on (a) cut slopes steeper than 2:1; (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.

2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.

3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

02821.6 MULCHING

All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Engineer.

It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.

Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3 inches in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil.

Mulch shall be applied within 24 hours after the completion of the seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.

Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to

penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

Mulch shall be held in place by applying a sufficient amount of binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Engineer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch operation.

The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

02821.7 MAINTENANCE

The Contractor shall keep all seeded areas in good condition, reseeding and mowing if and when necessary as directed by the Engineer, until a good lawn is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.

Grassed areas will be accepted when a 95 percent cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.

Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.

02821.8 METHOD OF MEASUREMENT

See Section 01700 Measurement and Payment for "Grassing."

END OF SECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

The work in this Section covers the installation of fencing, complete as shown on the plans and described herein.

1.02 SYSTEM DESCRIPTION

Unless otherwise indicated on the plans, all fencing will be eight feet (8') nominal height, using two-inch (2"), 9-gauge woven wire mesh fabric (hot-dipped galvanized after weaving). The fencing will be supported by posts and a # 7 gauge top tension wire.

1.03 QUALITY ASSURANCE

The Manufacturer shall be reputable and shall be experienced in the manufacture of chain link fencing.

1.04 SUBMITTALS

A. SHOP DRAWINGS

Six (6) sets of shop drawings shall be submitted to the Engineer for approval. Shop drawings shall include material specifications and manufacturer's drawings.

1.05 DELIVERY, STORAGE AND HANDLING

All materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations, and shall be properly protected.

1.06 WARRANTY

All materials shall be warranted to be free from defects in workmanship and design for a period of one (1) year.

PART 2: PRODUCTS

2.01 MATERIALS

A. CHAIN LINK FENCING

1. Fabric shall be zinc coated Class II chain link per ASTM Specification A-392-Latest Revision.

2. Barbed wire (where required by the Contract drawings) shall have a Class 3 galvanized coating per ASTM A121-Latest Revision and consist of two (2) 12-1/2 gauge stranded wire lines with 14 gauge barbs in a four point pattern on five-inch (5") centers.

3. The top tension wire shall be # 7 gauge.

4. Line posts shall be two-inch (2") standard weight pipe (weighing a minimum of 2.72 lbs. per foot), or 4.1 lbs. per foot "H" section.

5. End, corner and pull posts shall be 2-7/8" OD pipe ± 5.79 lb. per foot, or 3-1/4" by 3-1/4" roll formed sections with integral fabric loops, 5.14 lb. per foot.

B. SWING GATE POSTS

Posts for swing gates shall be sized according to the following gate leaf widths:

Leaf Gate Width	Posts	lb. per lin. ft.
Up to 6'	3-1/3" x 3-1/2" roll formed section or 2-7\8" OD Pipe	5.14 5.79
Over 6' to 13'	4" OD Pipe	9.11
Over 13' to 18'	6-5/8" OD Pipe	18.97
Over 18'	8-5/8" OD Pipe	24.70

C. GATE FRAMES

Gate frames shall be 2.0" OD (weighing a minimum of 2.72 lbs. per foot) with welded frame construction. All welds shall be cleaned and coated with galvanize coating. Each frame shall have 3/8" diameter adjustable truss rods. Intermediate bracing shall be no less than 1-5/8" OD Schedule

40 pipe (weighing a minimum of 2.27 lbs. per foot). Gates shall have positive type latching devices with provision for padlocking; and drive gates shall have a center plunger rod, catch, and semi-automatic outer catches. All gates and latches shall be of commercial grade and quality.

D. COATINGS

All posts, rails, and appurtenances shall be hot-dipped zinc coated steel according to ASTM Specifications A-120-Latest Revision and A-123-Latest Revision or A-153-Latest Revision whichever is applicable. Pipe posts shall have tops that exclude moisture.

PART 3: EXECUTION

3.01 INSTALLATION

A. POSTS

1. Each post shall be set plumb in a foundation of 2,500 psi concrete having a minimum diameter of nine inches (9") or three (3) times the diameter of the post, whichever is greater, and at least 36" deep. Line posts shall be evenly spaced 10' or less apart, true to line.

2. Top tension wire shall pass through line post tops and securely fasten to terminal posts. End, corner, pull and gate post trussed to line posts with 3/8" rods and tighteners.

B. FABRIC

Fabric shall be connected to line posts with 6-gauge wire clips, 14" on center; to top tension wire with 9-gauge hog rings, 24" on center; to terminal, corner and gate posts by integrally weaving into the post or by using 3/4" by 1/4" tension bars fastened to the post by 11-gauge x 1" wide steel bands and 3/8" bolts and nuts spaced 14" on center.

C. Relocated Fencing

Fencing that is identified on the drawings to be relocated will not be subject to complying with the material requirements for the fabric or line posts as given in this specification. However, all other material specifications for replacement posts, tension wire, gates, barbed wire, connectors, etc. and installation specifications shall be strictly adhered to.

PART 4: MEASUREMENTS AND PAYMENTS

4.01 MEASUREMENT AND PAYMENT

See Section 01700

END OF SECTION

SECTION 03301 MISCELLANEOUS CONCRETE CONSTRUCTION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. This section covers concrete construction, complete, including reinforcement therefore.

PART 2: PRODUCTS

2.01 MATERIALS

A. REINFORCING

Bar reinforcement shall be intermediate grade new billet steel conforming to the requirements of ASTM A-615. Unless otherwise noted, all reinforcing bars shall be grade 60. Wire fabric reinforcement shall consist of steel wire conforming to the requirements of ASTM A-185, latest revision.

B. CONCRETE

All concrete shall be equivalent to ready mix concrete manufactured and delivered in accordance with the requirements of ASTM C-94, latest revision and having a compressive strength at 28 days of 4000 psi, except as noted herein. The concrete manufacturer shall assume the responsibility of the design of the concrete mix in accordance with Alternate No. 2 of ASTM C-94. Air entrained concrete shall be used for all concrete exposed to the elements.

a. Cement shall be Type 1 or Type 1A "Portland" cement conforming to ASTM C-150, latest revision or ASTM C-175, latest revision respectively.

b. Aggregates shall conform to ASTM C-33, latest revision. Coarse aggregate shall be crushed rock or gravel and graded from 3/4" to #4 sieve for walls and slabs and from 2" to #4 sieve for mass or foundation concrete. Fine aggregate shall be natural sand.

c. Mixing water shall be proportioned so that slump when measured with standard slump cone does not exceed the following:

i. Slabs in grade.....Max. 4", Min. 3"

ii. Footings.....Max. 5", Min. 3"

iii. All others.....Max. 6", Min. 3"

d. Premolded joint filler strips shall be resilient compressive, bituminous and fiber material saturated, with at least 35% and not over 50% by weight of asphalt. Poured type joint composition for expansion joints shall be elastic compound made up of asphalt and colloidal mineral fillers.

PART 3: EXECUTION

3.01 FORMS

A. Forms shall be wood, metal, structural hardboard or other suitable material that will produce the required surface finish. Forms placed for successive pours for continuous surfaces shall be fitted to accurate alignment to assure a smooth completed surface free from irregularities, and shall be sufficiently tight to prevent the loss of mortar. No forms shall be left permanently in place without approval of the Engineer. Holes resulting from removal of form ties shall be filled solid within 12 hours after removal of forms with cement mortar.

3.02 PLACEMENT

A. Concrete shall be placed as nearly as possible in its final position. Runways for wheeled equipment shall not be supported on the reinforcement. Concrete shall be placed and compacted in layers not over 18 inches deep. Vibrators may be used provided they are used under experienced supervision and the mixture is dry enough to prevent segregation. Form vibrators shall not be used. Vibration shall not be used for transporting or moving concrete inside the forms. No more concrete shall be placed than can be consolidated and finished the same day as placed. Free fall of concrete shall be limited so that no segregation of materials occurs.

3.03 JOINTS

A. Construction of joints not indicated on drawing shall be approved by the Engineer in advance of pour. Joints in foundation walls shall be keyed. Before depositing of concrete is resumed, the hardened surface shall be roughened, cleaned and wetted surfaces shall be slushed with a coating

of neat cement grout against which the new concrete shall be placed before the new grout has attained its set.

3.03 FINISHING

A. After stripping forms, all voids and honeycombs shall be patched by chipping and scarifying the defective area and treating it with an approved bonding tended that all such voids be patched, not merely plastered. Grout mixture shall consist of one part Portland cement and one part sand. Immediately following removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or waterproofed.

B. Slabs shall be struck off and consolidated by approved machine or hand methods, so that upon completion, the surface shall be true to grade as shown on drawings and free of surface voids. All floors shall have monolithic steel trowel finish unless otherwise indicated on the drawings. Exterior walks shall be compacted, screeded and floated to a true even surface with wood floats and then broomed.

PART 4: PAYMENT

This work will be considered incidental to other work items included in this project, and no separate payment will be made for items covered by this Section.

END OF SECTION

11301.1 GENERAL

The Contractor shall furnish a diesel-operated trailer-mounted pump. The pump shall arrive on-site prior to the leachate storage lagoon going off-line. The pump will be used by the County to pump leachate from the temporary storage Frac Tanks to the leachate transport vehicle. At the conclusion of the project, the County will use the pump to pump stormwater off of the raincover of completed MSW Phase 3.

11301.2 PUMP REQUIREMENTS

The pump shall be a Godwin Dri-Prime CD100M Automatic Self-Priming Pumpset, or approved equal. Pump motor shall be capable of delivering 24.6 HP @ 2,200 RPM. The pump shall be capable of lifting liquids up to 28 feet. The pump shall be mounted on a highway trailer with integral 30 gallon fuel tank. The pump shall be capable of handling solids up to 2" in diameter with a maximum flow of 750 gallons per minute and 115 feet of total dynamic head. Impellers shall be constructed of cast chromium steel.

11301.3 CONTROLLER

The pump shall include a fully programmable microprocessor engine controller, allowing for inputs from transducer or standard float systems, equal to Godwin PrimeGuard Automatic Level Controller. The pump shall include a two (2) float assembly with 125' of cord, compatible with programmable controller.

11301.4 FITTINGS AND HOSES

The following fittings and hoses shall be provided with the pump:

- -4" male quick disconnect fitting x 4" flange;
- -4" female quick disconnect fitting x 4" flange;
- -Four (4) 4" x 20' light weight orange helix hoses with quick disconnect fittings;
- -Two (2) 4" x 50' heavy duty layflat discharge hoses with quick disconnect fittings;

11301.5 MISCELLANEOUS

Pump operation manuals shall be furnished with pump. Warranty information shall be in the name of Haywood County.

SECTION 11310 LEACHATE PUMPING SYSTEM

11310.1 Scope of Work

The leachate pumping system as outlined in this section shall consist of riser pipe, pump, motor, control panel, level sensor, power cable, electrical wiring, control wiring, and related associated discharge pipe and fittings, complete and per the operating conditions as shown on drawings and specifications.

11310.2 Quality Assurance

All equipment listed in this section shall be provided by a single supplier who has complete responsibility for the system. The supplier must have a minimum of five years experience in providing complete systems for side slope leachate removal applications.

The supplier of the leachate removal system will provide all warranty services which shall be one year from date of installation or eighteen months from date of shipment.

11310.3 Submittals

The submittal package shall include a complete list of components provided, pump curves, motor data, layout drawing, control electrical schematic, controller bill of materials, and warranty statement.

A fabrication drawing of the side slope riser and sump assembly shall be provided to the pump manufacturer with the approved submittal package.

11310.4 Equipment - Pumps

The contractor shall furnish and install one pump in an existing riser pipe (Pump 1) and two complete leachate pumping systems (Pumps 2 and 3) as manufactured by EPG., or approved equal.

The pumps shall be modified as required for suitable service in landfill leachate applications and shall be capable of operating in the horizontal or slope position, capable of pumping contaminated water to within inches of the sump bottom.

Pump 1 shall be a EPG Series 5 SurePump Wheeled Sump Drainer, Model 5-2, or approved equal, rated 25 GPM at 12' total dynamic head. Motor horsepower shall be a minimum of 0.5 horsepower. Operating voltage shall be three phase, 60 hertz, 460 volts.

Pumps 2 and 3 shall be a EPG Series 8 SurePump Wheeled Sump Drainer, Model 8-2, or approved equal, rated 35 GPM at 40' total dynamic head. Motor horsepower shall be a minimum of 0.75 horsepower. Operating voltage shall be three phase, 60 hertz, 460 volts.

Pump design shall include the following feature:

1. Integral check valve of 304 series stainless steel.

2. All series 304 stainless steel construction shall include impellers, bowls, guide vanes, and inlet screen

3. Each impeller shall have a E-Glide seal ring to reduce hydraulic losses, and shall consist of 304 stainless steel.

4. All shaft bearing shall be 304 stainless steel.

5. A stainless steel flow inducer shall be provided at the pump inlet.

11310.5 Equipment - Motor Design

The motor shall be a Franklin motor, suitable for submersible operation.

All materials in contact with leachate shall be 304 series stainless steel.

The motor shall not use any oils or greases for lubrication.

A jacketed power cable suitable for leachate service and properly sized shall be provided, with a suitable length such that splices are not needed.

11310.6 Equipment - Carriage

The pump shall be mounted in a (patented) 304 series stainless steel carriage for use in an 24" HDPE riser pipe set at an approximate 3:1 slope for Pumps 2 and 3 and in an 18" HDPE riser set at an approximate 1:1 slope for Pump 1.

The carriage shall provide a low center of gravity and all wheels shall remain in contact with the contour of the riser pipe. The wheels shall be of non-corrosive materials with self-lubricating qualities and the unit must be able to travel over welding beads as typically found in riser pipe fabrications. A stainless steel inlet suction screen shall be provided in prevent debris from entering carriage and pump inlet.

The pump and motor must be easily removed from the carriage in the field should the pump or motor require service.

A .25" X 100' safety/retrieval cable assembly with properly sized cable clips, snap hook of 304 series stainless steel shall be provided. An additional .25" cable will be attached to the 3" x 3" tee to ensure that the piping assembly can be retrieved from the side slope riser.

11310.7 Equipment - Discharge Hose Assembly

Discharge hose shall be 2.0" hose, rated 300 PSI and -20 to +180 degrees Fahrenheit. Each section shall be provided with threaded stainless steel couplings. The pipe shall be properly selected for the pump performance and shall be able to handle surge conditions of the system.

All hose fittings shall be 304 series stainless steel. Hose fitting shall be long shank type and suitable for the application. All hose bands shall be hi-torque 304 series stainless steel.

A riser side exit disconnect will be provided, which will allow quick connection/disconnection of the pump discharge hose and allow the pump to be removed without interference of the stationary fittings. The exit arrangement shall thread through the riser pipe as to provide a gas tight connection. The exit connection will penetrate the riser wall approximately 6" from the top of the riser pipe.

All side exit components shall be 304 series stainless steel.

A stainless steel liquid filled pressure gauge sized to the range of the pump shall be provided with fitting outside the riser pipe. The gauge is to be shipped separately and installed in the fitting provided by the pump manufacturer at the time of installation and start up.

A 2" PVC ball type check valve with threaded unions shall be provided and mounted within the side slope riser pipe.

A 3" polypropylene full port ball valve shall be provided to provide isolation of the system. The system shall terminate inside the riser pipe.

11310.8 Controls - Control Panel

The control panel shall provide level control, pump operation, and motor protection.

Control panel shall consist of NEMA 4 X 14 gauge 304 stainless steel enclosure with a rain guard and lockable outer cover. The door shall open a minimum of 180 degrees. A window on the outer door shall allow a view of all indicators without entering the enclosure.
The inner door shall be an aluminum dead front mounted on a continuous aircraft type hinge. The dead front door shall contain cutouts for the mounted equipment and operator accessible equipment and provide protection of personnel from live internal wiring.

Operator accessible components mounted on the dead front door shall include the following:

1. H-O-A switch
2. STAND-BY indicating light (amber).
3. RUN indicating light (green).
4. OVERLOAD indicating light (red).
5. DIGITAL READ OUT level indicator.
6. ELAPSED RUN TIME meter (mechanical non-reset type).
7. MAIN disconnect breaker.
8. PUMP MOTOR breaker.
9. CONTROL CIRCUIT breaker.
10. OVERLOAD RE-SET button.
11. FAULT indicating light (red).
12. LOW LEVEL indicating light (red).

The back plate shall consist of 12 gauge sheet steel and finished with a primer coat and two coats of baked on enamel. All hardware mounted to the subpanel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified with phenolic engraved nameplates.

The panel power distribution shall include all necessary components and shall be completely wired with standard copper conductors. Control wiring shall be properly sized and installed in Panduit type wiring trays.

An individual circuit breakers shall be provided for main power, pump, and control circuits. All circuit breakers shall be heavy duty thermal magnetic or motor circuit protectors similar and equal to Square D type FAL. Circuit breakers shall be indicting type, providing ON-OFF-TRIP positions. When the breaker is tripped automatically, the handle shall assume a middle position indicating TRIP.

Thermal magnetic breakers shall be quick-make and quick-break on manual and automatic operation and have inverse time characteristics secured through the use of bi-metallic tripping elements supplemented by a magnetic trip.

Breakers shall be designed so that an overload on one pole automatically trips and opens all legs. Field installed handle ties shall not be acceptable.

Motor starter shall be open frame, across the line, NEMA rated with individual overload protection in each leg. Motor starter contact and coil shall be replaceable from the front of the starter without removing it from its position. Overload heaters shall be block type, utilizing melting alloy spindles and shall provide visual trip indication and an alarm contact for alarming signals. The overload shall be sized fro the full load amperage draw of the pump. Adjustable type overloads, definite purpose contractors, fractional size starters, and horsepower rated contactors or relays shall not be acceptable.

A fused type control transformer shall be used to provide the 120 VAC for control circuits.

Surge protection for incoming main power and control circuit, and a plug in type indicating phase monitor shall be provided.

A thermostat controlled heater shall be provided to control the inside temperature below the dew point and alleviate the buildup of condensate in the control enclosure.

A corrosion inhibitor shall be provided within the enclosure.

A top-mounted red visual high level alarm beacon, which shall be weatherproof, shatterproof, shall be provided with a 40 watt light.

A low level relay shall be provided, which shall provide positive pump lock out and indication should the liquid level drop below the transducer (in case of a false reading due to gas pressure). This device shall provide protection from dry run conditions.

Panel mounted intrinsically safe barriers shall be provided for all sump probes. The control panel shall have the capability to accept an external interlock for the purpose of stopping the leachate pumps.

11310.9 Controls - Level Control

A panel mounted controller digital readout display shall provide level indication of the side slope sump with 4 1/2 digits. The pump "ON-OFF-HIGH LEVEL" selection shall be through set point located on the indicator.

Pump 1 controls shall be set to the following: Pump Off - 6" above bottom of sump; Pump ON - 24" above bottom of sump; High Water Alarm - 48" above bottom of sump; High Water Off - 30" above bottom of sump.

Pump 2 and 3 controls shall be set to the following: Pump Off - 6" above bottom of sump; Pump ON - 9" above bottom of sump; both Pumps On – 15" above bottom of sump; High Water Alarm - 24" above bottom of sump; High Water Off - 20" above bottom of sump. Pumps shall alternate on successful starts.

The controller unit will accept a 4 to 20 ma signal from the transducer and provide a level indication readout of 0 to 138.6 inches of liquid.

A submersible transducer shall be provided with a length of cable sufficient to reach the control panel without splices. Cable splices within the riser pipe are not acceptable. The transducer shall be all 316 stainless steel and shall be mounted to the pump carriage. The unit shall provide a 4-20 ma signal output to the control unit. Static accuracy rating shall be no less than 1.0 percent.

A filter/dryer shall be provided to be mounted in control panel or properly sized junction box to prevent moisture in the vent tube.

A low level sensor shall be provided with a length of cable sufficient to reach the control panel without splices. Cable splices within the riser pipe are not acceptable. The probe shall be non-corrosive construction and have no moving parts.

11310.10 Miscellaneous Items - Cable Fittings

Non-metallic gas tight cable exit fittings properly sized for the power and control cables shall be provided.

A stainless steel eye bolt shall be provided and installed in the riser. A stainless steel snap hook will be provided as part of the safety cable assembly.

11310.11 Execution - Start-Up

The manufacturer of the system shall provide field supervision assistance to insure proper system installation and start-up of the system. The scheduling of this service shall be coordinated with the Contractor to insure the riser is in place and the control panel is connected to power prior to arrival of the factory field technician. Installation and start-up typically requires one day to complete.

11310.12 Execution - Operational Test

The system shall be tested for proper operation at the time of start-up.

11310.13 Execution - Work by Contractor

Mounting control panel mounting posts and control panel to posts.

Assembly and installation of the leachate system. This includes installation of discharge and cable exit fittings.

Provide power to the leachate pump control panel from the electrical panel located at the leachate storage lagoon.

All electrical wiring, control wiring, conduit work and junction boxes between the leachate pump and control panel.

Electrical heat tracing and insulation of piping as required.

Connection of discharge piping from system termination point This should be completed at the time of system installation so the system may be tested.

Assistance in the operational testing including providing or removing water in the sump as required to allow for tests during the visit of factory technicians.

11310.14 Execution - Side Slope Riser Pipe

The riser pipe shall be provided by the contractor (Pumps 2 and 3 only) and shall be 24" HDPE. The riser pipe shall have a constant inside diameter with welding beads not to exceed .25". All riser pipe fittings shall be the same inside diameter as the riser pipe or within 1/2" without sharp steps.

An "AS BUILT" of the riser pipe and sump assembly shall be provided to the Engineer and made available to the pump system manufacturer prior to start-up.

END OF SECTION

SECTION 16010 BASIC ELECTRICAL REQUIREMENTS

PART 1 : GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 GENERAL

A. This section covers procedural requirements and is applicable to all Division 16 specifications. The requirements in this section supplement the requirements found in the General and Supplementary Conditions and Division 1 Specification Sections. The requirements in the General and Supplementary Conditions and Division 1 Specification Sections take precedence regarding any direct conflicts that may exist between this section and the General and Supplementary Conditions and Division 1 Specification Sections. In cases of duplication of or similar requirements between this section and the General and Supplementary Conditions and Division 1 Specification Sections, the most restrictive requirement applies.

B. Division 16 Specification Format: The Division 16 Specifications are organized into Divisions and Sections using the 16-division format.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

C. Division 16 Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

D. The words "Design Consultant," "Designer," "Architect," and "Engineer" may be used interchangeably throughout these specifications and refers to the design professional of record for the applicable portion of the project.

E. This Section includes requirements related to the following:

1. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.03 DEFINITIONS

A. Approved: When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

B. Directed: A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

C. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

D. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

E. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

F. Install: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

G. Provide: Furnish and install, complete and ready for the intended use.

H. Installer: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

J. Project Site: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

K. Action Submittals: Written and graphic information that requires Engineer's responsive action.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the industry recognized name of the standards and regulations.

1.05 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. State Government Agencies and Code References: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities or documents in the following list.

1. NCDoI - North Carolina Department of Insurance.
2. NCSBC - North Carolina State Building Code.

1.06 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 15 days for processing each resubmittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

C. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.

3. Include the following information on label for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Unique identifier, including revision number.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Other necessary identification.

D. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

E. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal

form. Engineer will discard submittals received from sources other than Contractor.

a. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

G. Use for Construction: Use only final submittals with mark indicating action taken by Engineer in connection with construction.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

D. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

PART 2 : PRODUCTS

2.01 SUBMITTALS

A. ACTION SUBMITTALS

1. General: Prepare and submit Action Submittals required by individual Specification Sections.

a. Number of Copies: Submit five copies of each submittal, unless otherwise indicated. Engineer will return three copies. Mark up and retain one returned copy as a Project Record Document.

2. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

   a. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   b. Mark each copy of each submittal to show which products and options are applicable.
   c. Include the following information, as applicable:
      1) Manufacturer's written recommendations.
      2) Manufacturer's product specifications.
      3) Manufacturer's installation instructions.
      4) Manufacturer's catalog cuts.
      5) Wiring diagrams showing factory-installed wiring.
      6) Printed performance curves.
      7) Operational range diagrams.
      8) Compliance with recognized trade association standards.
      9) Compliance with recognized testing agency standards.

3. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

   a. Preparation: Include the following information, as applicable:
      1) Dimensions.
      2) Identification of products.
      3) Fabrication and installation drawings.
      4) Roughing-in and setting diagrams.
      5) Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      6) Shopwork manufacturing instructions.
      7) Templates and patterns.
      8) Schedules.
      9) Notation of coordination requirements.
      10) Notation of dimensions established by field measurement.
   b. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   c. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

PART 3 : EXECUTION

3.01 SUBMITTALS

A. CONTRACTOR'S REVIEW

1. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
2. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

B. ENGINEER'S ACTION

1. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

2. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

   a. Final Unrestricted Release: Where submittal is marked "Approved," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
   b. Final-but-Restricted Release: Where the submittal is marked "Approved as Noted," the Work covered by the submittal may proceed provided it complies with both Engineer's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
   c. Returned for Resubmittal: Where the submittal is marked "Revise and Resubmit," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Engineer's notations and corrections.
   d. Rejected: Where the submittal is marked "Not Approved" do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

3. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

SECTION 16050 BASIC ELECTRICAL MATERIALS AND METHODS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. General coordination.
2. Electric utility coordination.
3. Cutting and patching for electrical construction.
4. Touchup painting.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.04 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of utilities and services, including provision for interfacing with the existing substation bus and metering equipment.

2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

PART 2: PRODUCTS

2.01 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3: EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.03 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Cutting and patching for electrical construction.
2. Touchup painting.

3.04 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint to match equipment finishes as recommended by equipment manufacturer.

3.05 CLEANING AND PROTECTION

A. On completion of installation inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 16060 GROUNDING AND BONDING

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Ground rods.

C. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2: PRODUCTS

2.01 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
4. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.02 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING ELECTRODES

A. Ground Rods: steel; 3/4 inch by10 feet (19 mm by 3 m) in diameter.

PART 3: EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors.

3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.03 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Piping: Install insulated copper grounding conductors, in conduit, from building's main service equipment to main metal water piping entrance to pump building. Connect grounding conductors to pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

   a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

   b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Report measured ground resistances that exceed the following values:

   1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 16073 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.03 DEFINITIONS

A. IMC: Intermediate metal conduit.

B. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.07 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2: PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
2. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3: EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Existing Concrete: Expansion anchor fasteners.
4. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
5. To Light Steel: Sheet metal screws.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 16075 ELECTRICAL IDENTIFICATION

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2: PRODUCTS

2.01 RACEWAY AND CABLE LABELS

A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

2.02 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with white letters on colored face. Refer Part 3 of this section for face color. Color is listed in parenthesis adjacent to the system type.
2. Punched or drilled for mechanical fasteners.

C. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

PART 3: EXECUTION

3.01 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

F. Color-Coding of Secondary Phase Conductors: Use the following colors for feeder and branch-circuit phase conductors:

1. 240/120-V Conductors:

   a. Phase L1: Black.

   b. Phase L2: Red.

   c. Neutral: White

2. 480/277-V Conductors:

   a. Phase A: Brown.

   b. Phase B: Orange.

   c. Phase C: Yellow.

3. Apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

   b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

G. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

H. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power and control systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

Engraved legend with white letters on colored face. See color of face as listed in parenthesis adjacent to the system type, below. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures. (240 V systems – Blue; 480 V systems - Black)
2. Disconnect switches. (240 V systems – Blue; 480 V systems - Black)
3. Control devices. (White)

END OF SECTION

SECTION 16120 CONDUCTORS AND CABLES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2: PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC with ground wire.

D.

2.02 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3: EXECUTION

3.01 CONDUCTOR INSULATION APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Feeders: Type THHN-THWN, single conductors in raceway.

C. Branch Circuits: Type THHN-THWN, single conductors in raceway.

D. Class 1 Control Circuits: Type THHN-THWN, in raceway.

E. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.02 INSTALLATION OF CONDUCTORS AND CABLES

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

D. Support cables according to Division 16 Section "Hangers And Supports For Electrical Systems."

E. Identify and color-code conductors and cables to match existing color coding or as required by Code.

3.03 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 16130 RACEWAYS AND BOXES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.03 DEFINITIONS

A. IMC: Intermediate metal conduit.

B. LFMC: Liquidtight flexible metal conduit.

C. RNC: Rigid nonmetallic conduit.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2: PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. LFMC: Flexible steel conduit with PVC jacket.

E. Fittings for Conduit (Including all Types and Liquidtight): NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

F. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 METAL WIREWAYS

A. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 4X, stainless steel (SST) unless otherwise indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Screw-cover type.

D. Finish: Manufacturer's standard finish.

2.03 BOXES, ENCLOSURES, AND CABINETS

A. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

B. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

C. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

D. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.

2.04 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

2.05 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3: EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: PVC coated rigid steel conduit or IMC.
   a. Provide PVC coated rigid steel conduit where specifically indicated.
2. Underground Conduit: RNC, Type EPC- 40-PVC, direct buried.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
5. Application of Handholes and Boxes for Underground Wiring:
   a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X, stainless steel in damp or wet locations.

B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.02 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 16 Section "Hangers And Supports For Electrical Systems."

D. Arrange stub-ups so curved portions of bends are not visible above the finished slab. Install PVC coated rigid steel conduit in Wet, Damp, Corrosive or Outdoor conditions are present.

E. Install no more than the equivalent of three 90-degree bends in any conduit run.

F. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

H. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 2 Section "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances.

    a. Couple steel conduits to ducts with adapters designed for this purpose.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below the frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 16410 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Fusible Switches.
2. Molded-case circuit breakers (MCCBs).
3. Enclosures.

1.03 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.04 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

1.07 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2: PRODUCTS

2.01 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 600-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.02 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

2.03 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 4X, Stainless Steel.

PART 3: EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with NECA 1.

3.03 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 16442 PANELBOARDS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Lighting and appliance branch-circuit panelboards.

1.03 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.04 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Include evidence of NRTL listing for series rating of installed devices.
   6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   7. Include wiring diagrams for power, signal, and control wiring.

8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.07 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.08 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

PART 2: PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3, Type 4X stainless steel.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

3. Finishes:

a. Back Boxes: Same finish as panels and trim.

4. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

B. Incoming Mains Location: Top.

C. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Main and Neutral Lugs: Compression type.
3. Ground Lugs and Bus-Configured Terminators: Compression type.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.02 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.03 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.

    b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.

    c. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

2.04 PANELBOARD SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Current Technology; a subsidiary of Danahar Corporation.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Liebert Corporation.
5. Siemens Energy & Automation, Inc.
6. Square D; a brand of Schneider Electric.

B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:

    a. LED indicator lights for power and protection status.

b. Audible alarm, with silencing switch, to indicate when protection has failed.

c. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.

C. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:

   a. Fuses rated at 200-kA interrupting capacity.

   b. Fabrication using bolted compression lugs for internal wiring.

   c. Integral disconnect switch.

   d. Redundant suppression circuits.

   e. Redundant replaceable modules.

   f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.

   g. LED indicator lights for power and protection status.

   h. Audible alarm, with silencing switch, to indicate when protection has failed.

   i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

   j. Four-digit, transient-event counter set to totalize transient surges.

2. Peak Single-Impulse Surge Current Rating: 80 kA per mode/160 kA per phase.

3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.

   a. Line to Neutral: 70,000 A.

   b. Line to Ground: 70,000 A.

   c. Neutral to Ground: 50,000 A.

4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.

5. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277-V, three-phase, four-wire circuits shall be as follows:

   a. Line to Neutral: 800 V for 480Y/120.

   b. Line to Ground: 800 V for 480Y/120.

   c. Neutral to Ground: 800 V for 480Y/120.

PART 3: EXECUTION

3.01 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 72 inches height above finished floor unless otherwise indicated.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

E. Install filler plates in unused spaces.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

G. Comply with NECA 1.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section"Electrical Identification."

3.04 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

B. Panelboards will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 16461 LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.3 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACME Electric Corporation; Power Distribution Products Division.
2. Eaton Electrical Inc.; Cutler-Hammer Products.
3. Siemens Energy & Automation, Inc.
4. Sola/Hevi-Duty.
5. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Aluminum.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 3R.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

E. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

F. Wall Brackets: Manufacturer's standard brackets.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 16 Section "Electrical Identification."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 16 Section "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Division 16 Section "Electrical Supports and Seismic Restraints."

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 16461

ADDENDUM NUMBER 1
TO
WHITE OAK MSW LANDFILL
MSW PHASE 3
HAYWOOD COUNTY, NORTH CAROLINA

This Addendum Number One (1) is issued this the 22nd day of April, 2009 to all parties who hold a set of Bid Documents for the project entitled **"White Oak MSW Landfill, MSW Phase 3, Haywood County, North Carolina"**. Each Bidder shall acknowledge receipt of this Addendum on his/her bid and shall incorporate all changes in their Bid.

The following changes and/or additions shall be made:

1. The **Table of Contents** was revised to include **Section 02222, Rock Excavation.**

2. The **Bid** document was modified as follows: the Bid Schedule has been revised. New **Item 13-Underdrain-2,375 L.F.**, was added to the schedule. The bid items were renumbered to accommodate the addition of the new bid item.

3. The **Bid** document was modified as follows: the Bid Schedule has been revised. New **Item 52-Rock Excavation-1,000 C.Y.**, was added to the schedule. The bid items were renumbered to accommodate the addition of the new bid item.

4. The **Bid** document was modified as follows: the Bid Schedule has been revised. The quantity for **Item 2-Silt Fence has been revised to 3,200 LF.**

5. **Specification 01700, Measurement and Payment, Paragraph 01700.4.3d, Underdrain Installation** has been added.

6. **Specification 01700, Measurement and Payment, Paragraph 01700.4.15, Rock Excavation** has been added.

7. **Specification 02200, Earthwork, Paragraph 1.01 A 7** has been added.

8. **Specification 02720, Drainage Materials, Paragraph 2.02A** has been revised.

9. **Specification 02222, Rock Excavation** has been added.

10. Plan **Sheet C2** was revised to clarify the double silt fence around the stormwater dissipater structure S-2. The quantity of silt fence in the **Bid Schedule** was revised.

11. Plan **Sheet C6** was revised to show elevation information on the existing leachate collection sewer manholes.

The following questions and comments were made at the Pre-Bid Meeting held at the Haywood County Temporary Administrative Offices April 17, 2009:

12. Can information be provided for existing leachate collection sewer manholes?

Existing leachate collection manhole information has been added to the attached ***Sheet C6.***

13. Are underdrain quantities included in with the leachate collection system piping?

No, the ***Underdrain*** *quantities are paid for separately from the leachate collection system piping.* ***Underdrain*** *quantities have been added to the* ***Bid Schedule*** *and* ***Measurement and Payment, Section 1700, Paragraph 1700.4.3.d*** *has been added.*

14. Can you provide contact information for key Haywood County personnel?

The Haywood County Solid Waste Director is Stephen King, and he can be reached at 828/627-8042-office, 828/400-3544-cell, and sking@haywoodnc.net. The White Oak MSW Landfill Manger is Denese Ballew, and she can be reached at 828/627-6445-scale house or dballew@haywoodnc.net.

15. Are material thicknesses measured perpendicular to the slope?

Yes, the required thicknesses are measured perpendicular to the slope. The Contractor must take this into account when conducting the verification grid surveys, which are performed at the same point. For instance, on a 3:1 slope, to achieve a 2-foot thick layer, the verification points must show 2.1082 feet of separation.

16. Will rock excavation be included in unclassified materials? Is blasting allowed if rock is encountered?

Rock excavation will be paid for separately. A quantity of rock excavation has been added to the ***Bid Schedule.*** *A specification for* ***Rock Excavation – 02222*** *has been added. Blasting will be allowed on a case by case basis, ONLY with the approval of the Engineer.*

17. Will waste be encountered when performing cuts in the existing MSW Phase 2 landfill area?

There is a possibility of wastes being encountered at the southeast corner of the existing MSW Phase 2 area as the Contractor exposes the existing liner to make the proposed connection. A bid quantity has been included in the ***Bid Schedule*** *for waste removal. It will be determined on site whether a before and after survey or an estimation will be used to verify quantities.*

18. Clarify the friction angle testing requirements. How many tests are required for the clay/geomembrane interface?

Friction angle testing is required between the clay liner and 60-mil geomembrane, the 60-mil geombrane and 16-oz geotextile, the 16-oz geotextile and the stone drainage layer, and the 8-oz double-sided geocomposite and 60-mil geomembrane (for leachate lagoon area). Clay-geomembrane friction angle testing is required for any change of materials.

19. Who is responsible for testing clay permeability?

The Contractor is responsible for ensuring that the installed clay liner meets the requirements of the plans and specifications; however, the CQA firm is ultimately responsible for signing off on the installed clay.

20. Regarding the requirements for Record Drawings, please clarify.

***Special Conditions, Section 01200, 1.04F Record Documents** spells out the Contractor's obligations for providing as-built information to the Owner. Additionally, **Special Conditions, Section 01200, 3.01J Construction Surveying** lists the surveying requirements of the Contractor.*

21. **Specification 01200, Paragraph 1.03 c** implies that sales tax will be included in the bid price for this project. Is this correct?

Yes, and the appropriate documentation regarding sales tax must be supplied to the County at the time of the pay request submittal for that item.

22. Clarify the clearing and grubbing and soil stockpiling requirements?

*Trees and stumps cleared from the site shall be placed at the direction of the Haywood County Landfill Manager, at the Mulching Operation shown on Sheet C1 of the plans. Grubbed materials containing vegetative matter shall be stockpiled separately from soil materials. The Contractor shall stockpile all excess soil materials meeting clay liner requirements separately in soil stockpile area #2. **Specification 02200, Section 1.01 A 7** has been added to show the requirements of stockpiling excess clay liner materials.*

23. Clarify the requirements of the CMP stormwater piping?

*CMP pipe shall be Aluminized Type 2 Corrugated Steel. **Section 2720 DRAINAGE MATERIALS, paragraph 2.02** has been revised to clarify the requirements of the CMP storm drainage piping.*

24. What are the working hours for the project?

Working hours are daylight hours, Monday through Saturday. Work is not allowed on Sundays and holidays when the landfill is closed, except under extreme circumstances and only with the approval of the Haywood County White Oak Landfill Manager.

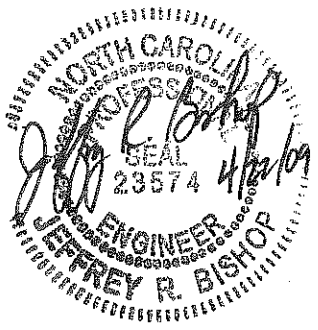
The following written questions were received from Contractors:

25. Can a digital copy (ACAD format) be obtained for the borings shown on **Sheet C2**?

Yes, an ACAD dwg with the borings locations will be submitted via email.

26. Will a subgrade grading plan be issued?

*No, the Contractor is expected to install the top of clay grades as shown on **Sheet C3** of the plans, and make allowances for the required thickness of clay.*



JEFFREY R. BISHOP, P.E.

McGILL ASSOCIATES, P.A.
CONSULTING ENGINEERS
ASHEVILLE, NORTH CAROLINA

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APPENDICES

BID

TO: **Haywood County**
81 Elmwood Way
Waynesville, North Carolina 28786

FROM:_____

_____

_____

of the City of _____, County of _____ and

State of _____, hereinafter called "Bidder".

PROJECT: **White Oak MSW Landfill, MSW Phase 3**

Gentlemen:

The bidder, in compliance with your Advertisement for Bids for the construction of the above-referenced project, having examined the Drawings and Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder declares that he has carefully examined the site of the proposed work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed work, and the difficulties attendant upon its execution, and that he has carefully read and examined the Drawings, the annexed proposed Agreement, and the specifications and other Contract Documents therein referred to, and knows and understands the terms and provisions thereof.

Bidder understands that information relative to existing structures, apparent and latent conditions, and natural phenomena, as furnished to him on the Drawings, in the Contract Documents, or by the Owner or the Engineer, carries no guarantee expressed or implied as to its completeness or accuracy, and he has made due allowance therefor.

TIME FOR COMPLETION AND LIQUIDATED DAMAGES: Bidder hereby agrees to commence work under this contract within 10 days of receipt of the Notice to Proceed

and to fully complete the project within **300** consecutive calendar days after the date of the Notice to Proceed.

Bidder also agrees to pay **$1,000.00/day** as liquidated damages for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

ADDENDA: Bidder acknowledges receipt of the following Addenda:

Addendum No. 1 Date: April 22, 2009
Addendum No. _____ Date: _____
Addendum No. _____ Date: _____

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization	1	LS		
2	Silt Fence	3,200	LF		
3	Clearing and Grubbing	1	LS		
4	Grassing	23	ACRE		
5	Slope Matting on Slopes 2.5:1 or Steeper	18	ACRE		
6	Stone Check Dams	10	EA		
7	Sediment Basins 5, 6, & 7	3	EA		
8	Sediment Basin 4	1	LS		
9	Riprap, Including Ditches and Outlet Protection	2,100	CY		
10	Remove Existing Chain-link Fencing	3,170	LF		
11	Gravel Access Road	9,000	SY		
12	Truck Wash Area	140	SY		
13	Underdrain Installation	2,375	LF		
14	Earthworks (Approximately 310,000 cy cut, 80,000 structural fill, remainder to be stockpiled)	1	LS		
15	24-inch Compacted Clay	391,500	SF		
16	24-inch Washed Stone	391,500	SF		
17	Clay Liner Test Pad	2	EA		
18	60 Mil HDPE Textured Membrane	391,500	SF		
19	16-ounce Geotextile Cushion	391,500	SF		

20	Permanent Liner Edge No. 1 & 1A (approx. 580 L.F.)	1	LS		
21	Temporary Liner Edge No. 2 (approx. 155 L.F.)	1	LS		
22	Temporary Liner Edge No. 3 (approx. 770 L.F.)	1	LS		
23	Connection to Existing Liner Edge (Approx. 1,150 L.F.)	1	LS		
24	Stormwater Control Liner	391,500	SF		
25	Leachate Pump Station 1	1	EA		
26	Leachate Pump Stations 2 and 3	2	EA		
27	6-inch Perforated HDPE LCS Pipe	1,450	LF		
28	8-inch Perforated HDPE LCS Pipe	2,850	LF		
29	6-inch Leachate Cleanout	4	EA		
30	8-inch Leachate Cleanout	5	EA		
31	Leachate Head Test Well	2	EA		
32	3-inch HDPE Dual-Contained Force Main	200	LF		
33	8-inch HDPE Dual-Contained Gravity Sewer	1,700	LF		
34	Leachate Gravity Sewer Manhole 1	1	LS		
35	Leachate Gravity Sewer Manhole 2	1	LS		
36	Leachate Gravity Sewer Connection to existing leachate gravity lines (2 locations)	1	LS		
37	8-inch PVC Stormwater Pump Discharge Pipe	90	LF		
38	12-inch Corrugated Metal Pipe	110	LF		
39	15-inch Corrugated Metal Pipe	45	LF		
40	18-inch Corrugated Metal Pipe	360	LF		
41	24-inch Corrugated Metal Pipe	380	LF		
42	30-inch Corrugated Metal Pipe	700	LF		
43	54-inch Corrugated Metal Pipe	60	LF		
44	18-inch HDPE Storm Drainage Pipe	80	LF		
45	Raise Leachate Storage Lagoon	1	LS		
46	Raise Existing Leachate Gravity Manhole	3	EA		
47	Raise/Lower Existing Ground Water Monitoring Well	2	EA		
48	Liner Edge Marker (Permanent and Temporary)	10	EA		
49	Electrical Installation, Complete	1	LS		
				SUB-TOTAL	
	ADDITIONAL WORK IF ORDERED BY THE ENGINEER				
50	Erosion Control Cash Allowance	1	LS	#####	$25,000.00

				#	
51	Removal and replacement of unsuitable material				
A	Suitable Earth Material	8,000	CY		
B	Crushed Stone (#57)	2,000	CY		
C	Geogrid (TerraGrid B120 by Hanes Geo Components, or approved equal)	50,000	SF		
52	Rock Excavation	1,000	CY		
53	Removal of MSW waste near existing liner edge	600	CY		
54	Installation of 8' Chain Link Fence	3,820	LF		
55	Installation of 20-foot Double-Swing Chain Link Gate	3	EA		
56	Dri-Prime Diesel-Powered Trailer-Mounted Pump and Appurtenances	1	LS		
				BID TOTAL	

The above unit prices shall include all costs for furnishing materials and labor complete, each item including all sales tax, labor cost, material cost, and cost of miscellaneous items.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closed time for receiving bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder will execute the formal Agreement attached within 10 days. Surety Bonds will be required for this project.

The undersigned declares that his firm is (delete those not acceptable):

A corporation organized and existing under the laws of the State of _____.

A partnership consisting of _____.

The undersigned declares that the person or person signing this proposal is fully authorized to sign the proposal on behalf of the firm listed and to fully bind the firm listed to all the conditions and provisions thereof.

It is agreed that no person or persons or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the contract that may be entered into as a result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

Respectfully Submitted:

_____
CONTRACTOR

(SEAL - if bid is by a Corporation)

_____

_____
Title

_____

_____
Address

NC General Contractor's License No. _____

Attest: _____

to either the mulching and grinding or LCID area on the landfill property.

b. Gravel Access Roads

This bid item will be paid for the actual square yardage of access road constructed per the details. Compensation will be paid for the actual square yardage installed, per the details, including sub-grade preparation, railroad ballast, and compacted aggregate base course, all materials and labor. Grading of shoulders is considered incidental to this bid item.

c. Truck Wash Area

This bid item will be paid for the actual square yardage of truck wash area constructed per the details, if directed by the Engineer. Included in this item is all concrete and stone required. Incidental to this item is grading in the vicinity of the existing sediment basin to ensure that all runoff from the truck wash area enters the basin.

d. Underdrain Installation

This bid item will be paid for the actual linear footage of underdrain installed, per the details. Included in this item is all materials and labor, including 8" perforated hdpe pipe, stone backfill, and geotextile wrap. Incidental to this item is any temporary capping of the underdrain pipe necessary in order to keep sediment from entering the pipe, connection to energy dissipater structure S-2 at the downstream end, connection to the existing underdrain at the upstream end, and any fittings required to join the three underdrain pipes.

01700.4.4 Earthwork

a. Earthwork

This item will be paid for on a lump sum basis. The lump sum will be the full compensation for excavating, transporting, and stockpiling soil materials, including placing Structural Fill. Select backfill for the Temporary Liner Edges is included in a separate item. Removal and replacement of unsuitable materials is included under a separate item. The grading associated with Sediment Basin 4 is included under a separate item.

b. 24-inch Compacted Clay

an accurate calculation of the unsuitable material removed and replaced. This item shall be paid for at the price per cubic yard given in the Bid Schedule for replacement with suitable earth fill or crushed stone, according to the material the Engineer directs the Contractor to use.

01700.4.14 Erosion Control Cash Allowance

An erosion control cash allowance of $25,000.00 has been included in the Bid Schedule to cover the cost of adding erosion control measures, unforeseen at this time. This could include temporary sediment traps, stormwater culverts, riprap for ditches and pipe outlets, and erosion control matting. The contractor will not be eligible for compensation of this allowance unless a proposal of cost for completing the work is submitted to the Engineer prior to beginning construction. The Contractor will be required to provide documentation for all expenses incurred.

01700.4.15 Rock Excavation

The quantity of excavated rock to be paid for will be the actual quantity, in cubic yards, of rock excavated, as defined in the specifications. This work shall not be performed unless directed by the Engineer. The Contractor will provide sufficient topographic survey before and after rock excavation in order to make an accurate calculation of the quantity removed.

END OF SECTION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. General: The work included in this section consists of the grading of the project area. The work includes:

1. Site clearing and on-site disposal of all debris and unsuitable material.

2. Removal of all topsoil, organically contaminated soil and existing unsuitable fill. Topsoil shall be stockpiled on site in a location supplied by the owner.

3. Proofrolling and grading of the property to the prescribed elevations.

4. Stockpiling or wasting on site of any excess cut material for providing acceptable material as required to obtain the desired grades.

5. Construction of earthen embankments.

6. Placement of Fill Material in order to bring the site to subgrade elevations, prior to placement of landfill components.

7. **Contractor shall stockpile all excess soil materials meeting clay liner requirements separately in soil stockpile area #2.**

1.02 SITE CONDITIONS

A. Site Information: The boring logs and related information depict approximate subsurface conditions only at these specific locations and at the particular time designated on the logs. Subsurface conditions at other locations may differ from those reported at the boring locations. It is expressly understood that neither the Owner nor the Engineer will be responsible for interpretations or conclusions drawn from the boring data by the Contractor. The data are made available for the convenience of the Contractor. Test borings and other exploratory operations may be undertaken by the Contractor at his own expense, provided such operations are acceptable to the Owner.

3. Underdrain or Pipe Bedding

4. Drainage Structure Castings

5. Precast Drainage Structures

1.05 WARRANTY

All pipe and materials shall be warranted for a period of one (1) year following installation and acceptance by the Owner.

PART 2: PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Reinforced concrete pipe shall conform to ASTM C-76, latest revision. Pipe shall be Class III with Wall B, unless otherwise noted. All pipe shall have interior surfaces free from roughness, projection, indentations, offset or irregularities of any kind.

B. Joint material for reinforced concrete pipe shall be either "O" ring type joints utilizing a rubber "O" ring, or bell and spigot type utilizing a mastic joint material equal to Ram-Neck.

2.02 CORRUGATED METAL PIPE

A. Corrugated metal pipe shall conform to AASHTO M-36, latest revision.

B. Corrugated metal pipe shall have 2-2/3" x 1/2" corrugations and shall be of the following minimum gauges:

18" and smaller pipes ..... 16 gauge
21" - 30" pipes ..... 14 gauge
36" - 48" pipes ..... 12 gauge
56" and larger pipes..... 10 gauge

C. Corrugated Metal Pipe shall have rerolled ends to accommodate corrugated coupling bands. Coupling bands shall conform to NCDOT 932-3(A). Dimple bands shall not be used.

2.03 HIGH DENSITY POLYETHELENE PIPE

A. High density polyethylene pipe (HDPE) shall meet the requirements of AASHTO M294, Type S for 12" – 48" diameter and AASHTO MP7, Type S for 60" diameter. Joints shall be water-tight, per ASTM 3212, with gaskets per ASTM F477.

SECTION 02222 ROCK EXCAVATION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. The work covered by this section consists of the blasting and excavation of rock material in cut areas. Rock excavation shall be classified material which cannot be removed with normal construction equipment such as hydraulic excavators, bulldozers with "rippers" and requires the construction practice of blasting.

1.02 DEFINITIONS

A. Rock is defined as being sandstone, limestone, flint, graphite, quartzite, slate, hard shale, or similar material that cannot be excavated without systematic drilling and blasting.

B. Should rock be encountered in two or more ledges, each ledge being not less than 3" thick and with interlying strata of earth, clay or gravel not more than 12" thick in each stratum, the entire volume between the top of the top ledge and the bottom of the bottom ledge will be classified as rock.

PART 2: NOT USED

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

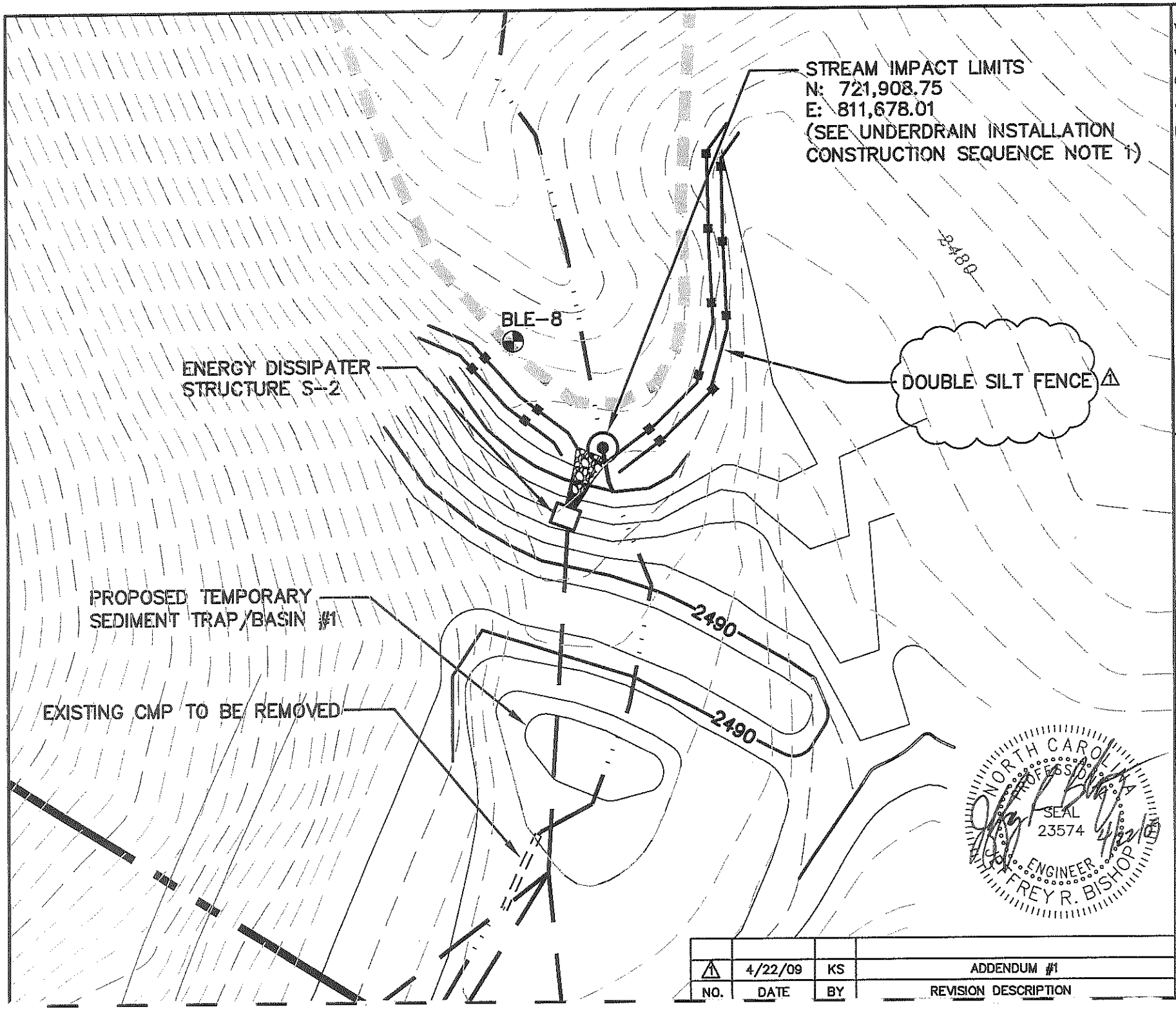
A. Blasting: The use of explosives shall conform to be in strict accordance with all Federal, State, County and local regulations and only after the approval of the Engineer. The Contractor shall be responsible for all damage caused by blasting operations. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of excavation or trench.

B. When rock is encountered, all lines and grades will be held in accordance with the plans or adjusted only after approval of the Engineer.

C. When rock is encountered within the limits of construction, the Contractor shall notify the Engineer prior to any removal. Upon the Engineer's authorization, the Contractor shall remove the rock. The Contractor shall not be paid for rock removed without prior approval from the Engineer.

D. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

END OF SECTION



NO.	DATE	BY	REVISION DESCRIPTION
1	4/22/09	KS	ADDENDUM #1

NORTH CAROLINA PROFESSIONAL SEAL 23574 ENGINEER FREY R. BISHOP

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC PH. (828) 252-0575

UNDERDRAIN INSTALLATION EROSION CONTROL PLAN

SHEET C2

ADDENDUM NUMBER 2
TO
WHITE OAK MSW LANDFILL
MSW PHASE 3
HAYWOOD COUNTY, NORTH CAROLINA

This Addendum Number Two (2) is issued this the 28th day of April, 2009 to all parties who hold a set of Bid Documents for the project entitled **"White Oak MSW Landfill, MSW Phase 3, Haywood County, North Carolina"**. Each Bidder shall acknowledge receipt of this Addendum on his/her bid and shall incorporate all changes in their Bid.

The following changes and/or additions shall be made:

1. The **Instruction to Bidders, Section IB-04. Addenda and Interpretations** was revised to show the last date for receiving questions from Contractors is April 29, 2009 at 2 p.m.

2. The **Bid** document was modified as follows: the **Bid Schedule** has been revised. The quantity of **Bid Item 5, Slope Matting on Slopes 2.5:1 or Steeper and Erosion Control Matting in Ditches**, was revised to **19.7 Acres** to include the area of grass-lined ditches requiring North American Green products.

3. The **Bid** document was modified as follows: the **Bid Schedule** has been revised. New **Items 45 and 46 – Energy Dissipater Structure S-2 and Storm Drainage Structure S-3, 1 Each**, were added to the schedule. The bid items were renumbered to accommodate the addition of the new bid items.

4. The **Bid** document was modified as follows: the **Bid Schedule** has been revised. New **Item 47, Concrete Endwalls, 4 Each**, was added to the schedule. The bid items were renumbered to accommodate the addition of the new bid item.

5. The **Bid** document was modified as follows: the **Bid Schedule** has been revised. New **Item 48, Removal of Existing Leachate System Manholes, 5 Each**, was added to the schedule. The bid items were renumbered to accommodate the addition of the new bid item.

6. **Specification 01700, Measurement and Payment, Paragraphs 01700.4.2 c, Slope Matting on Slopes 2.5:1 and Steeper and Erosion Control Matting in Ditches** has been revised to include the North American Green products called for in grass-lined ditches.

7. **Specification 01700, Measurement and Payment, Paragraphs 01700.4.2 e&f, Sediment Basins** has been revised to include the porous baffles required for each sediment basin.

8. **Specification 01700, Measurement and Payment, Paragraphs 01700.4.2 g, Temporary Sediment Trap** has been revised to show that the traps are considered incidental to the earthworks.

9. **Specification 01700, Measurement and Payment, Paragraph 01700.4.7a, Leachate Pump Station 2 & 3** was revised to show 24" HDPE riser pipes.

10. **Specification 01700, Measurement and Payment, Paragraph 01700.4.7k, Removal of Existing Leachate System Manholes** has been added.

11. **Specification 01700, Measurement and Payment, Paragraphs 01700.4.8 b,c, and d, Energy Dissipater Structure S-2, Storm Drainage Structure S-3, and Concrete Endwalls** have been added.

12. Plan **Sheet C6** was revised to clarify the elevations of one of the existing leachate collection system manholes.

The following written questions were received from Contractors:

13. Should the porous baffles in the sediment basins be carried under Item 7?

*Yes, the porous baffles for the sediment basins for both **Items 7 and 8** shall be included in the cost of that sediment basin. The **Measurement and Payment Paragraphs 01700.4.2 e&f, Sediment Basins** have been revised to reflect this.*

14. Regarding the detail on **Sheet D10** for **Basin w/Skimmer**, the note calls for NAG S75 matting at the conclusion of construction. Should the matting be carried in **Item 7** or will it be included in **Bid Item 5** for **Slope Matting?** Also, where should the NAG products called for in the grass-lined ditches be included?

*The matting for the side slopes of sediment basins will be included in **Item 5, Slope Matting**. The North American Green matting called for in the grass-lined ditches has been added to Item 5 and is shown in Measurement and Payment Section 01700. The quantity for **Item 5** was revised to **19.7 acres**.*

15. What item should the **8" HDPE Underdrain** shown on **Sheet C2** be carried in?

*The **Underdrain** will be paid for under **Item 13**. See **Addendum #1** for information pertaining to this item.*

16. On Sheet C2, which bid item will the temporary sediment trap #1, diversion berm, energy dissipater structure S-2 and CMP removal be carried in?

It is necessary to construct the slopes of temporary sediment trap #1 in order to construct the area of the access road north of the sump area, therefore, temporary sediment trap #1 will be considered incidental to the earthworks. Measurement and Payment Section 01700.4.2g was revised to reflect this. A major challenge for the Contractor as the project progresses will be managing stormwater runoff in the area of temporary sediment trap #1. Methods and

materials used by the Contractor to manage stormwater in this area will be considered incidental to the Contract.

Diversion berms are considered incidental to earthworks.

Energy dissipater structure S-2 and also storm drainage structure S-3 will be paid for under ***Items 45 and 46*** *in the* ***Bid Schedule****.*

The removal of any existing stormwater piping, including the existing pipe near temporary sediment trap #1 and at the existing sediment basin within the MSW Phase 3 area, will be considered incidental to the Contract. The removed material shall be placed on site at the area designated by the White Oak Landfill Manager.

17. Is there a spec for the various types of geotextile? Specifically the 16-oz. cushion layer?

Section ***02400*** *of the* ***Specifications*** *pertains to the various types of geotextile, with* ***02400.4*** *listing the requirements for the 16-oz cushion layer as well as the 6-oz. geotextile material for wrapping leachate piping.*

18. Where do we put the cost for the various minor structures such as special headwalls and FES?

The endwalls shall be paid for under ***Bid Item 47, Concrete Endwalls, 4 Each****, which was added to the* ***Bid Schedule****.* ***Measurement and Payment Section 01700.4.8d, Concrete Endwalls (Headwalls)*** *was added.*

19. If quality clay is located within the cell area below subgrade or in fill areas, is it the intention of the Owner to excavate and stockpile the clay for current or future use and backfill the areas with structural fill from cell excavation? If so, how will the Contractor be compensated since the excavation item is Lump Sum?

No. The Owner would however like for the Contractor to stockpile excess quality clay for future use.

20. The discharge structure from Sed. Basin #5 does not have any unique design characteristics such as Basin #6 or Sed. Trap #1. Can storm water flows from cell construction be directed through Basin #5 without causing any heartburn?

Yes, sediment basin #5 can receive runoff from construction. See question #16 above for more information regarding managing stormwater runoff from construction.

21. Who is responsible for removing any accumulated sludges from the leachate lagoon prior to installing the new liner system?

The Contractor is required to clean the existing liner prior to placement of the proposed geocomposite and 60-mil HDPE liner. The County is in the process of pumping down the leachate lagoon, and the liquid volume of the lagoon at the start of the project will be as low as

and to fully complete the project within **300** consecutive calendar days after the date of the Notice to Proceed.

Bidder also agrees to pay **$1,000.00/day** as liquidated damages for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

ADDENDA: Bidder acknowledges receipt of the following Addenda:

Addendum No. 1 Date: April 22, 2009
Addendum No. 2 Date: April 28, 2009
Addendum No. _____ Date: _____

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization	1	LS		
2	**Silt Fence**	**3,200**	**LF**		
3	Clearing and Grubbing	1	LS		
4	Grassing	23	ACRE		
5	**Slope Matting on Slopes 2.5:1 or Steeper and Erosion Control Matting in Ditches**	**19.7**	**ACRE**		
6	Stone Check Dams	10	EA		
7	Sediment Basins 5, 6, & 7	3	EA		
8	Sediment Basin 4	1	LS		
9	Riprap, Including Ditches and Outlet Protection	2,100	CY		
10	Remove Existing Chain-link Fencing	3,170	LF		
11	Gravel Access Road	9,000	SY		
12	Truck Wash Area	140	SY		
13	**Underdrain Installation**	**2,375**	**LF**		
14	Earthworks (Approximately 310,000 cy cut, 80,000 structural fill, remainder to be stockpiled)	1	LS		
15	24-inch Compacted Clay	391,500	SF		
16	24-inch Washed Stone	391,500	SF		
17	Clay Liner Test Pad	2	EA		
18	60-mil HDPE Textured Membrane	391,500	SF		

19	16-ounce Geotextile Cushion	391,500	SF		
20	Permanent Liner Edge No. 1 & 1A (approx. 580 L.F.)	1	LS		
21	Temporary Liner Edge No. 2 (approx. 155 L.F.)	1	LS		
22	Temporary Liner Edge No. 3 (approx. 770 L.F.)	1	LS		
23	Connection to Existing Liner Edge (Approx. 1,150 L.F.)	1	LS		
24	Stormwater Control Liner	391,500	SF		
25	Leachate Pump Station 1	1	EA		
26	Leachate Pump Stations 2 and 3	2	EA		
27	6-inch Perforated HDPE LCS Pipe	1,450	LF		
28	8-inch Perforated HDPE LCS Pipe	2,850	LF		
29	6-inch Leachate Cleanout	4	EA		
30	8-inch Leachate Cleanout	5	EA		
31	Leachate Head Test Well	2	EA		
32	3-inch HDPE Dual-Contained Force Main	200	LF		
33	8-inch HDPE Dual-Contained Gravity Sewer	1,700	LF		
34	Leachate Gravity Sewer Manhole 1	1	LS		
35	Leachate Gravity Sewer Manhole 2	1	LS		
36	Leachate Gravity Sewer Connection to existing leachate gravity lines (2 locations)	1	LS		
37	8-inch PVC Stormwater Pump Discharge Pipe	90	LF		
38	12-inch Corrugated Metal Pipe	110	LF		
39	15-inch Corrugated Metal Pipe	45	LF		
40	18-inch Corrugated Metal Pipe	360	LF		
41	24-inch Corrugated Metal Pipe	380	LF		
42	30-inch Corrugated Metal Pipe	700	LF		
43	54-inch Corrugated Metal Pipe	60	LF		
44	18-inch HDPE Storm Drainage Pipe	80	LF		
45	**Energy Dissipater S-2**	1	EA		
46	**Storm Drainage Structure S-3**	1	EA		
47	**Concrete Endwalls**	4	EA		
48	**Remove Existing Leachate System Manhole**	5	EA		
49	Raise Leachate Storage Lagoon	1	LS		
50	Raise Existing Leachate Gravity Manhole	3	EA		
51	Raise/Lower Existing Ground Water Monitoring Well	2	EA		

52	Liner Edge Marker (Permanent and Temporary)	10	EA		
53	Electrical Installation, Complete	1	LS		
				SUB-TOTAL	
	ADDITIONAL WORK IF ORDERED BY THE ENGINEER				
54	Erosion Control Cash Allowance	1	LS	##### #	$25,000.00
55	Removal and replacement of unsuitable material				
A	Suitable Earth Material	8,000	CY		
B	Crushed Stone (#57)	2,000	CY		
C	Geogrid (TerraGrid B120 by Hanes Geo Components, or approved equal)	50,000	SF		
56	**Rock Excavation**	**1,000**	**CY**		
57	Removal of MSW waste near existing liner edge	600	CY		
58	Installation of 8' Chain Link Fence	3,820	LF		
59	Installation of 20-foot Double-Swing Chain Link Gate	3	EA		
60	Dri-Prime Diesel-Powered Trailer-Mounted Pump and Appurtenances	1	LS		
				BID TOTAL	

The above unit prices shall include all costs for furnishing materials and labor complete, each item including all sales tax, labor cost, material cost, and cost of miscellaneous items.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closed time for receiving bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder will execute the formal Agreement attached within 10 days. Surety Bonds will be required for this project.

The undersigned declares that his firm is (delete those not acceptable):

A corporation organized and existing under the laws of the State of _____.

A partnership consisting of _____.

The undersigned declares that the person or person signing this proposal is fully authorized to sign the proposal on behalf of the firm listed and to fully bind the firm listed to all the conditions and provisions thereof.

It is agreed that no person or persons or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the contract that may be entered into as a result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

Respectfully Submitted:

_____

CONTRACTOR

(SEAL - if bid is by a Corporation)

_____

_____

Title

_____

_____

Address

NC General Contractor's License No. _____

Attest: _____

SECTION 01700 MEASUREMENT AND PAYMENT

01700.1 SCOPE

This section covers methods of measurement and payment for items of work under this contract.

01700.2 GENERAL

The total Bid Price for each section of the contract shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

01700.3 ESTIMATED QUANTITIES

All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only; a) as a basis for estimating the probable cost of the work, and b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. The Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts thereof.

01700.4 WORK ITEMS

01700.4.1 Mobilization

All work covered by this section will be paid for at the contract lump sum price for "Mobilization". The lump sum bid price shall not exceed 3% of the total project bid.

Partial payments for the item of "Mobilization" will be made with the first and second partial pay estimates paid on the contract, and will be made at a rate of 50 percent of the lump sum price for "Mobilization" on each of these partial pay estimates.

01700.4.2 Erosion and Sedimentation Control

a. Silt Fence

The quantity of silt fence to be paid for will be in actual measured length of silt fence installed at the unit price per linear foot. The unit price will be the full compensation for all work including but not limited to material, installation, and maintenance during construction period and removal.

b. Grassing.

The quantity of grassing to be paid for will be the actual measured acres of grassing installed per grassing schedule at the unit price per acre, rounded to the nearest 0.1 of an acre. The unit price will be the full compensation for all work including, but not limited to seed, fertilizer, mulching and installation. The areas included in this item are all disturbed (outside proposed liner edges, excluding gravel access roads, riprap ditches, and permanent sediment basins) areas including stockpile areas.

c. **Slope Matting on Slopes Steeper than 2.5:1 and Erosion Control Matting in Ditches**

The quantity of erosion control matting to be paid for will be the actual measured acres of matting installed per the slope stabilization detail and ditch detail, at the unit price per acre, rounded to the nearest 0.1 of an acre. The unit price will be the full compensation for all work including, but not limited to installation and materials. Slope matting will be required on all slopes 2.5:1 or steeper. An allowance for a 1' overlap on the outside of ditches designated to receive matting is included in this item. Any additional overlaps are considered incidental to this item.

d. Stone Check Dams.

The quantity of stone check dams to be paid for will be the actual number of stone check dams installed per the drawings at the unit price for each stone check dam. The unit price will be the full compensation for all work including material, installation and maintenance during the construction period.

e. Sediment Basins 5, 6, and 7

The quantity of sediment basins will be paid for each sediment basin installed at the unit price for each as given in the bid schedule. The unit price will be the full compensation for all work including riser pipe and skimmer, and maintenance of these items during the construction period. **Also included in this item are the porous baffles**. Barrel piping will be paid for under storm drainage piping. Earthwork quantities as part of the construction of the sediment basin are included under the earthworks item. Riprap for emergency spillway channels and outlet protection are paid for under separate items.

f. Sediment Basin 4

This item shall be paid for on a lump sum basis. Included in this item is the earthwork (approximately 25,000 cubic yards cut and fill, as shown on the grading plan), riser pipe, and skimmer associated with the construction of the basin. **Also included in this item are the porous baffles.** Barrel piping and riprap for emergency spillway channel and outlet protection is included under a separate item.

g. Temporary Sediment Trap

The construction of temporary sediment traps will be considered incidental to the Contract, as it is part of the earthworks. The option of the installation of a temporary riser/barrel at temporary sediment trap 1 is considered incidental to this item. Riprap at the outlet of the traps will be considered incidental to this item.

h. Riprap

The quantity of riprap to be paid for will be for the actual cubic yardage of riprap installed (per the detail) at unit price per cubic yard. Riprap is used as riprap inlet/outlet protection and in riprap ditches. The unit price will be the full compensation for all work including, but not limited to material, installation and maintenance during the construction period. This bid item shall include ditch excavation and filter fabric beneath the riprap. Stone check dams utilizing riprap are paid under a separate item.

01700.4.3 Site Preparation

a. Clearing and Grubbing

Clearing and Grubbing will be paid on a lump sum basis. All the area which requires clearing and grubbing to complete the work will be paid for as a lump sum. The lump sum will be the full compensation for all work including labor and disposal of material. Included are the areas where clay borrow materials will be obtained. Incidental to this item is transportation of wood material to either the mulching and grinding or LCID area on the landfill property.

b. Gravel Access Roads

This bid item will be paid for the actual square yardage of access road constructed per the details. Compensation will be paid for the actual square yardage installed, per the details, including sub-grade preparation, railroad ballast, and compacted aggregate base course, all materials and labor. Grading of shoulders is considered incidental to this bid item.

c. Truck Wash Area

This bid item will be paid for the actual square yardage of truck wash area constructed per the details, if directed by the Engineer. Included in this item is all concrete and stone required. Incidental to this item is grading in the vicinity of the existing sediment basin to ensure that all runoff from the truck wash area enters the basin.

d. Underdrain Installation

This bid item will be paid for the actual linear footage of underdrain installed, per the details. Included in this item is all materials and labor, including 8" perforated hdpe pipe, stone backfill, and geotextile wrap. Incidental to this item is any temporary capping of the underdrain pipe necessary in order to keep sediment from entering the pipe, connection to energy dissipater structure S-2 at the downstream end, connection to the existing underdrain at the upstream end, and any fittings required to join the three underdrain pipes.

01700.4.4 Earthwork

a. Earthwork

This item will be paid for on a lump sum basis. The lump sum will be the full compensation for excavating, transporting, and stockpiling soil materials, including placing Structural Fill. Select backfill for the

Temporary Liner Edges is included in a separate item. Removal and replacement of unsuitable materials is included under a separate item. The grading associated with Sediment Basin 4 is included under a separate item.

b. 24-inch Compacted Clay

The quantity of compacted clay to be paid for will be the actual measured surface area of material placed as compacted clay to the full thickness at the unit price per square foot, rounded to the nearest square foot. The area will be to the proposed and existing certified liner edge, as shown on the liner edge details and the connection to existing liner edge detail. The unit price will be the full compensation for all work associated with clay placement including material (on-site or off-site), the addition of bentonite, if required, compaction, and verification survey. Payment will not be made until clay has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. Additional clay required for raising the existing leachate storage lagoon will be paid for under that item. Additional clay (beyond the 2' thickness) required at the connection to existing liner edge will be paid for under a separate item.

c. 24-inch Washed Stone

The quantity of washed stone to be paid for will be the actual measured area of material placed to the full thickness at the unit price per square foot. The unit cost will include all cost associated with furnishing and placement of the washed stone on the lined area and verification survey. The washed stone material will be furnished by the Contractor. The limit of the 24-inch washed stone to be measured and paid will be to the certified liner edges, as shown in the details. Additional stone beyond the 2' thickness necessary to construct the temporary liner edges will be paid under separate item. Stone outside of the certified liner edge shall be paid for under the liner edge item.

d. Clay Liner Test Pad

The clay liner test pad will be paid on a unit price basis, up to a total of two (2) clay liner test pads. All cost associated with the placement of the clay liner test pad will be included in the unit price. Additional clay liner test pads will be considered incidental to this item.

e. Geogrid

The quantity of geogrid to be paid for will be for the actual square footage of geogrid installed at the direction of the engineer at the unit price per square foot. The unit price will be the full compensation for all work including, but not limited to material, installation and maintenance during the construction period.

01700.4.6 Leachate Containment System

a. 60-mil HDPE textured geomembrane

The quantity of 60 mil HDPE geomembrane to be paid for will be the actual measured square footage of surface area for material placed and seamed together at the unit price per square foot. The unit cost for HDPE geomembrane will include all costs associated with the purchase, delivery and placement of the geomembrane including, but not limited to, material, labor, seaming, sand bags, etc. The actual measured square footage will be based on field measurements of completed liner placement. Payment will not be made for this item until the geomembrane has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. The certified HDPE liner edge will be the perimeter boundary for measuring geomembrane quantities. All geomembrane material used for constructing the liner edges (including flaps and anchors) will be paid for under the respective liner edge bid item.

b. 16-ounce Geoxtile

The quantity of Geotextile to be paid for will be the actual measured square footage of surface area for material placed and seamed together at the unit price per square foot. The unit cost for Geotextile will include all costs associated with the purchase, delivery and placement of the Geotextile including, but not limited to, material, labor, seaming, sand bags, etc. The actual measured square footage will be based on field measurements of completed geotextile placement. Payment will not be made for this item until the Geotextile has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. The certified HDPE liner edge will be the perimeter boundary for measuring Geotextile quantities. The Geotextile material used in the anchor trench will be considered incidental to this item.

c. Liner Edge. (All Types)

The quantity of liner edge to be paid for will be the lump sum price listed in the bid schedule for each type of liner edge installed. The lump sum price will be the full compensation for all work associated

with the liner edge construction per the details, including but not limited to the anchor trench, select backfill, any HDPE, 16-ounce geotextile, or 20-mil stormwater control liner material beyond certified liner edge, treated plywood, caution tape, and any additional drainage layer stone not considered part of the base drainage layer. Incidental to this item is the 60-mil HDPE geomembrane flap near the certified liner edge for Temporary Liner Edge #2. Liner edge markers are included under separate item. Leachate systems cleanouts are included under a separate item. The construction of temporary drainage swales near liner edges to ensure stormwater runoff does not enter beneath liner during construction is considered incidental to this item.

d. Connection to Existing Liner Edge

This item will be paid for on a lump sum basis for both types of Connection to the Existing Liner Edge. The work for this item will include all materials and labor necessary in order to connect the proposed geomembrane to the existing Phase 1 and Phase 2 liner edge per the details. This item includes the additional work as shown in the Connection details, including select backfill, HDPE Flap, and additional geotextile over flap. HDPE geomembrane and 16-oz geotextile will be paid for under separate item. Twenty-four (24) inches of low permeable soils shall be paid for under separate item, additional low permeable soils beyond 2' of depth (approximately 1,275 cubic yards) shall be considered incidental to this item. Removal of existing MSW wastes from the liner edge area to be paid for under separate item. Existing liner edge coordinates and elevations are approximate only (±1'), no adjustments will be made to earthworks totals for actual location of existing liner edge.

e. Stormwater Control Liner

The stormwater control liner to be paid for will be the actual measured square footage of surface area for stormwater control liner installed at the unit price per square foot. The unit price will be the full compensation for all work including material, installation, seaming, and proper ballasting. The limits of measurement for this item will be to the certified liner edge. Any material located in the anchor trench or along the existing liner edge beyond the certified liner edge for MSW Phase 3 shall be considered incidental to this bid item.

01700.4.7 HDPE Leachate Collection System

a. Leachate Pump Station

Pump Station 1

The leachate pump station will be paid for each station installed at the unit price. The unit price will include all materials and installation including but not limited to pump, electrical control panel and junction box, control wiring from control panel to pump, line voltage wiring from control panel to pump, check valve, disconnects, gate valve, force main piping within the side slope riser, and connection to power supply. Force main piping from the exit point of the existing side slope riser to the discharge point in the leachate gravity system is included under a separate item.

Pump Stations 2 & 3

The leachate pump station will be paid for each station installed at the unit price. The unit price will include all materials and installation including but not limited to pump, **24" HDPE riser pipe**, electrical control panel and junction box, control wiring from control panel to pump, line voltage wiring from control panel to pump, check valve, disconnects, gate valve, force main piping within the side slope riser, and connection to power supply. Sump construction, including required #5 stone, 8-oz geotextile overlay, secondary layer of 60-mil geomembrane, and all fabric connections is considered incidental to this item. Piping within the sump is included under separate items. Force main piping from the exit point of the side slope riser to the discharge point in the leachate gravity system is included under a separate item.

b. Leachate Collection System Perforated HDPE Piping

The perforated HDPE piping will be paid for by the actual footage of each size of pipe installed at the unit price per linear foot. The unit price will include material and the installation of the piping, purchase, delivery, and placement of the No. 5 washed stone, and Geotextile wrap. Leachate piping in the sump area (except for 18" leachate pump station side slope riser) is included in this item. This item shall include the cost of welded caps where required.

c. Leachate Cleanouts

The leachate cleanouts will be paid for by the actual number of each size of cleanouts installed at the unit price for each. The unit cost will include the material and installation. The solid HDPE piping located on the slopes shall be considered incidental to the unit price for leachate cleanout.

d. Leachate Head Test Well

This item will be paid for the actual number of leachate head test wells installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to leachate collection piping within the sump. The leachate head test well measurement ends at the toe of the slope within the sump.

e. 3-inch Dual-Contained Force Main

The quantity of dual-contained force main to be paid for will be the actual linear footage of installed and tested force main at the unit price per foot, for each pipe size. The unit price will include the material, installation, and testing of the force main. HDPE force main is measured from the exit point of the 24" side slope riser to the connection point at proposed leachate collection system Manhole 2. Thrust blocks are considered incidental to this item. Additional force main within the side slope riser is included under separate item.

f. 8-inch Dual-Contained Gravity Sewer

The quantity of dual-contained gravity sewer to be paid for will be the actual linear footage of installed and tested force main at the unit price per foot. The unit price will include the material, installation, and testing of the pipe. HDPE gravity sewer shall be installed from the connection points adjacent to existing MSW Phase 2 and MSW Phase 1, Cell 4 to the discharge at the leachate storage lagoon. The cost of the connection to the existing gravity sewers shall be paid separately. The approximate 20 linear feet of dual-contained gravity sewer connecting the existing MSW Phase 1, Cells 1-3 gravity sewer to proposed Manhole 1 is included under a separate item.

g. Connection to Existing Dual-Contained Gravity Sewer

The item will be paid for on a lump sum basis for the connection to existing dual-contained gravity sewer at two connections, near existing MSW Phase 2 and existing MSW Phase 1, Cell 4. The lump sum price will include all materials and labor for connecting the proposed sewer to the existing sewer. Testing of dual-contained sewer is under a separate item. Connection of the existing gravity sewer near proposed Manhole 1 will be included under that item.

h. Leachate Gravity Sewer Manhole 1

This item will be paid for on a lump sum basis. The lump sum price will include all material and installation of Manhole 1, including the manhole, epoxy lining and connection to the proposed and existing gravity sewers, including the piping and connection from the existing gravity manhole, approximately 20 feet to the south of Manhole 1. Incidental to this item is a temporary plug and pump that will be used to pump leachate to the transport tanker while the leachate storage lagoon is off line. The County will provide the transport tanker and will be responsible for disposal of leachate.

i. Leachate Gravity Sewer Manhole 2

This item will be paid for on a lump sum basis. The lump sum price will include all material and installation of Manhole 2, including the manhole, epoxy lining and connection to the proposed gravity sewers and force main.

j. Leachate Storage Lagoon Modifications

This item will be paid for on a lump sum basis. The work associated with this item includes all of the materials and labor for raising the existing leachate lagoon approximately 3.25', as shown on the plans. Included in this item are the following: low permeable soils to meet hydraulic conductivity requirements, additional soils needed to reach final grade, all required 60-mil textured HDPE liner, all required 8-oz double-sided geocomposite, abandonment of existing leachate manholes, grouting of abandoned leachate sewer lines, installation and operation of temporary leachate pump installed in proposed manhole 1. The Owner will provide two 20,000 gallon Frac Tanks for the storage of leachate for a period of 30 calendar days after the leachate lagoon goes off-line. The Owner will be responsible for transporting leachate to the disposal point. After 30 calendar days that the leachate storage lagoon is off-line, the Contractor shall provide two 20,000 gallon Frac Tanks for the storage of leachate. The Owner will be responsible for transporting leachate to the disposal point during this time.

k. **Removal of Existing Leachate Collection System Manholes**

This item will be paid for the actual number of leachate collection system manholes removed at the unit price for each. The unit price will be the full compensation for removal of the structures and transporting the removed material to the location on site designated by the Landfill Manager. Incidental to this item is grouting the incoming and outgoing piping, all materials and labor. Also, incidental to this item is removal of the existing leachate collection system valve, located at the northeast margin of MSW Phase 3.

01700.4.8 Storm Drainage

a. Piping

The storm drain piping will be paid for by the actual footage installed at the unit price per linear foot for each size and type listed in the Bid Schedule. The unit cost will include the material and installation.

b. **Energy Dissipater, Structure S-2**

This item will be paid for the actual number of energy dissipater structures installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to inlet and outlet piping. Included in this item is the pre-cast drainage structure, #57 stone surrounding structure, filter fabric, ENFM grate will fasteners and supports, 4" discharge piping, and metal flashing and fasteners. Riprap and filter fabric at discharge will be paid for under riprap item. Piping other than 4" discharge will be paid for under storm drainage piping.

c. **Storm Drainage Structure S-3**

This item will be paid for the actual number of storm drainage structures installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to inlet and outlet piping. Included in this item are the pre-cast drainage structure and frame and cover.

d. **Concrete Endwalls (Headwalls)**

This item will be paid for the actual number of concrete endwalls installed at the unit price for each. The unit price will be the full compensation for materials and installation and connection to inlet and outlet piping.

e. Dri-Prime Diesel-Operated Stormwater Pump

The quantity of stormwater pump will be paid for on a lump sum basis, for the specified trailer-mounted diesel-operated pump and all appurtenances, including but not limited to, fittings, hoses, pump controller, and float assembly, if directed by the Engineer.

01700.4.9 Fencing

a. Removal of Existing Fencing

The quantity of existing fencing to be removed will be the actual linear footage removed and will be paid for at the unit price per linear foot listed in the Bid Schedule. Incidental to this item is cutting the fence posts and bundling the fencing. Removed posts and fencing shall be disposed on site at the location chosen by the Owner. The removal of concrete foundation and transportation to the location on-site designated by the Owner shall be considered incidental to this item.

b. Installation of New Fencing

This item shall be paid in accordance with the unit price listed in the Bid Schedule for the installation of new fencing. This shall include all materials, equipment, and labor for a complete installation of a new 8' chain link fence, per the detail.

c. Gates

This item shall be paid in accordance with the unit price listed in the Bid Schedule for each gate installed. This shall include all materials, equipment, and labor for a complete installation of a new 20' double-swing gate, per the detail.

01700.4.10 Liner Edge Markers

Liner edge markers will be paid for by the actual number installed at the unit price for each. The unit cost will include the material and installation.

01700.4.12 Electrical Installation

This item will be paid for on a lump sum basis. The lump sum price will include all materials and installation of the electrical service to the pump station control panels from the existing utility service pole.

01700.4.13 Removal and Replacement of Unsuitable Material

The quantity of removed and replaced unsuitable material to be paid for will be the actual quantity, in cubic yards, of unsuitable material removed and replaced that is below the subgrade elevation. This work shall not be performed unless directed by the Engineer. The Contractor will provide sufficient topographic survey before and after removal of unsuitable materials in order to make an accurate calculation of the unsuitable material removed and replaced. This item shall be paid for at the price per cubic yard given in the Bid Schedule for replacement with suitable earth fill or crushed stone, according to the material the Engineer directs the Contractor to use.

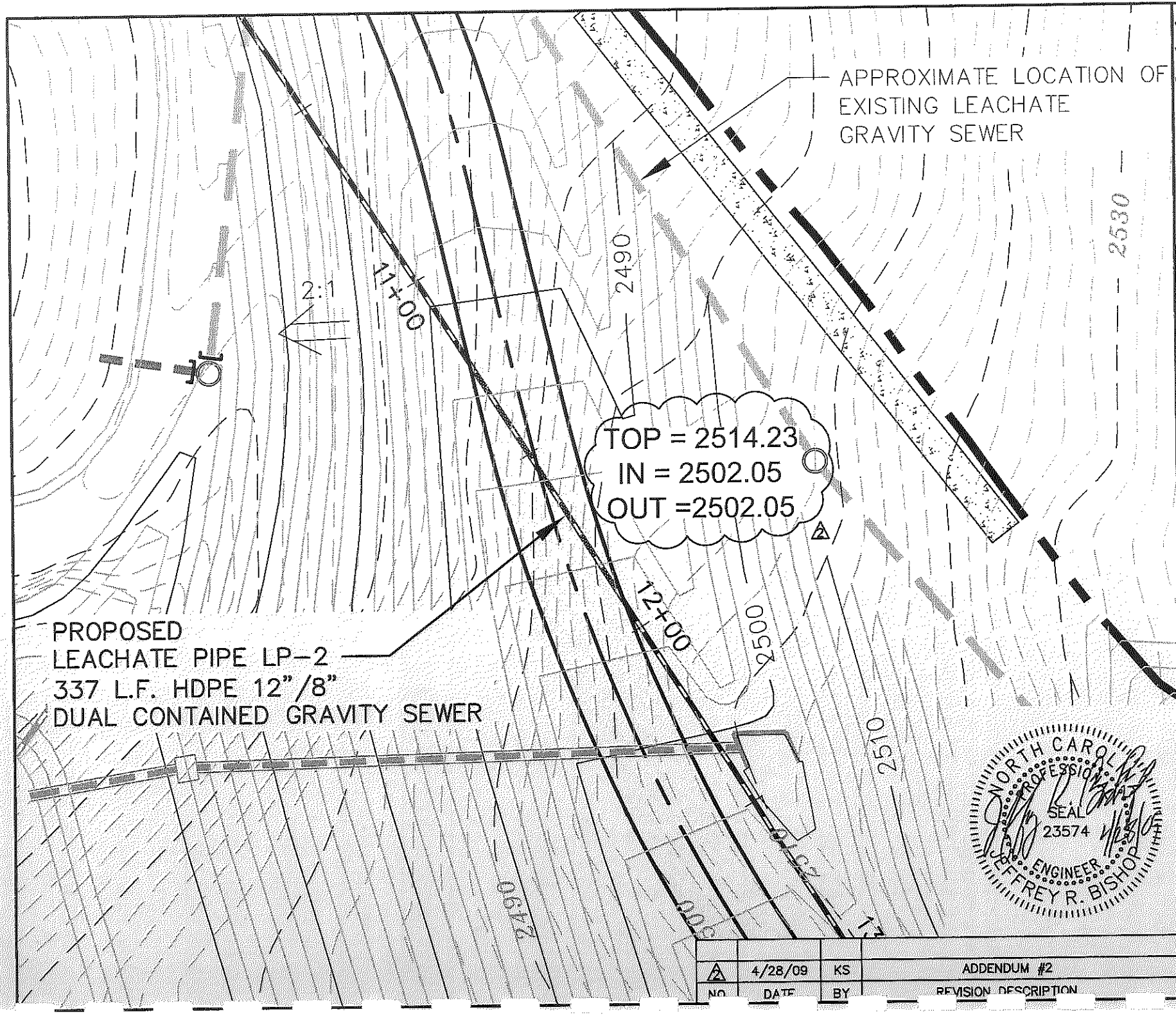
01700.4.14 Erosion Control Cash Allowance

An erosion control cash allowance of $25,000.00 has been included in the Bid Schedule to cover the cost of adding erosion control measures, unforeseen at this time. This could include temporary sediment traps, stormwater culverts, riprap for ditches and pipe outlets, and erosion control matting. The contractor will not be eligible for compensation of this allowance unless a proposal of cost for completing the work is submitted to the Engineer prior to beginning construction. The Contractor will be required to provide documentation for all expenses incurred.

01700.4.15 Rock Excavation

The quantity of excavated rock to be paid for will be the actual quantity, in cubic yards, of rock excavated, as defined in the specifications. This work shall not be performed unless directed by the Engineer. The Contractor will provide sufficient topographic survey before and after rock excavation in order to make an accurate calculation of the quantity removed.

END OF SECTION



NO	DATE	BY	REVISION DESCRIPTION
2	4/28/09	KS	ADDENDUM #2

NORTH CAROLINA PROFESSIONAL SEAL 23574 ENGINEER JEFFREY R. BISHOP

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC PH. (828) 252-0575

LEACHATE SEWER
PLAN - PROFILE

SHEET
C6

ADDENDUM NUMBER 3
TO
WHITE OAK MSW LANDFILL
MSW PHASE 3
HAYWOOD COUNTY, NORTH CAROLINA

This Addendum Number Three (3) is issued this the 29th day of April, 2009 to all parties who hold a set of Bid Documents for the project entitled **"White Oak MSW Landfill, MSW Phase 3, Haywood County, North Carolina"**. Each Bidder shall acknowledge receipt of this Addendum on his/her bid and shall incorporate all changes in their Bid.

The following changes and/or additions shall be made:

1. The **Bid** document was modified as follows: the **Bid Schedule** has been revised. New **Item 49, Pipe Bollards, 12 Each**, was added to the schedule. The bid items were renumbered to accommodate the addition of the new bid item.

2. **Specification 02720, Drainage Materials, Paragraph 02720-2.02B** has been revised to show that the 54-inch and larger pipes should be 10 gauge.

The following written questions were received from Contractors:

3. What item are the FES's carried under?

   There are not any FES's on the project.

4. What is the confining pressure for the insitu permeability test?

   Permeability tests shall be performed at a confining pressure of 25 p.s.i. ± 1 p.s.i., as noted in the Site Specific Quality Assurance Plan, Section 6.4.1.

5. No erosion control devices (silt fence, diversion ditches/berms, etc) are shown around any of the proposed stockpile areas. Will any erosion devices be required and if so how will they be paid? Proposed Stockpile Area #1 is shown on Sheet C1. What is the proposed quantity of material that can be stockpiled in this area?

   Erosion control measures, including silt fence, are shown on Sheet C5 around stockpile 2, which will hold the bulk of the stockpiled soils. Runoff from stockpile areas will run through the ditches shown on Sheet C5 to proposed sediment basins, or in the case of Stockpile 1, to an existing sediment basin. Stockpile 1 offers approximately 4,000 cy of soil storage volume. Due to the low volume of this stockpile, the area should be grassed immediately after filling. The

Contractor may install silt fence at his own expense around stockpile 1 if he chooses not to grass the area as soon as possible after filling.

6. On Sheet C1 there is a Limits of Disturbance line shown. Is this same line intended to be the limits of the clearing and grubbing for Bid Item #3 for 1 Lump Sum? At the prebid conference it was stated that ALL clearing and grubbing materials would be transported to the wood waste area located in the landfill. Specification 02102 for the clearing and grubbing do not mention this, please clarify?

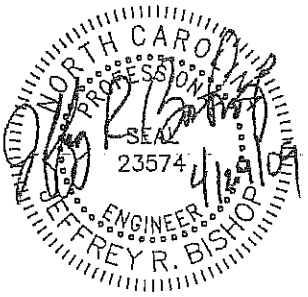
   The Contractor has to clear only that area required for grading, not necessarily to the limits of disturbance. The Contractor may not grade beyond the limits of disturbance shown. It is the intent of the Owner that all wood items cleared (including stumps) be transported to the Mulching and Grinding area shown on Sheet C1. Otherwise, cleared and grubbed material may be placed in stockpile 2, except for demolished manholes or piping, which are placed at the direction of the Landfill Manager.

7. Specification 02720-2.02B lists the minimum gauges for the CMP. Pipe run P1 for the project is 54" but the schedule calls for 36"-48" to be 12 gauge and 56" and larger to be 10 gauge. What should the gauge be for the 54" CMP?

   Specification 02720-2.02B should read "54" and larger pipes...10 gauge".

JEFFREY R. BISHOP, P.E.

McGILL ASSOCIATES, P.A.
CONSULTING ENGINEERS
ASHEVILLE, NORTH CAROLINA



BID

TO: **Haywood County**
81 Elmwood Way
Waynesville, North Carolina 28786

FROM:_____

_____

_____

of the City of _____, County of _____ and

State of _____, hereinafter called "Bidder".

PROJECT: **White Oak MSW Landfill, MSW Phase 3**

Gentlemen:

The bidder, in compliance with your Advertisement for Bids for the construction of the above-referenced project, having examined the Drawings and Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder declares that he has carefully examined the site of the proposed work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed work, and the difficulties attendant upon its execution, and that he has carefully read and examined the Drawings, the annexed proposed Agreement, and the specifications and other Contract Documents therein referred to, and knows and understands the terms and provisions thereof.

Bidder understands that information relative to existing structures, apparent and latent conditions, and natural phenomena, as furnished to him on the Drawings, in the Contract Documents, or by the Owner or the Engineer, carries no guarantee expressed or implied as to its completeness or accuracy, and he has made due allowance therefor.

TIME FOR COMPLETION AND LIQUIDATED DAMAGES: Bidder hereby agrees to commence work under this contract within 10 days of receipt of the Notice to Proceed

and to fully complete the project within **300** consecutive calendar days after the date of the Notice to Proceed.

Bidder also agrees to pay **$1,000.00/day** as liquidated damages for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

ADDENDA: Bidder acknowledges receipt of the following Addenda:

Addendum No. 1 Date: April 22, 2009
Addendum No. 2 Date: April 28, 2009
Addendum No. 3 Date: April 29, 2009

ITEM NO.	DESCRIPTION	QUAN.	UNIT	UNIT PRICE	TOTAL
1	Mobilization	1	LS		
2	**Silt Fence**	3,200	LF		
3	Clearing and Grubbing	1	LS		
4	Grassing	23	ACRE		
5	**Slope Matting on Slopes 2.5:1 or Steeper and Erosion Control Matting in Ditches**	19.7	ACRE		
6	Stone Check Dams	10	EA		
7	Sediment Basins 5, 6, & 7	3	EA		
8	Sediment Basin 4	1	LS		
9	Riprap, Including Ditches and Outlet Protection	2,100	CY		
10	Remove Existing Chain-link Fencing	3,170	LF		
11	Gravel Access Road	9,000	SY		
12	Truck Wash Area	140	SY		
13	**Underdrain Installation**	2,375	LF		
14	Earthworks (Approximately 310,000 cy cut, 80,000 structural fill, remainder to be stockpiled)	1	LS		
15	24-inch Compacted Clay	391,500	SF		
16	24-inch Washed Stone	391,500	SF		
17	Clay Liner Test Pad	2	EA		
18	60-mil HDPE Textured Membrane	391,500	SF		

19	16-ounce Geotextile Cushion	391,500	SF		
20	Permanent Liner Edge No. 1 & 1A (approx. 580 L.F.)	1	LS		
21	Temporary Liner Edge No. 2 (approx. 155 L.F.)	1	LS		
22	Temporary Liner Edge No. 3 (approx. 770 L.F.)	1	LS		
23	Connection to Existing Liner Edge (Approx. 1,150 L.F.)	1	LS		
24	Stormwater Control Liner	391,500	SF		
25	Leachate Pump Station 1	1	EA		
26	Leachate Pump Stations 2 and 3	2	EA		
27	6-inch Perforated HDPE LCS Pipe	1,450	LF		
28	8-inch Perforated HDPE LCS Pipe	2,850	LF		
29	6-inch Leachate Cleanout	4	EA		
30	8-inch Leachate Cleanout	5	EA		
31	Leachate Head Test Well	2	EA		
32	3-inch HDPE Dual-Contained Force Main	200	LF		
33	8-inch HDPE Dual-Contained Gravity Sewer	1,700	LF		
34	Leachate Gravity Sewer Manhole 1	1	LS		
35	Leachate Gravity Sewer Manhole 2	1	LS		
36	Leachate Gravity Sewer Connection to existing leachate gravity lines (2 locations)	1	LS		
37	8-inch PVC Stormwater Pump Discharge Pipe	90	LF		
38	12-inch Corrugated Metal Pipe	110	LF		
39	15-inch Corrugated Metal Pipe	45	LF		
40	18-inch Corrugated Metal Pipe	360	LF		
41	24-inch Corrugated Metal Pipe	380	LF		
42	30-inch Corrugated Metal Pipe	700	LF		
43	54-inch Corrugated Metal Pipe	60	LF		
44	18-inch HDPE Storm Drainage Pipe	80	LF		
45	**Energy Dissipater S-2**	1	EA		
46	**Storm Drainage Structure S-3**	1	EA		
47	**Concrete Endwalls**	4	EA		
48	**Remove Existing Leachate System Manhole**	5	EA		
49	**Pipe Bollards**	12	EA		
50	Raise Leachate Storage Lagoon	1	LS		
51	Raise Existing Leachate Gravity Manhole	3	EA		

52	Raise/Lower Existing Ground Water Monitoring Well	2	EA		
53	Liner Edge Marker (Permanent and Temporary)	10	EA		
54	Electrical Installation, Complete	1	LS		
				SUB-TOTAL	
	ADDITIONAL WORK IF ORDERED BY THE ENGINEER				
55	Erosion Control Cash Allowance	1	LS	##### #	$25,000.00
56	Removal and replacement of unsuitable material				
A	Suitable Earth Material	8,000	CY		
B	Crushed Stone (#57)	2,000	CY		
C	Geogrid (TerraGrid B120 by Hanes Geo Components, or approved equal)	50,000	SF		
57	**Rock Excavation**	**1,000**	**CY**		
58	Removal of MSW waste near existing liner edge	600	CY		
59	Installation of 8' Chain Link Fence	3,820	LF		
60	Installation of 20-foot Double-Swing Chain Link Gate	3	EA		
61	Dri-Prime Diesel-Powered Trailer-Mounted Pump and Appurtenances	1	LS		
				BID TOTAL	

The above unit prices shall include all costs for furnishing materials and labor complete, each item including all sales tax, labor cost, material cost, and cost of miscellaneous items.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closed time for receiving bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder will execute the formal Agreement attached within 10 days. Surety Bonds will be required for this project.

The undersigned declares that his firm is (delete those not acceptable):

A corporation organized and existing under the laws of the State of _____.

A partnership consisting of _____.

The undersigned declares that the person or person signing this proposal is fully authorized to sign the proposal on behalf of the firm listed and to fully bind the firm listed to all the conditions and provisions thereof.

It is agreed that no person or persons or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the contract that may be entered into as a result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

Respectfully Submitted:

_____

CONTRACTOR

(SEAL - if bid is by a Corporation)

_____

_____

Title

_____

_____

Address

NC General Contractor's License No. _____

Attest: _____

3. Underdrain or Pipe Bedding

4. Drainage Structure Castings

5. Precast Drainage Structures

1.05 WARRANTY

All pipe and materials shall be warranted for a period of one (1) year following installation and acceptance by the Owner.

PART 2: PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Reinforced concrete pipe shall conform to ASTM C-76, latest revision. Pipe shall be Class III with Wall B, unless otherwise noted. All pipe shall have interior surfaces free from roughness, projection, indentations, offset or irregularities of any kind.

B. Joint material for reinforced concrete pipe shall be either "O" ring type joints utilizing a rubber "O" ring, or bell and spigot type utilizing a mastic joint material equal to Ram-Neck.

2.02 CORRUGATED METAL PIPE

A. Corrugated metal pipe shall conform to AASHTO M-36, latest revision.

B. Corrugated metal pipe shall have 2-2/3" x 1/2" corrugations and shall be of the following minimum gauges:

18" and smaller pipes ..... 16 gauge
21" - 30" pipes ..... 14 gauge
36" - 48" pipes ..... 12 gauge
54" and larger pipes ..... 10 gauge

C. Corrugated Metal Pipe shall have rerolled ends to accommodate corrugated coupling bands. Coupling bands shall conform to NCDOT 932-3(A). Dimple bands shall not be used.

2.03 HIGH DENSITY POLYETHELENE PIPE

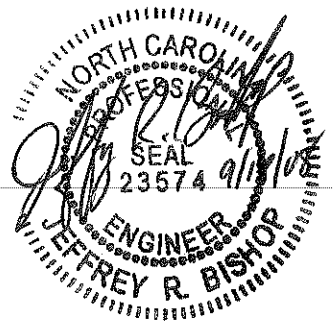
A. High density polyethylene pipe (HDPE) shall meet the requirements of AASHTO M294, Type S for 12" – 48" diameter and AASHTO MP7, Type S for 60" diameter. Joints shall be water-tight, per ASTM 3212, with gaskets per ASTM F477.

Section 3

SITE SPECIFIC CONSTRUCTION QUALITY ASSURANCE PLAN

WHITE OAK MSW LANDFILL
PHASES 3 & 4
HAYWOOD COUNTY, NORTH CAROLINA

JEFFREY R. BISHOP, P.E.



McGill ASSOCIATES

Engineering • Planning • Finance
Asheville, North Carolina

September 2008
Revised March 2009
Revised September 2009

07518

SITE SPECIFIC CONSTRUCTION QUALITY ASSURANCE PLAN

White Oak MSW Landfill
Haywood County, North Carolina
Phases 3 & 4

This Construction Quality Assurance Plan has been prepared as required under Rule .1617 and in accordance with Rule .1621.

1.0 INTRODUCTION

1.1 Project Background

The White Oak MSW Landfill Site is the current MSW landfill for Haywood County. The current project involves the construction of a 15.5-acre expansion referred to as Phases 3 & 4. Phase 3, consisting of 8.8 acres, will be constructed initially and will provide approximately 5 years of landfill airspace. Phase 4 will be constructed and brought on line as Phase 3 nears operational capacity. Phase 1 of the landfill began receiving wastes in October 1993. The current active waste area, Phase 2, began operation in November 2001. This project will include connecting to portions of the existing Phase 1 and Phase 2 liner edge. The Phases 3 & 4 Expansion will consist of structural fill to achieve the desired gradients followed by a compacted, low-permeability clay liner layer, a 60-mil high density polyethylene (HDPE) geomembrane liner, and an aggregate drainage layer. The White Oak Landfill site is located in Haywood County at 3898 Fines Creek Road (S.R. 1338).

1.2 Project Scope

The purpose of this Site Specific Construction Quality Assurance Plan (SSCQAP) is to provide guidance to McGill Associates and sub-contractor personnel on required documentation activities during the construction of the engineered Phase expansion. This guidance is intended to ensure that construction meets the requirements of Haywood County and the Project Construction Quality Assurance (CQA) Plan and project drawings and specifications.

The overall goals of the SSCQAP are to ensure that proper construction techniques and procedures are used to verify that the materials and installation techniques used meet Project CQA Plan and project drawings and specifications. Additionally, the program will identify and define problems that may occur during construction and ensure that these problems are corrected before the construction is complete. At completion of work, the program will culminate in a certification report, which documents that, the

clay liner and the geosynthetic liners have been constructed in substantial compliance with this SSCQAP and project drawings and specifications. The primary emphasis of the SSCQAP is careful documentation during the preparation and placement of the clay and the geosynthetic liner.

1.2.1 Scope of Services

The Scope of Services provided by CQA Consulting Firm for the construction of engineered base is as follows:

1. Pre-Construction materials evaluation (structural fill, clay liner, geosynthetics).
2. Structural Fill observation, testing, documentation, and verification of construction procedures.
3. Clay liner or geosynthetic clay liner (GCL) observation, testing, documentation, and verification of construction procedures.
4. Geosynthetic observation, testing, documentation, and verification of construction procedures.
5. Provide CQA Report and CQA Certification that Phases 3 & 4 was constructed in accordance with this SSCQAP.

1.2.2 Construction Schedule

Construction of Phase 3 shall be completed within 270 consecutive calendar days.

Description
Preconstruction Meeting
Underdrain Installation
Extension of Existing Leachate Gravity Sewer From Phases 1 & 2, Beneath Phase 3
Structural Fill Subgrade Installation
Primary Clay Liner or Geosysnthetic Clay Liner Installation
Primary Geomembrane Liner Installation
Primary Geotextile Cushion Installation
Installation of Leachate Collection System
Installation of Washed Stone Drainage Layer
Submit CQA Report and CQA Certification

2.0 Parties Involved

2.1 Haywood County

Contact: Mr. Stephen King, (828) 627-8042
Title: Haywood County Solid Waste Director

Contact: Mr. Mark Shumpert, P.E. (828) 356-2114
Title: Haywood County Engineer

Contact: Mr. David Cotton (828) 452-6625
Title: Haywood County Manager

2.2 McGill Associates, P.A.

Contact: Jeffrey R. Bishop, P.E. (828) 252-0575
Title: Project Engineer

2.3 General Contractor

Contact: Unknown

Title:

2.3.1 Surveyor

Contact: Unknown

Title:

2.3.2 Geosynthetic Manufacturer

Contact: Unknown

Title:

2.3.3 Geosynthetic Installer

Contact: Unknown

2.4 Construction Quality Assurance Consulting Firm

Contact: Unknown

Title:

2.4.1 CQA Certifying Engineer

Name: Unknown

Title:

CQA Resident Engineer

Name: Unknown

Title:

Geosynthetic Testing Laboratory

Contact: Unknown

Title:

2.4.4 Soils Laboratory (permeability testing)

Contact: Unknown

Title:

3.0 Preconstruction Meeting

A Preconstruction meeting will be held prior to the beginning of construction. The following people shall be present: Owner representative, Solid Waste Director, County Engineer, Project Engineer, Design Engineer, Certifying CQA Engineer/CQA Project Manager, Resident CQA Engineer, General Contractor, Geosynthetics Installer, and all other subcontractors.

The following items will be discussed at a minimum:

Any questions about the SSCQAP will be addressed and any modifications that result will be documented. Any modifications to the approved SSCQAP must be approved by the North Carolina Department of Environment, Health, and Natural Resources, Division of Waste Management, Solid Waste Section (DEHNR Solid Waste Section).

- Special permits and state and/or federal regulations.
- Responsibilities, expectations, and roles of each party.
- Lines of authority and proper lines of communication.
- Procedures for documenting and reporting information.
- Distribution and storage of documents and reports.
- Protocol for testing and geosynthetic sample management.
- Protocol for handling construction deficiencies.
- Protocol for repairs and re-testing.
- Conduct site walk through:

  Discuss work plans
  Inspect material handling and storage locations
  Review office facilities (copy machine, mailing, etc.)

- Review detailed time schedule for all operations.
- Review work area security, check-in procedure, and safety protocol.
- Establish procedures for material processing.
- Review site health and safety requirements.

The Preconstruction Meeting will be documented by McGill Associates and a copy of the meeting minutes will be distributed to all parties who attend.

4.0 Definitions

4.1 Construction Quality Assurance

A planned and systematic application of all means and actions designed to provide adequate confidence that items or services meet design and specifications requirements and will perform satisfactorily in service. In the context of the geosynthetic liner system, construction quality assurance refers to means and actions employed by the CQA Resident Engineer, CQA Senior Lead Technician, and the CQA Monitors to

ensure conformity of the liner system installation with guidelines set forth in the SSCQAP, construction plans, and construction specifications.

4.2 Construction Quality Control

Those actions which provide a means to measure and regulate the characteristics of an item or services to design, and specifications requirements. In the context of the geosynthetic liner system installation, quality control refers to those actions taken by the Geosynthetic Contractor/Manufacturer to ensure that the product and the workmanship meets the requirements set forth in the SSCQAP, construction plans, and construction specifications.

4.3 Design Engineer

The individual or firm responsible for the preparation of this SSCQAP, construction drawings, and construction specifications.

4.4 Project Engineer

The individual or firm responsible for the implementation of this SSCQAP, construction drawings, and construction specifications.

4.5 General Contractor

The firm responsible for the complete construction of the soil and geosynthetic components of the landfill as specified in this SSCQAP and as shown on the construction drawings and construction specifications.

4.6 Construction Quality Assurance Consultant

The firm responsible for observing, testing and documenting activities related to construction quality assurance during the installation of the leak detection layer, clay liner, geomembrane liner, and the leachate collection system. The CQA Certifying Engineer is responsible for issuing a summary certification and documentation report bearing his/her Professional Engineering Seal. The CQA Resident Engineer is responsible for the management of on-site CQA personnel and providing the Project Engineer and Owner with a daily report of the construction activities.

5.0 DOCUMENTATION PROCEDURES

5.1 Standard Reporting Procedures

The CQA Technicians shall issue a daily report of construction activities. These reports shall include, as a minimum, the following information:

An identifying sheet number for cross-referencing and documentation control.

Date, project name, location and other identification.

1. Weather conditions.

2. Problems encountered and resolutions.

3. Descriptions and locations of ongoing construction.

4. Equipment and personnel in each work area, including subcontractors.

5. Descriptions and specific locations of areas or units of work being tested and/or observed and documented (identified by coordinates or seam/panel numbers).

6. Locations where samples were taken.

7. A summary of test results, failures, and re-tests.

5.2 Monitors of geosynthetic installation shall perform and/or provide the following information and services:

a. Material delivery (time, date, and physical condition of material)
b. Unloading and on-site storage and transport
c. Sampling for conformance testing
d. Deployment operations (roll #, panel #, approved QA\QC cert, thickness, overlap, defects, etc.)
e. Seam preparation (proper overlap and cleanliness)
f. Seaming operations (seaming method, seam#, welding technician, welding apparatus #, welder settings, ambient temperature, chronological order of seams welded, seam length, etc.)
g. Conditions of panel before and after placement
h. Locate and document all defects in the geosynthetic material.
i. Repairs (location, method, technician, date, etc.)
j. Trial seams (monitor preparation and testing)
k. Nondestructive testing (visual observation and documentation)
l. Sampling for destructive seam testing (locating test location)
m. Final walkovers (confirm defect repairs)

5.3 Applicable Forms

As a minimum, the CQA monitors will utilize the following forms for the project:

1. Daily Field Report
2. Weekly Progress Report
3. Nuclear Density Testing
4. Drive Cylinder Test Report
5. Soil Testing Tracking Log
6. Certificate of Acceptance of Soil Subgrade
7. Geosynthetic Materials Inventory Checklist
8. Weather Log
9. Trial Weld Form
10. Panel Deployment
11. Panel Seaming
12. Nondestructive Seam Testing
13. Destructive Sample Test Log
14. Geosynthetic Defect Log
15. Geosynthetic Repair Log
16. Construction Site Safety Form
17. Construction Photo Log
18. Certificate of Completion

5.4 Problem/Deficiency Identification and Corrective Action Report

The CQA Monitor is required to inform the General Contractor and/or the Geosynthetic Contractor, or their representatives, in a timely manner, of any difference between the interpretation of the SSCQAP, the construction plans and construction specifications by the contractor versus the CQA Monitor's interpretation. In addition, any actual or suspect work deficiencies shall be brought to the Project Engineer's and Owner's attention.

A special meeting shall be held when and if a problem or deficiency is present. At a minimum, the meeting shall be attended by the General Contractor, the Owner, the Project Engineer, the CQA Resident Engineer, and the CQA Monitor. If the problem involves a possible design modification, the Design Engineer shall be notified. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:

1. Define and discuss the problem or deficiency

2. Review alternative solutions
3. Implement an action plan to resolve the problem or deficiency

The CQA Resident Engineer or his representative will document all proceedings.

Any changes and/or modifications to the SSCQAP must be approved by the Owner, Design Engineer, Project Engineer, CQA Certifying Engineer, and the DEHNR Solid Waste Section.

5.5 Plan Modifications

Design and/or specification changes shall be made only with written approval of the Owner, the Design Engineer and the Project Engineer. Substantial design changes shall also require approval from the DEHNR Solid Waste Section.

5.6 Scope Change

The CQA Resident Engineer shall notify the Project Engineer whenever additional engineering services are requested by Owner that exceed the original scope of services.

5.7 Photographic Documentation

Photographs taken to document observations, problems, and/or deficiencies, or work in progress will include identification of the date, location, direction of view, and time period. Photographs will be filed in chronological order in a permanent protective file by the CQA team. One set of prints shall be turned over to both the Owner and Project Engineer at the conclusion of the project.

The permanent file will also contain a comprehensive index of each photo, which the CQA Monitor is responsible for preparing and maintaining. This index will include the following information:

1. Date of photograph
2. Provide a location and scale where photographed, including information regarding the orientation of the photograph itself for proper viewing
3. Subject description
4. Photo file number

The following is a list of minimum photographs to be taken during cell construction:

1. Subgrade/subbase proof rolling
2. Geosynthetic conformance sampling

3. Geomembrane deployment
4. Fusion welding devices
5. Extrusion welding devices
6. Air testing
7. Vacuum box testing
8. Seaming
9. Destructive sample location and removal
10. Trial welds
11. Tensiometer testing
12. Geotextile deployment
13. On-site lab soil testing
14. Drainage Layer Construction
15. Progress photographs
16. Design modifications
17. Construction deficiencies
18. Completed construction

5.8 Final Construction Documentation Report

During placement of the drainage layer and stormwater control liner, the CQA Resident Engineer shall prepare a final certification-documentation report covering the installation and testing of the clay and geosynthetic lining system. This report shall certify that the clay or GCL system and geosynthetic liner system has been constructed in substantial accordance with this SSCQAP, the construction drawings, and the construction specifications. A Draft Copy of this report shall be issued to the Project Engineer following completion of the lining system. The final report shall be issued to the Project Engineer following completion of the drainage layer. For this project, two (2) copies of the draft version, five (5) copies of the final version of the report, and a digital copy of the final version of the report, complete with all attachments shall be issued.

5.9 Format of CQA Report

As a minimum, the certification report will contain the following items for discussion in the narrative portion of the report. The proposed table of contents is:

5.9.1 Table of Contents

Section

1.0 Summary of Information

1.1 Narrative
1.2 Reference Information

2.0 Soil Preconstruction Data (embankment and clay liner)

2.1 Proctors
2.2 Soil Density/Moisture
2.3 Soil Classification

3.0 Subgrade Field Data

3.01 Moisture Content
3.02 Field Density Testing

3.1 Clay Liner or GCL Field Data

3.21 Moisture Content
3.22 Field Density Testing
3.23 Permeability Testing

4.0 Soil Laboratory Data

4.1 Construction Proctors
4.2 Soil Classification
4.3 Permeability

5.0 Geosynthetic Quality Control

5.1 Manufacturer's Q.C.
5.2 Installer Resumes
5.3 Material Conformance Testing

6.0 Geosynthetic Liner Field Data

6.1 Weather Log
6.2 Trial Welds
6.3 Panel Placement
6.4 Panel Seaming
6.5 Non-Destruct Test
6.6 Destruct Test
6.7 Repair Log
6.8 Installed Quantities

6.9 Defect Location Map

7.0 Protective/Drainage Layer Data

7.1 Preconstruction testing

7.2 Field and laboratory testing

7.2.1 Sieve analysis
7.2.2 Permeability testing

8.0 Project Meeting Minutes

9.0 Construction Photographs

10.0 Pertinent Information

5.9.2 List of Drawings

As a minimum, the certification will include in an appendix the following proposed list of drawings:

- Geomembrane Panel Layout
- Defect Location Map
- Map giving elevation of subgrade, clay or GCL liner, and drainage layer at a maximum frequency of every fifty (50) feet and a maximum frequency of every fifty (50) feet along grade breaks.

5.10 Site Surveying Requirements

The CQA Resident Engineer shall coordinate all survey activities with the surveyor, provided by the Contractor. Survey services will be required for initial site layout, final grade verification, and primary geomembrane as-built survey. All grade surveying shall be conducted on a maximum 50-foot grid and a maximum 50-foot frequency along grade breaks. The certification surveys will be as directed by the CQA Resident Engineer and shall include the following items:

- Panel placement and seaming locations
- Location of destructive testing samples
- Location of all significant repairs
- Topographic survey of base grades
- Topographic survey of top of clay or GCL liner
- Topographic survey of top of drainage layer

6.0 LANDFILL CONSTRUCTION-EARTHWORK

6.1 Subgrade/ Structural Fill Preparation

6.1.1 Subgrade

Subgrade preparation shall be performed by the General Contractor and in accordance with the construction drawings and construction specifications.

The General Contractor shall be responsible for preparing the subgrade prior to placement of the base liner system and is responsible for constructing the subgrade in accordance with the technical specifications.

Before beginning placement of the Compacted Clay Liner:

1. The Resident CQA Engineer shall document that a licensed land surveyor has verified that all grades and elevations are consistent with the DEHNR Solid Waste Section approved engineering plans.

2. The Resident CQA Engineer shall document that he/she has visually inspected the subgrade surface to evaluate its suitability and that the subgrade meets the criteria specified in the project specifications.

3. The prepared subgrade shall be proof-rolled using a smooth-drum roller (minimum 20 tons) making a minimum of two (2) passes in each direction or other procedures and equipment approved by the Project Engineer.

4. The Resident CQA Engineer shall document that the subgrade has been tested for conformance to the construction specifications at the following minimum frequencies:

Construction Testing SUBGRADE TESTING FREQUENCIES		
TEST	ASTM METHOD	QUANTITY
Field Density	D6938, D1556, D2937	1/5,000 YD^3
Field Moisture	D2216, D6938, D4643	1/5,000 YD^3

6.1.2 Structural Fill

Structural fill shall be the soil placed to achieve the design subgrade contours. The subgrade will be tested for field density and field moisture content at a minimum frequency of one (1) test per 5,000 cubic yards placed. Testing will also consist of visual observation and documentation of proof-rolling with a smooth-drum roller (minimum 20 tons) with at least two (2) passes in each direction or by other procedures and equipment approved by the Project Engineer. If a nuclear gauge is used as the primary means of construction testing, the instrument shall be calibrated properly and test data shall be verified using alternate test methods such as drive cylinders. An alternate test method shall be used at least once for every hundred tests performed with the nuclear gauge. The alternate test method should be performed in the same area as an instrument reading in order to allow accurate comparison of the data resulting from the two tests.

Preconstruction Qualification Structural Fill		
Test	**ASTM Method**	**Quantity**
Natural Moisture Content	D2216	1/5,000 YD^3
Laboratory Compaction	D698	1/5,000 YD^3

Construction Testing STRUCTURAL FILL TESTING FREQUENCIES		
TEST	ASTM METHOD	QUANTITY
Field Density	D6938, D1556, D2937	1/5,000 YD^3
Field Moisture	D2216, D6938, D4643	1/5,000 YD^3

6.2 Select Backfill Placement and Testing

Select backfill will be utilized on a limited basis in berms near the liner edge and at anchor trenches. This material will have the same preconstruction and testing requirements as the subgrade, with the exception that the preconstruction and construction testing will have to be performed to show conformance with the Maximum Particle Size requirements. The testing requirements are as follows:

Preconstruction Qualification		
Test	**ASTM Method**	**Quantity**
Natural Moisture Content	D2216	1/5,000 YD^3
Laboratory Compaction	D698	1/5,000 YD^3
Grain Size Analysis	D422	1/5,000 YD^3
*** Preconstruction test samples shall be taken from the borrow source and or clay stockpiled prior to construction.**		
Construction Testing		
Test	**ASTM Method**	**Quantity**
Field Density	D6938, D1556, D2937	1/5,000 YD^3
Field Moisture	D2216, D6938, D4643	1/5,000 YD^3
Grain Size Analysis	D422	1/5,000 YD^3

6.3 Compacted Clay Liner Material

The Compacted Clay Liner shall consist of low-permeability soils placed on the prepared subgrade.

Table 1 - QA Testing Frequencies and Criteria for Compacted Clay Liner Layer

Preconstruction Qualification		
Test	**ASTM Method**	**Quantity**
Natural Moisture Content	D2216	1/1,000 YD^3 or Change in Material
Grain Size Analysis	D422 or D1140	1/5,000 YD^3 or Change in Material
Classification	D2487	1/5,000 YD^3 or Change in Material
Atterberg Limits	D4318	1/5,000 YD^3 or Change in Material
Laboratory Compaction	D698 - Standard	1/5,000 YD^3 or Change in Material
Permeability **	D5084	1/10,000 YD^3 or Change in Material Three per Moisture-Density Curve

*** Preconstruction test samples shall be taken from the borrow source and or clay stockpiled prior to construction.**

** The Moisture-Density Curve shall show the region in which the required maximum permeability is met. A minimum of three (3) permeability tests (ASTM D5084) shall be performed per curve to establish the zone of acceptable moistures and densities at which the required maximum permeability may be achieved. If the Contractor elects to run multiple curves to enlarge the zone of acceptance, all curves must be submitted.

Construction Testing		
Test	**ASTM Method**	**Quantity**
Field Density	D6938, D1556, D2937	1/10,000 FT^2/Lift
Field Moisture	D2216, D6938, D4643	1/10,000 FT^2/Lift
Classification	D2487	1 per acre per lift
Permeability	Extracted per D1587 Tested Per D5084	1/40,000 FT^2/Lift
Atterberg Limits	D4318	1/5,000 YD^3
Grain Size	D422 or D1140	1/5,000 YD^3
Maximum particle Size		3- inch diameter (lower 18 inches) 1/4-inch diameter (top 6 inches)
Soil Layer Thickness	Observation, Field Measurement	Continuous Observation, Minimum of Five (5) per Lift

If a nuclear gauge is used as the primary method for construction testing of the clay liner, the test data shall be verified by alternate test methods at least once for every 10 tests performed.

Any modifications made to these testing frequencies will require prior approval from the DEHNR Solid Waste Section.

Clay liner material generally consists of cohesive soils with low hydraulic conductivity used as barriers in lining systems. Soils used in clay liners shall consist of clean, select material free of debris, excessive coarse particles or other deleterious matter. Soils with a visibly identifiable organic content, or soils classified according to the Unified Soil Classification System as organic silt or organic clay (OL, OH) shall not be used.

Any tests resulting in the penetration of the compacted clay liner shall be repaired by backfilling the test area with a hand-tamped 50/50 bentonite/clay mixture.

6.4 Clay Liners

Prior to the construction of a clay liner, soil evaluation tests shall be performed to confirm the adequacy of clay liner materials procured from each on-site or off-site source area. All tests shall be performed in a geotechnical laboratory. The General Contractor shall submit the results of source evaluation tests to the Project Engineer. Previous testing and evaluations of the soil sources may also be used to evaluate the soil material. The material shall be accepted or rejected by the Project Engineer according to these results. The acceptance and rejection criteria for the clay liner material will be verified by the construction of a test pad in accordance with the construction specifications

6.4.1 Quality Assurance Testing

Permeability tests shall be performed at a confining pressure of 25 psi +/- 1 psi and with a gradient in accordance with ASTM method D5084. Samples taken from each location shall be compared to the approved moisture-density-permeability relation. Test frequencies for construction testing are given in Table 1 of Section 6.3. The Resident CQA Engineer shall certify that the clay liner was constructed using the same methods and acceptance criteria consistent with test pad construction and tested according to the DEHNR Solid Waste Section approved plans.

6.4.2 Test Pad Construction

The test pad shall be constructed in accordance with the technical specifications. The results of the test pad testing shall be in accordance with Table 1 in Section 6.3 and the previously approved moisture-density-permeability relationship established from

preconstruction testing. Field moisture and density tests and laboratory permeability tests will be performed by the Resident CQA Engineer for each lift placed on the test pads to verify the construction method, equipment, and material to achieve the maximum required permeability for the clay liner. If the contractor chooses to construct the test pads within the cell, all lifts of the test pads must pass to enable them to remain as part of the clay liner. The Contractor shall allow sufficient time for construction and testing of the test pad prior to placement of the Compacted Clay Liner.

6.4.3 Clay Liner Placement

The clay liner shall be placed in accordance with Section 02300 of the technical specifications.

6.4.4 Clay liner Acceptance

The Resident CQA Engineer must approve the condition of the clay liner prior to the geosynthetic installer deploying the geomembrane.

The soil components of the lining system will be approved by the Resident CQA Engineer when:

1. The installation of the soil components is finished.

2. Verification of the adequacy of the constructed components, including repairs, if any, is completed in accordance with this SSCQAP and the technical specifications.

All documentation of installation is completed.

The depth and grade of the clay liner has been verified by a licensed surveyor and has been approved by the project engineer.

3. The appropriate frequency of permeability tests have been performed and the results have been approved by the Certifying CQA Engineer.

4. The Soil QA Monitors shall certify that installation of the soil components has proceeded in accordance with this SSCQAP and the Technical Specifications.

6.5 Granular Drainage and Protective Layer

The Granular Drainage and Protective Layer will be the twenty-four (24) inch layer of material placed directly over the liner system to provide protection for the liner system as well as a drainage conduit for leachate drainage. The testing requirements are as follows:

Testing Frequencies and Criteria for Granular Drainage and Protective Layer

Preconstruction Qualification		
Test	**ASTM Method**	**Quantity**
Moisture Content	D2216	1 per source***
Grain Size	D422 or D1140	1 per source***
Classification	D2487	1 per source
Calcium Carbonate	D4373	1 per source
Permeability	D2434	1 per source
***In addition to quarry certificate		
Construction Testing		
Test	**ASTM Method**	**Quantity**
Grain Size	D422	1/1,500 YD^3
Permeability	D2434	1/6,000 YD^3

6.6.2 Placement

Placement of the granular drainage layer shall be performed by a low ground pressure dozer and/or off-road dump truck not in direct contact with the geomembrane. A minimum depth of 2 feet of drainage layer material must be maintained at all times during placement activities when vehicles other than the low ground pressure dozer are needed. High traffic areas, such as access roads constructed to transport material into the landfill, should have a minimum depth of three (3) feet.

The drainage layer shall be placed in the coolest part of the day when possible in order to reduce the potential for wrinkles forming in the geomembrane. See Sections 1.4.2 and 1.1.5 of Appendix B for information on evaluating and repairing wrinkles in the geomembrane.

The Resident CQA Engineer will observe placement activities. The General Contractor is to provide laborers ahead of drainage material placement to assist in minimizing wrinkle formation of the geomembrane. Temperature variations may impact the Contractor's ability to place this material.

6.6.3 Depth Verification

CQA Monitor(s) will randomly verify granular drainage layer depth utilizing test pits or survey means. A Surveyor licensed in the State of North Carolina will survey the top of the drainage layer to certify proper depth was achieved. The General Contractor may use depth markers (i.e., painted tubes, flags, traffic cones, etc.) during placement to provide depth control and minimize possible damage to geomembrane. Depth markers shall be removed as the drainage layer is completed. Depth markers shall not be constructed of a material that could potentially puncture the geomembrane and shall be approved by the Project Engineer.

7.0 LANDFILL CONSTRUCTION-GEOMEMBRANE

7.1 Geomembrane Liner

The geosynthetic components of the lining system will be approved by the Resident CQA Engineer when:

The installation of the geosynthetic components has been completed in accordance with this SSCQAP and the Technical Specifications.

Verification of the adequacy of all seams including associated testing and repairs, if any, is completed in accordance with this SSCQAP and the Technical Specifications.

1. All documentation of installation is completed.

2. The Geosynthetic CQA Monitor(s) are able to recommend acceptance.

7.2 Geomembrane Quality Control

The Geosynthetic Contractor/Manufacturer will provide geosynthetic quality control in accordance with Appendix A.

7.3 Geomembrane Quality Assurance

7.3.1 Conformance Sampling

Conformance testing will be done on-site as material arrives and is inventoried. Conformance sampling procedures will be in accordance with Appendix A.

7.4 Geomembrane Seaming

Field seaming will be done in accordance with Appendix B.

7.4.1. Double Tracked Fusion Welding

All seaming performed shall utilize the double-tracked fusion process when possible. Detailing and repairs do not require double tracked fusion welding.

7.4.2 Extrusion Welding

Extrusion welding shall only be used when double-tracked fusion welding is not possible. The extrusion process will be utilized for repair or detail work, attaching temporary rain flaps, capping a failed seam, or completion of other appurtenances that cannot be performed with fusion welding.

7.5 Geomembrane/Seam Repairs

All repairs to the geomembrane or seams shall be done utilizing the extrusion welding process. All repair work shall be conducted in accordance with Appendix B.

7.6 Geotextile Quality Control

The Geosynthetic Contractor/Manufacturer shall provide quality control information in accordance with Appendix C.

7.7 Geotextile Quality Assurance

Conformance sampling will be performed on-site as material arrives and is inventoried. All conformance sampling will be in accordance with Appendix C.

8.0 LEACHATE COLLECTION PIPING

8.1 Definition and Applicability

Leachate Collection Piping pertains to the High Density Polyethylene Pipe (HDPE) pipe utilized in the collection and transmission of leachate and/or other contaminated liquids generated as a byproduct of the disposal of MSW.

8.2 Quality Control Documentation

Prior to the shipment of any HDPE pipe, the Manufacturer shall provide the Resident CQA Engineer with the following information:

1. A specification for the HDPE pipe that includes all properties contained in the Project Technical Specifications measured using the appropriate test methods.

2. At a minimum, results shall be given for the following:

Property	Test Method	Frequency
Relative Density	ASTM D1505	Per Shipment
Melt Index	ASTM D1238	Per Shipment
Carbon Black Content	ASTM D3350	Per Shipment
Tensile Strength at Yield	ASTM D638, Type IV	Per Shipment
Elastic Modulus	ASTM D638	Per Shipment

The Manufacturer shall identify all HDPE pipe products with the following:

Manufacturers Name
Product Identification
Size
SDR Rating

The Resident CQA Engineer shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The Resident CQA Engineer shall verify that:

Property values submitted by the Manufacturer meet the required Project Technical Specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

HDPE pipe products are appropriately labeled.

Appendix A

1.0 Geomembranes

1.1 Description and Applicability

Geomembranes are low permeability geosynthetic barriers used in lining systems. This Section is applicable to smooth and textured high density polyethylene (HDPE) geomembranes. This Section may need to be modified when using other geomembranes.

1.2 Manufacturing Plant Inspection

The Owner or other appropriate representative may conduct an inspection of the Manufacturer's plant. In addition, the Project Engineer, or his designated representative, may visit the manufacturing plant for a project-specific inspection if deemed necessary. If possible, the project-specific inspection shall be prior to or during the manufacturing of the geomembrane rolls for that particular project. The purpose of the plant inspection is to review the manufacturing process and quality control procedures.

The manufacturing plant inspection shall include:

Verification that properties guaranteed by the manufacturer are met and meet all the project specifications.

Verification that the measurement of properties by the Manufacturer is properly documented and test methods used are acceptable.

Spot inspection of the rolls and verification that they are free of imperfections or any sign of contamination by foreign matter.

Review of handling, storage, and transportation procedures, and verification that these procedures will not damage the geomembrane.

Verification that roll packages have a label indicating the name of the manufacturer, type of geomembrane, thickness, roll number, and roll dimensions.

Verification that extrusion rods and/or beads are produced from the same base resin type as the geomembrane.

A report describing the inspection shall be retained by the Owner and by the Project Engineer for project-specific inspections.

1.3 Quality Control Documentation

Prior to the shipment of any geomembrane, the Manufacturer shall provide the Resident CQA Engineer with the following information:

1. The origin (supplier's name and production plant) and identification (brand name and number) of the resin used to manufacture the geomembrane.

2. Copies of dated quality control certificates issued by the resin supplier.

3. Results of tests conducted by the Manufacturer to verify that the resin used to manufacture the geomembrane meets the project specifications.

4. A statement indicating that the amount of reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness.

5. A list of the materials that comprise the geomembrane, expressed in the following categories as percent by weight: polyethylene, carbon black, other additives.

6. A specification for the geomembrane that includes all properties contained in the project specifications measured using the appropriate test methods.

7. Written certification that minimum values given in the specification are guaranteed by the Manufacturer.

8. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for the following:

Property	Test Method	Frequency
Thickness	ASTM D-5199 (Smooth) ASTM D-5994 (Textured)	Each Roll
Relative Density	ASTM D-1505	Every 5th roll
Tensile Properties	ASTM D6693 Type IV	Every 5th roll
Tear Resistance	ASTM D1004 Die C	Every 5th roll
Puncture Resistance	ASTM D-4833	Every 5th roll
Carbon Black Content	ASTM D-1603	Every 5th Roll
Carbon Black Dispersion	ASTM D-5596	Every 5th Roll

The Manufacturer shall identify all rolls of geomembranes with the following:

Manufacturer's name
Product identification
Thickness
Roll number
Roll dimensions

The Resident CQA Engineer shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The Resident CQA Engineer shall verify that:

Property values certified by the Manufacturer meet all of its guaranteed specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.

Rolls are appropriately labeled.

Certified minimum properties meet the project specifications.

1.4 Conformance Testing

1.4.1 Sampling Procedures

Upon delivery of the rolls of the geomembrane, the Resident CQA Engineer shall ensure that conformance test samples are obtained for the geomembrane. The geomembrane rolls to be sampled shall be selected by the Resident CQA Engineer. Samples shall be taken across the entire width of the roll judged by the Resident CQA Engineer not to be damaged. Unless otherwise specified, samples shall be 3 ft (1 m) long by the roll width. The Resident CQA Engineer shall mark the machine direction on the samples with an arrow.

A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. Alternatively, a lot may be designated by the Certifying CQA

Engineer based on a review of all roll information including quality control documentation and manufacturing records.

If the Project Engineer desires, the Resident CQA Engineer can perform the conformance test sampling at the manufacturing plant. This may be advantageous in expediting the installation process for very large projects.

Unless otherwise specified in the project specifications, samples shall be taken at a rate of one per lot and not less than one per 100,000 ft^2 (10,000 m^2) of geomembrane. These samples shall be forwarded to the Resident CQA Engineer for testing.

1.4.2 Conformance Tests

The following conformance tests shall be conducted:

Relative Density (ASTM D-1505)
Carbon black content (ASTM D-1603)
Carbon black dispersion (ASTM D-5596)
Thickness – Smooth (ASTM D-5199)
Thickness - Textured (ASTM D-5994)
Tensile properties (ASTM D-6693, Type IV)

Other conformance tests may be required by the project specifications.

1.4.3 Test Results

All conformance test results shall be reviewed and accepted or rejected by the Certifying CQA Engineer prior to the deployment of the geomembrane. The Certifying CQA Engineer shall examine all results from laboratory conformance testing and shall report any non-conformance to the Project Engineer. The Certifying CQA Engineer shall be responsible for checking that all test results meet or exceed the property values listed in the project specifications.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out-of-specification and rejected. Alternatively, at the option of the Project Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting the project specification. This procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line. To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next large roll number)

shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

1.5 Geomembrane Specifications

1.5.1 Materials

The geomembrane materials used for construction shall be in strict accordance with the technical specifications.

1.5.2 Construction

The geomembrane liner shall be installed as soon as practical after completion and approval of the compacted clay liner or portion thereof. The top of the compacted clay liner will be surveyed to ensure adequate thickness of clay material and proper grades toward the collection sump area have been achieved. The geomembrane is to cover the bottom of the secure cell and the side slopes in accordance with the Contract Drawings.

Areas to receive liner installation should be relatively smooth and even, free of ruts, voids, etc., to the extent required by the Engineer. This shall be accomplished by final dressing of the compacted liner with smooth drum rollers. No vehicles are permitted on final dressed surfaces unless authorized by the Engineer.

An anchor trench (as illustrated on the Contract Drawings) will be required to secure the geomembrane. No loose soil will be allowed to underlie the geomembrane in the anchor trenches. The time schedule for excavation and backfilling of the anchor trenches is to be approved by the Engineer so that desiccation of trench soils does not occur prior to backfilling.

Before the geomembrane installation begins, the Resident CQA Engineer shall verify that:

1) A State of North Carolina licensed Professional Land Surveyor has verified all lines and grades of the compacted clay liner.

2) A qualified and licensed Professional Engineer has verified that the clay liner surface meets the criteria specified in the project specifications.

3) The clay liner surface to be lined has been rolled, compacted, or hand-worked so as to be free of irregularities, protrusions, loose soil, and abrupt changes in grade.

4) The surface of the clay liner does not contain stones, which may be damaging to the geomembrane.

5) There is no area excessively softened by high water content.

6) There is no area where the clay liner surface contains desiccation cracks, which may damage the geomembrane.

7) The clay liner has sufficient thickness and that all permeability tests have not exceeded the specified maximum permeability.

8) The geomembrane to be deployed has an absolute minimum thickness of 60 mils and passing conformance samples at the frequencies specified in Section 1.4.1 of this Appendix B and be documented .

The Installer shall certify in writing that the surface on which the geomembrane will be installed is acceptable. A certificate of acceptance shall be given by the Installer to the Resident CQA Engineer prior to commencement of geomembrane deployment in the area under consideration. The Certifying CQA Engineer shall be given a copy of this certificate by the Resident CQA Engineer.

After the underlying soil has been accepted by the Installer, it is the Installer's responsibility to indicate to the General Contractor any change in the underlying soil condition that may require repair work. The General Contractor will consult with the Resident CQA Engineer regarding the need for repairs. If the Resident CQA Engineer concurs with the Installer, the General Contractor shall ensure that the underlying soil is repaired.

At any time before or during the geomembrane installation, the Resident CQA Engineer shall indicate to the General Contractor any locations which may not be adequately prepared for the geomembrane.

The Resident CQA Engineer shall verify that the **anchor trench** is constructed in accordance with the following:

1) The anchor trench has been constructed according to the project plans and specifications.

2) If the anchor trench is excavated in a clay material susceptible to desiccation, the amount of trench open at any time is minimized. The Resident CQA Engineer shall inform the Contractor and Project Engineer of any signs of significant desiccation associated with the anchor trench construction.

3) Rounded corners are provided in the trench so as to avoid sharp bends in the geomembrane.

4) Excessive amounts of loose soil are not allowed to underlie the geomembrane in the anchor trench.

5) The anchor trench is adequately drained to prevent ponding or softening of the adjacent soils while the trench is open.

6) The anchor trench is backfilled and compacted as outlined in the project specifications.

Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetic components. The Resident CQA Engineer shall observe the backfilling operation and advise the Contractor and Project Engineer of any problems. Any problems shall be documented by the Resident CQA Engineer in his daily report.

Appendix B

1.0 Field Seaming

1.1.1 Seam Layout

Before installation begins, the Installer shall provide the Resident CQA Engineer and the Project Engineer with a panel layout drawing. This drawing shall present all the proposed seams of the lining system at the facility. The Project Engineer and the Resident CQA Engineer shall review the panel layout drawing and verify that it is consistent with the technical specifications and the Division approved plans. No panels may be seamed until written approval of the panel layout drawing has been provided by the Project Engineer. In addition, panels not specifically shown on the panel layout drawing may not be used without the Project Engineer's prior approval.

In general, seams should be oriented parallel to the line of maximum slope, thus, oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than 10 ft (3.0m) from the toe or crest of the slope, or areas of potential stress concentrations, unless otherwise authorized by the Project Manager.

A seam numbering system compatible with the panel numbering system shall be used by the Resident CQA Engineer and the CQA monitors.

1.1.2 Accepted Seaming Methods

Approved processes for field seaming are fusion welding and extrusion welding. Proposed alternate processes shall be documented and submitted by the Installer to the Project Engineer for approval. Only apparatuses that have been specifically approved by make and model shall be used. The Contractor shall submit all documentation regarding seaming methods to be used to the Resident CQA Engineer for review.

1.1.2.1 Fusion Process

The CQA monitor shall log ambient temperature, seaming apparatus, and geomembrane surface temperatures at appropriate intervals and report any noncompliances to the Resident CQA Engineer.

The Resident CQA Engineer shall verify that:

The Installer maintains on-site the number of spare operable seaming apparatuses agreed upon at the pre-construction meeting.

Equipment used for seaming is not likely to damage the geomembrane.

The electric generator is placed on a smooth base such that no damage occurs to the geomembrane.

A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage such that no damage occurs to the geomembrane.

1. A movable protective layer is used as required by the Installer directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets and to prevent debris from collecting around the pressure rollers.

2. In general, the geomembrane panels are aligned to have an overlap of 4 to 6 in (100 mm to 150 mm) for fusion welding. In any event, the final overlap shall be sufficient to allow peel tests to be performed on the seam.

3. No solvent or adhesive is used.

4. The geomembrane is protected from damage in heavy traffic areas.

1.1.2.2 *Extrusion Process*

The CQA monitor shall log ambient temperature, seaming apparatus, and geomembrane surface temperatures at appropriate intervals and report any noncompliances to the Resident CQA Engineer.

The Resident CQA Engineer shall verify that:

The Installer maintains on-site the number of spare operable seaming apparatuses agreed upon at the pre-construction meeting.

Equipment used for seaming is not likely to damage the geomembrane.

Prior to beginning a seam, the extruder is purged until all heat-degraded extrudate has been removed from the extruder barrel.

Clean and dry welding rods or extrudate pellets are used.

The electric generator is placed on a smooth base such that no damage occurs to the geomembrane.

Grinding is completed no more than one hour prior to seaming.

A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage such that no damage occurs.

The geomembrane is protected from damage in heavy traffic areas.

Exposed grinding marks adjacent to an extrusion weld shall be minimized. In no instance shall exposed grinding marks extend more than 1/8 in (6 mm) from the finished seamed area.

In general, the geomembrane panels are aligned to have a nominal overlap of 3 in (75 mm) for extrusion welding. In any event, the final overlap shall be sufficient to allow peel tests to be performed on the seam.

No solvent or adhesive is used.

The procedure used to temporarily bond adjacent panels together does not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any temporary welding apparatus is controlled such that the geomembrane is not damaged

1.1.3 Seam Preparation

The CQA monitors shall verify that prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris or foreign material of any kind. If seam overlap grinding is required, the CQA monitors must ensure that the process is completed according to the Manufacturer's instruction within one hour of the seaming operation, and in a way that does not damage the geomembrane. The CQA monitors shall also verify that seams are aligned with the fewest number of wrinkles and "fishmouths".

1.1.4 Test Seams

Trial seams shall be made on fragment pieces of geomembrane liner to verify that conditions are adequate for production seaming. Trial seams shall be performed in accordance with Section 02620 of the technical specifications.

1.1.5 General Seaming Procedures

During general seaming, the CQA monitors shall ensure the following:

Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 in (150 mm) beyond the cut in all directions.

If seaming operations are carried out at night, adequate illumination shall be provided.

Seaming shall extend to the outside edge of panels placed in the anchor trench.

All cross seam tees should be extrusion welded to a minimum distance of 4 in (100 mm) on each side of the tee.

No field seaming shall take place without the Master Seamer being present.

A firm substrate may be required to be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

The Resident CQA Engineer shall verify that the above seaming procedures or any other procedures agreed upon and indicated in the Preconstruction Meeting or construction progress meetings are followed, and shall inform the Project Engineer of any nonconformance.

1.1.6 Seaming Weather Conditions

1.1.6.1 *Cold Weather Conditions*

To ensure a quality installation, if seaming is conducted when the ambient temperature is below 40°F (5°C), the following conditions shall be met:

Geomembrane surface temperatures shall be determined by the Resident CQA Engineer at intervals of at least once per 100 feet (30 m) of seam length to determine if preheating is required. For extrusion welding, preheating is required if the surface temperature of the geomembrane is below 41°F (5°C).

1. For fusion welding, preheating may be waived by the Project Engineer based on a recommendation from the Resident CQA Engineer, if the Installer demonstrates to their satisfaction that welds of equivalent quality may be obtained without preheating at the expected temperature of installation.

2. If preheating is required, the CQA monitors shall observe all areas of geomembrane that have been preheated by a hot air device prior to seaming, to ensure that they have not been overheated.

3. Care shall be taken to confirm that the surface temperatures are not lowered below the minimum surface temperatures specified for welding due to winds or

other adverse conditions. It may be necessary to provide wind protection for the seam area.

4. All preheating devices shall be approved prior to use by the Resident CQA Engineer.

Additional destructive tests shall be taken at an interval between 250 feet and 500 feet 75 to 150 m) of seam length, at the discretion of the Resident CQA Engineer.

Sheet grinding may be performed before preheating, if applicable.

Test seams shall be conducted under the same ambient temperature and preheating conditions as the production seams. Under cold weather conditions, additional trial seams shall be conducted if the ambient temperature drops by more than 10°F from the initial trial seam test conditions. Such new seams shall be constructed upon completion of seams in progress during temperature drop.

1.1.6.2 *Warm Weather Conditions*

At ambient temperatures above 104°F, no seaming of the geomembrane shall be permitted unless the Installer can demonstrate to the satisfaction of the Resident CQA Engineer that geomembrane seam quality is not compromised. Test seams shall be conducted under the same ambient temperature conditions as the production seams. At the option of the Resident CQA Engineer, additional destructive tests may be required for any suspect areas.

1.2 Nondestructive Seam Testing

1.2.1 Concept

The Installer shall nondestructively test all field seams over their full length using an air pressure test (for double fusion seams only, a vacuum test or other approved method. Air pressure testing and vacuum testing are described elsewhere respectively. The purpose of nondestructive tests is to check the continuity of seams. It does not provide quantity information on seam strength. Nondestructive testing shall be carried out as the seaming work progresses, not at the completion of all field seaming.

For all seams, the CQA monitors shall:

Observe nondestructive testing procedures.

Record location, data, test unit number, name of tester, and outcome of all testing.

Inform the Installer and Resident CQA Engineer of any required repairs.

Any seams that cannot be nondestructively tested shall be cap-stripped. The cap-stripping operations shall be observed by the Resident CQA Engineer and Installer for uniformity and completeness.

1.2.2 Air Pressure Testing

Air pressure testing is applicable to double fusion welding which produces a double seam with an enclosed space.

The Equipment for air pressure testing shall consist of the following:

An air pump (manual or motor driven), equipped with pressure gauge and capable of generating and sustaining a pressure between 25 and 30 psi (160 and 200 kPa) and mounted on a cushion to protect the geomembrane.

A rubber hose with fittings and connections.

A sharp hollow needle, or other pressure feed device, approved by the Resident CQA Engineer.

The following procedures shall be followed:

Seal both ends of the seam to be tested.

Insert needle or other approved pressure feed device into the air channel created by the fusion weld.

Insert a protective cushion between the air pump and the geomembrane.

Pressurize the air channel to a pressure of approximately 30 psi (200 Kpa). Close valve, allow 2 minutes for pressure to stabilize, and sustain pressure for at least 5 minutes. Pressure loss over the 5-minute period should not exceed 3psi.

If loss of pressure exceeds the maximum permissible pressure differential as outlined in the project specifications or does not stabilize, locate fault area and repair in accordance with Section 1.4.3.

Cut opposite end of tested seam area once testing is complete to verify continuity of the air channel. If air does not escape, locate blockage and retest unpressurized area.

Remove needle or other approved pressure feed device and grind and weld or patch the hole in the geomembrane.

1.2.3 Vacuum Testing

Vacuum testing is applicable to extrusion welding.

The equipment shall consist of the following:

A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, a porthole or valve assembly, and a vacuum gauge.

A pump assembly equipped with a pressure controller and pipe connections.

A rubber pressure/vacuum hose with fittings and connections.

A soapy solution. (CQA monitors shall ensure solution makes bubbles when air is passed through.)

A bucket and wide paint brush, or other means of applying the soapy solution.

The following procedures shall be followed:

Wet a strip of geomembrane approximately 12 in X 48 in (0.3 m X 1.2 m) with the soapy solution.

Place the box over the wetted area.

Close the bleed valve and open the vacuum valve.

Ensure that a leak-tight seal is created.

Energize the vacuum pump and reduce the applied pressure to approximately 5 psi (10 in of Hg/35kPa) gauge.

For a minimum of 10 seconds, apply vacuum with the box placed and maintaining a seal, examine the geomembrane through the viewing window for the presence of soap bubbles.

If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 in (75 mm) overlap, and repeat the process.

All areas where soap bubbles appear shall be marked and repaired in accordance with Section 1.4.3.

1.2.4 Test Failure Procedures

The Installer shall complete any required repairs in accordance with Section 1.4.3. For repairs, the CQA monitor shall:

Observe the repair and testing of the repair.

Mark on the geomembrane that the repair has been made.

Document the repair procedures and test results.

1.3 Destructive Seam Testing

1.3.1 Concept

The purpose of destructive tests is to evaluate seam strength. Destructive seam tests shall be performed at selected locations. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

1.3.2 Location and Frequency

The Resident CQA Engineer shall select where seam samples will be cut out for laboratory testing. The frequency and locations shall be established as follows:

A minimum frequency of one test location per 500 feet (150 m) of seam length performed by each welding machine. This frequency is to be determined as an average taken throughout the entire facility.

Test locations shall be determined during seaming at the discretion of the Resident CQA Engineer or the Project Engineer. Special consideration shall be given to locations where the potential for imperfect welding, such as overheating, contamination, and offset welds exists.

1.3.3 Sampling Procedures

Samples shall be cut by the Installer at locations chosen by the Resident CQA Engineer as the seaming progresses so that laboratory test results are available before the geomembrane is covered by another material. The Resident CQA Engineer shall:

Observe sample cutting.

1. Assign a number to each sample, and mark it accordingly.

2. Record sample location on layout drawing.

3. Record reason for taking the sample at this location (e.g., statistical routine, suspicious feature of the geomembrane).

All holes in the geomembrane resulting from destructive seam sampling shall be repaired in accordance with repair procedures described in Section 1.4.3 immediately following receipt of successful test results. The continuity of the new seams in the repaired area shall be tested according to Section 1.2.3. All holes in the geomembrane shall be temporarily patched or repaired in accordance with Section 1.4.3 before the end of each work day in order to protect the clay liner from inclement weather.

1.3.4 Sampling Procedure

Destructive sampling shall be performed in accordance with Section 02620 of the technical specifications.

1.3.5 Field Testing

Destructive field testing shall be performed in accordance with Section 02620 of the technical specifications.

1.3.6 Destructive Test Failure

Destructive test failures shall be handled in accordance with Section 02620 of the technical specifications.

1.4 Defects and Repairs

1.4.1 Identification

All seams and non-seam areas of the geomembrane shall be examined by the CQA monitors for identification of defects, holes, blisters, undispersed raw materials, large

wrinkles and any sign of contamination by foreign matter. The geomembrane surface shall be cleaned by the Installer prior to examination if the CQA monitor determines that the amount of dust or mud inhibits examination.

1.4.2 Evaluation

Each suspect location both in seam and non-seam areas shall be nondestructively tested using the methods described in Section 1.2. Each location which fails the nondestructive testing shall be marked by the CQA monitor and repaired by the Installer. Work shall not proceed with any materials that will cover locations that have been repaired until successful nondestructive and/or laboratory tests are obtained.

When seaming of the geomembrane is completed, and prior to placing overlying materials, the Resident CQA Engineer shall indicate to the General Contractor any large wrinkles that should be cut and reseamed by the Installer. The number of wrinkles to be repaired should be kept to an absolute minimum. Therefore, wrinkles should be located during the coldest part of the installation period, while keeping in mind the forecasted weather to which the undercover geomembrane may be exposed. Wrinkles are considered to be large when the geomembrane can be folded over onto itself which is generally a wrinkle that extends 12 in (0.3 m) from the subgrade. Seams produced while repairing wrinkles shall be nondestructively tested.

When placing overlying material on the geomembrane, every effort must be made to minimize wrinkle development. If possible, cover should be placed during the coolest weather. In addition, small wrinkles should be isolated and covered as quickly as possible to prevent their growth. The placement of cover materials shall be observed by McGill Associates or a CQA monitor to ensure that wrinkle formation is minimized and that, in all cases, the geomembrane is not folded over on itself.

1.4.3 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be determined by the Project Engineer and the Resident CQA Engineer.

1. The repair procedures available include:

    a. Patching, used to repair holes, tears, undispersed raw materials, and contamination by foreign matter.

    b. Spot welding used to repair pinholes, or other minor, localized flaws.

c. Capping, used to repair large lengths of failed seams.

d. Extrusion welding the flap, used to repair areas of inadequate fusion seams which have an exposed edge. Repairs of this type shall be approved by Resident CQA Engineer and shall not exceed 100 ft (30 m) in total length.

e. Removing bad seam and replacing with a strip of new material welded into place.

2. For any repair method, the following provisions shall be satisfied:

a. Surfaces of the geomembrane which are to be repaired using extrusion methods shall be ground no more than one hour prior to the repair.

b. All surfaces shall be clean and dry at the time of the repair.

c. All seaming equipment used in repairing procedures shall meet the requirements of this SSCQAP.

d. Patches or caps shall extend at least 6 in (150 mm) beyond the edge of the defect, and all corners of patches shall be rounded with a radius of approximately 3 in (75 mm).

1.4.4 Repair Verification

The CQA monitors shall observe all nondestructive testing of repairs and shall record the number of each repair, date and test outcome. Each repair shall be nondestructively tested using the method described in Section 1.2 as appropriate. Repairs that pass the nondestructive test shall be taken as an indication of an adequate repair. Repairs more than 500 ft (50 m) long require destructive test sampling. Failed tests require that the repair shall be redone and re-tested until a passing test results.

1.5 Geomembrane Protection

The quality assurance procedures indicated in this Section are intended only to assure that the installation of adjacent materials does not damage the geomembrane. The quality assurance of the adjacent materials themselves are covered in separate Sections of this manual.

1.5.1 Soils

1. Placement of gravel on the geomembrane shall not proceed at an ambient temperature below 32 degrees F (0 degrees C) nor above 104 degrees F (40 degrees C) unless otherwise specified.

2. Placement of gravel on the geomembrane should be done during the coolest part of the day to minimize the development of wrinkles in the geomembrane.

3. Equipment used for placing gravel shall not be driven directly on the geomembrane.

4. A minimum thickness of 24 inches of gravel shall be maintained between the geotextile cushion and the top of the drainage layer Off-road trucks shall have a minimum thickness of 3 feet between them and the geomembrane/geotextile cushion.

5. In any areas traversed by heavy construction, any vehicles other than low ground pressure vehicles approved by the Project Engineer, the gravel layer shall have a minimum thickness of 3 ft (09 m). This requirement may be waived if provisions are made to protect the geomembrane through an engineered design approved by the Project Engineer. Drivers shall proceed with caution when traveling on the overlying gravel and prevent spinning of tires or sharp turns.

6. Leachate collection pipes shall not be crossed with construction equipment without the full two (2) feet of stone in place. In areas where off-road trucks must repeatedly cross the leachate piping, a temporary stone road shall be build to bridge over the pipe and maintain a minimum thickness of three (3) feet.

7. Care shall be taken to avoid creating wrinkles in the geomembrane during placement of the gravel layer.

1.5.2 Sumps and Appurtenances

The sumps shall be constructed in accordance with the technical specifications and the Resident CQA Engineer shall certify the following:

1. Installation of the geomembrane, sumps, equipment, and appurtenant areas has been performed properly, and connections of geomembrane to sumps and appurtenances have been made according to project specifications.

2. Extreme care is taken while welding around appurtenances since nondestructive testing will be difficult in these areas.

3. The geomembrane has not been visibly damaged while making connections to sumps and appurtenances.

4. The Resident CQA Engineer or his representative shall be present at all times when the Installer is welding geomembrane to appurtenant structures.

The Resident CQA Engineer shall inform the Project Engineer in writing if the above conditions are not fulfilled.

Appendix C

1.0 Geotextiles

1.1 Definition and Applicability

Geotextiles are used in protection and filtering applications in lining systems. This Section does not describe procedures for other applications such as erosion control or reinforcement. This Section is applicable to nonwoven geotextiles made of polyester of polypropylene and not applicable to nonwoven geotextiles made of other materials or woven geotextiles.

1.2 Manufacturing Plant Inspection

The Owner or an appropriate representative may conduct a periodic inspection of the Manufacturer's plant. In addition, the Project Engineer or his designated representative may visit the manufacturing plant for a project-specific inspection if deemed necessary. If possible, the project-specific inspection shall be prior to or during the manufacturing of the geotextile rolls for that particular project. The purpose of the plant inspections is to review the manufacturing process and quality control procedures.

The manufacturing plant inspection shall include:

1. Verification that properties of the geotextile guaranteed by the Manufacturer are met and meet the project specifications.

2. Verification that the measurement of properties by the manufacturer is properly documented and test methods used are acceptable.

3. Inspection of the rolls and verification that they are free of imperfections or any sign of contamination by foreign matter.

4. Review of packaging, handling, storage, and transportation procedures and verification that these procedures will not damage the geotextile.

5. Verification that roll packages have a label indicating the name of the manufacturer, type of geotextile, roll number and roll dimensions.

6. Verification that the geotextiles are inspected continuously for the presence of needles using a metal detector.

A report describing the inspection will be retained by the Owner for periodic inspections and by the Project Engineer for project-specific inspections.

1.3 Quality Control Documentation

Prior to the shipment of any geotextile, the Manufacturer shall provide the Resident CQA Engineer with the following information:

1. Results of tests conducted by the Manufacturer to verify that the material used to manufacture the geotextile meets the project specifications.

2. A specification for the geotextile that includes all properties contained in the Project Technical Specifications were measured using the appropriate test methods.

3. Written certification that minimum values given in the Project Technical Specifications are guaranteed by the Manufacturer.

4. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and the results of quality control tests. At a minimum, results shall be given for the following:

Property	Test Method	Frequency
Mass per Unit Area	ASTM D-5261	Each Roll
Grab Tensile Strength	ASTM D-4632	Every 5th Roll
Grab Tensile Elongation	ASTM D-4632	Every 5th Roll
Puncture (pin) Strength	ASTM D-4833	Every 5th Roll
Apparent Opening Size (AOS)	ASTM D-4751	Every 5th Roll

The Manufacturer shall identify all rolls of geotextiles with the following:

Manufacturer's name
Product identification
Thickness
Roll number
Roll dimensions

The Resident CQA Engineer shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The Resident CQA Engineer shall verify that:

Property values certified by the Manufacturer meet all of its guaranteed specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.

Rolls are appropriately labeled.

Certified minimum properties meet the project specifications.

1.4 Conformance Testing

1.4.1 Sampling Procedures

Upon delivery of the rolls of geotextiles, the Resident CQA Engineer shall ensure that conformance test samples are obtained for the geotextile. The rolls to be sampled shall be selected by the Resident CQA Engineer. Samples shall be taken from any portion of a roll that has not been damaged. Unless otherwise specified, samples shall be 3 ft (1 m) long by the roll width. The Resident CQA Engineer shall mark the machine direction on the samples with an arrow. All lots of material and the particular test sample that represents each lot should be defined before the samples are taken.

A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. Alternatively, a lot may be designated by the Certifying CQA Engineer based on a review of all roll information including quality control documentation and manufacturing records.

Unless otherwise specified in the project specifications, samples shall be taken at a rate of one per lot, not to be less than one per 100,000 ft^2 of geotextile. These samples shall then be forwarded to the Geosynthetic laboratory for testing to ensure conformance with the project specifications.

1.4.2 Conformance Tests

The following conformance tests shall be conducted;

Mass per Unit Area (ASTM D5261)
Grab Tensile Strength (ASTM D4632)
Grab Tensile Elongation (ASTM D4632)
Puncture Strength (ASTM D4833)

Apparent Opening Size (ASTN D4751)

1.4.3 Test Results

All conformance test results shall be reviewed and accepted or rejected by the Certifying CQA Engineer prior to the deployment of the geotextile. The Certifying CQA Engineer shall examine all results from laboratory conformance testing and shall report any non-conformance to the Project Engineer. The Certifying CQA Engineer shall be responsible for checking that all test results meet or exceed the property values listed in the project specifications.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out-of-specification and rejected. Alternatively, at the option of the Project Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting the project specification. This procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line. To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next large roll number) shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

2.0 Geocomposites

2.1 Definition and Applicability

Geocomposites are geosynthetic nets with geotextile heat bonded to the surface. The geocomposite can be single-sided or double-sided depending on the application. They are used as a drainage medium in lining systems, where the properties of the geotextile can either serve as a filter media from clogging the geonet or increase stability of the lining system. This Section is applicable to geocomposites where the geonet portion is made of high density polyethylene (HDPE), including "foamed" HDPE products but is not applicable to geocomposites where the geonet is made of other polymers.

2.2 Manufacturing Plant Inspection

The Owner or appropriate representative may conduct a periodic inspection of the Manufacturer's plant. In addition, the Project Engineer, or his designated representative may visit the manufacturing plant for a project-specific inspection if deemed necessary. If possible, the project-specific inspection shall be prior to or

during the manufacturing of the geocomposite rolls for that particular project. The purpose of the inspection is to review the manufacturing process and quality control procedures.

The manufacturing plant inspection shall include:

Verification that properties guaranteed by the Manufacturer are met and meet all project specifications.

1. Verification that properties guaranteed by the Manufacturer are met and meet all Project Technical Specifications.

2. Verification that the measurement of properties by the Manufacturer is properly documented and test methods used are acceptable.

3. Spot inspection of the rolls and verification that they are free of imperfections or any sign of contamination by foreign matter.

4. Review of packaging, handling, storage, and transportation procedures and verification that these procedures will not damage the geocomposite.

5. Verification that the geotextiles are inspected continuously for the presence of needles using a metal detector.

6. Verifications that roll packages have a label indicating the name of the manufacturer, type of geocomposite, roll number and roll dimensions.

A report describing the inspection will be retained by the Owner for periodic inspections and by the Project Engineer for project-specific inspections.

2.3 Production

The geocomposite shall be manufactured by heat bonding the geotextile to the HDPE drainage net on one or both sides. No burn through geotextiles shall be permitted. No glue or adhesive shall be permitted.

The geonet portion of the geocomposite shall be manufactured by extruding two sets of strands to form a three (3) dimensional structure to provide planar water flow.

2.4 Quality Control Documentation

Prior to the shipment of any geocomposite, the Manufacturer shall provide the Resident CQA Engineer with the following information:

1. The origin (supplier's name and production plant) and identification (brand name and number) of the resin used for geonet.

2. Copies of dated quality control certificates issued by the geonet resin supplier.

3. Results of tests conducted by the Manufacturer to verify that the resin used to manufacture the geonet meets the Project Technical Specifications.

4. A statement indicating that the amount of any reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness.

5. A list of the materials that comprise the geonet, expressed in the following categories as a percent by weight: polyethylene, carbon black, other additives.

6. Results of tests conducted by the Manufacturer to verify that the material used to manufacture the geotextile meets the Project Technical Specifications.

7. A specification for the geocomposite that includes all properties contained in the Project Technical Specifications measured using the appropriate test methods.

8. Written certification that minimum values given in the Project Technical Specification are guaranteed by the Manufacturer.

9. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for the following:

GEONET COMPONENT		
Property	**Test Method**	**Frequency**
Density	ASTM D1505 or ASTM D792, Method B	Every 5th Roll
Thickness	ASTM D5199	Each Roll
Carbon Black Content	ASTM D1603	Every 5th Roll
Peak Tensile Strength	ASTM D5035	Every 5th Roll
Transmissivity (MARV)	ASTM D4716	Every 5th Roll
GEOTEXTILE COMPONENT		
Property	**Test Method**	**Frequency**
Mass per Unit Area	ASTM D5261	Each Roll
Grab Tensile Strength	ASTM D4632	Every 5th Roll
Grab Tensile Elongation	ASTM D4632	Every 5th Roll

Puncture Strength	ASTM D4833	Every 5th Roll
Permittivity (min. avg.)	ASTM D4491	Every 5th Roll
Apparent Opening Size (AOS)	ASTM D4751	Every 5th Roll
UV Stability, % Retained (500 hr.)	ASTM D4355	Every 5th Roll
GEOCOMPOSITE		
Property	**Test Method**	**Frequency**
Ply Adhesion	ASTM D7005	Every 5th Roll
Transmissivity (MARV)	ASTM D4716	Every 5th Roll

The manufacturer shall identify all rolls of geocomposite with the following:

Manufacturers Name
Product Identification
Roll Number
Roll Dimensions

The Resident CQA Engineer shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The Resident CQA Engineer shall verify that:

Property values certified by the Manufacturer meet all of its guaranteed specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.

Rolls are appropriately labeled.

Certified minimum properties meet the project specifications.

2.5 Conformance Testing

2.5.1 Sampling Procedures

Upon delivery of the rolls of geocomposite, the Resident CQA Engineer shall ensure that conformance test samples are obtained for the geocomposite. The rolls to be

sampled shall be selected by the Resident CQA Engineer. Samples shall be taken from any portion of a roll that has not been damaged. Unless otherwise specified, samples shall be 3 ft. (2 m) long by the roll width. The Resident CQA Engineer shall mark the machine direction on the samples with an arrow.

A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. Alternatively, a lot may be designed by the Certifying CQA Engineer based on a review of all roll information including quality control documentation and manufacturing records.

Unless otherwise specified in the project specifications, samples shall be taken at a rate of one per lot, not to be less than one per 100,000 ft^2 of geocomposite. These samples shall then be forwarded to the Geosynthetic laboratory for testing to ensure conformance to the project specifications.

2.5.2 Conformance Tests

The following conformance tests shall be conducted;

Ply Adhesion (ASTM D7005)
Transmissivity (ASTM D4716)

2.5.3 Test Results

All conformance test results shall be reviewed and accepted or rejected by the Certifying CQA Engineer prior to the deployment of the geocomposite. The Certifying CQA Engineer shall examine all results from laboratory conformance testing and shall report any non-conformance to the Project Engineer. The Certifying CQA Engineer shall be responsible for checking that all test results meet or exceed the property values listed in the project specifications.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out-of-specification and rejected. Alternatively, at the option of the Project Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting the project specification. This procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line. To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next large roll number) shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

Appendix D

1.0 Geosynthetic Clay Liners (GCL)

1.1 Description and Applicability

Geosynthetic Clay Liners (GCL) are a manufactured hydraulic barrier consisting of granular sodium bentonite clay bonded to a layer or layers of geosynthetics. This Section is applicable to all GCL type liner systems. This Section may need to be modified when using other variations of GCL liners.

1.2 Manufacturing Plant Inspection

The Owner or other appropriate representative may conduct an inspection of the Manufacturer's plant. In addition, the Project Engineer, or his designated representative, may visit the manufacturing plant for a project-specific inspection if deemed necessary. If possible, the project-specific inspection shall be prior to or during the manufacturing of the geosynthetic clay liner rolls for that particular project. The purpose of the plant inspection is to review the manufacturing process and quality control procedures.

The manufacturing plant inspection shall include:

Verification that properties guaranteed by the manufacturer are met and meet all the project specifications.

Verification that the measurements of properties by the Manufacturer are properly documented and test methods used are acceptable.

Spot inspection of the rolls and verification that they are free of imperfections or any sign of contamination by foreign matter.

Review of handling, storage, and transportation procedures, and verification that these procedures will not damage the GCL.

Verification that roll packages have a label indicating the Product Identification Information (Manufacturer's name and address brand product code), lot number, roll number, and roll length, width and weight.

A report describing the inspection shall be retained by the Owner and by the Project Engineer for project-specific inspections.

1.3 Quality Control Documentation

Prior to the shipment of any geomembrane, the Manufacturer shall provide the Resident CQA Engineer with the following information:

1. Certificates of analysis for the bentonite clay used in the GCL production demonstrating compliance with the swell index and fluid loss values shown in the Minimum Required Physical Properties of Geosynthetic Clay Liner table in the Technical Specifications.

2. Manufacturer's test data for the finished GCL product demonstrating compliance with the values shown in the specified Minimum Required Physical Properties of Geosynthetic Clay Liner table in the Technical Specifications.

3. GCL lot and roll numbers supplied for the project (with corresponding shipping information).

4. A specification for the GCL that includes all properties contained in the project specifications measured using the appropriate test methods.

5. Written certification that minimum values given in the specification are guaranteed by the Manufacturer.

6. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for the following:

Property	Test Method	Frequency
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes
Bentonite Mass/Area[2]	ASTM D 5993	Every 40,000 ft^2
GCL Tensile Strength[3]	ASTM D 6768	Every 200,000 ft^2
GCL Peel Strength[3]	ASTM D 6496	Every 40,000 ft^2
GCL Index Flux[4]	ASTM D 5887	Weekly
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic

Notes: [1] Bentonite property tests performed at a bentonite processing facility before shipment to manufacturer's production facilities.

[2] Bentonite mass/area reported at 0 percent moisture content.

[3] All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496.

[4] Index flux and permeability testing with deaired distilled/deionized water at 80 psi cell pressure, 77 psi headwater pressure and 75 psi tailwater pressure. Manufacturer to supply last 20 weekly values prior to the end of the production date of the supplied GCL.

[5] Peak values measured at 200 psf normal stress for a specimen hydrated for 48 hours.

The Manufacturer shall identify all rolls of geomembranes with the following:

Manufacturer's name and address
Brand Product Code
Lot Number
Roll number
Roll Length and width
Roll Weight

The Resident CQA Engineer shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The Resident CQA Engineer shall verify that:

Property values certified by the Manufacturer meet all of its guaranteed specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.

Rolls are appropriately labeled.

Certified minimum properties meet the project specifications.

1.4 Conformance Testing

1.4.1 Sampling Procedures

Upon delivery of the rolls of the GCL, the Resident CQA Engineer shall ensure that conformance test samples are obtained for the GCL. The GCL rolls to be sampled

shall be selected by the Resident CQA Engineer. Samples shall be taken across the entire width of the roll judged by the Resident CQA Engineer not to be damaged. Unless otherwise specified, samples shall be 3 ft (1 m) long by the roll width. The Resident CQA Engineer shall mark the machine direction on the samples with an arrow.

A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. Alternatively, a lot may be designated by the Certifying CQA Engineer based on a review of all roll information including quality control documentation and manufacturing records.

If the Project Engineer desires, the Resident CQA Engineer can perform the conformance test sampling at the manufacturing plant. This may be advantageous in expediting the installation process for very large projects.

Unless otherwise specified in the project specifications, samples shall be taken at a rate of one per lot and not less than one per 100,000 ft^2 (10,000 m^2) of GCL. These samples shall be forwarded to the Resident CQA Engineer for testing.

1.4.2 Conformance Tests

The following conformance tests shall be conducted:

Bentonite Mass per unit area (ASTM D 5993)
Bentonite Swell Index (ASTM D 5890)
Bentonite Fluid Loss (ASTM D 5891)
Grab Tensile Strength (ASTM D 6495)

Other conformance tests may be required by the project specifications.

1.4.3 Test Results

All conformance test results shall be reviewed and accepted or rejected by the Certifying CQA Engineer prior to the deployment of the GCL. The Certifying CQA Engineer shall examine all results from laboratory conformance testing and shall report any non-conformance to the Project Engineer. The Certifying CQA Engineer shall be responsible for checking that all test results meet or exceed the property values listed in the project specifications.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out-of-specification and rejected. Alternatively, at the option of the Project Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting the project specification. This procedure is valid only when all rolls in the lot are consecutively produced and numbered from one

manufacturing line. To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next large roll number) shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

1.5 GCL Specifications

1.5.1 Materials

The GCL materials used for construction shall be in strict accordance with the technical specifications.

1.5.2 Damage From Shipping and Handling

The Resident CQA Engineer shall observe the unloading and storage of the GCL rolls once they arrive at the project site. Rolls with its protective plastic sleeve torn or damaged during transit should be inspected for damage in the area of the torn sleeve. If the geotextile under the torn sleeve is also torn, the outermost wrap of GCL on the roll should be unwound and discarded when the roll is installed. The Resident CQA Engineer shall so mark the roll and ensure the Installer removes and discards the damaged portion of the GCL roll. At the time the roll is unwound, the Resident CQA Engineer will ensure that further damage to the roll did not occur. If so then additional wraps will be removed and discarded prior to the roll being installed.

Rolls that are dropped and/or bent during the unloading, storage or dropped and/or bent while being transported from the storage area to the project site will be so noted by the Resident CQA Engineer and will be moved away from the project site. These rolls will not be used on the project site.

1.5.3 Construction

The GCL shall be installed as soon as practical after completion and approval of the compacted clay liner or portion thereof. The top of the compacted clay liner will be surveyed to ensure adequate thickness of clay material and proper grades toward the collection sump area have been achieved. The GCL is to cover the bottom of the secure cell and the side slopes in accordance with the Contract Drawings.

Areas to receive GCL installation should be relatively smooth and even, free of ruts, voids, etc., to the extent required by the Engineer. This shall be accomplished by final dressing of the compacted clay liner with smooth drum rollers. No vehicles are permitted on final dressed surfaces unless authorized by the Engineer.

An anchor trench (as illustrated on the Contract Drawings) will be required to secure the GCL. No loose soil will be allowed to underlie the GCL in the anchor trenches. The time schedule for excavation and backfilling of the anchor trenches is to be approved by the Engineer so that desiccation of trench soils does not occur prior to backfilling.

Before the GCL installation begins, the Resident CQA Engineer shall verify that:

1) A State of North Carolina licensed Professional Land Surveyor has verified all lines and grades of the compacted clay liner.

2) A qualified and licensed Professional Engineer has verified that the clay liner surface meets the criteria specified in the project specifications.

3) There are no ambient site conditions which could affect the quality of the installation of the GCL. Specifically, the presence at the project site of excessively high winds, rain, standing water, snow or other conditions that may be construed as unsuitable weather conditions for GCL installation.

4) The clay liner surface to be lined has been rolled, compacted, or hand-worked so as to be free of irregularities, protrusions, loose soil, and abrupt changes in grade.

5) The surface of the clay liner does not contain stones, which may be damaging to the GCL.

6) There is no area excessively softened by high water content.

7) There is no area where the clay liner surface contains desiccation cracks, which may damage the GCL.

8) The clay liner has sufficient thickness and that all permeability tests have not exceeded the specified maximum permeability.

9) Passing conformance samples at the frequencies specified in Section 1.4.1 of this Appendix D have been received and documented.

The Installer shall certify in writing that the surface on which the GCL will be installed is acceptable. A certificate of acceptance shall be given by the Installer to the Resident CQA Engineer prior to commencement of GCL deployment in the area under consideration. The Certifying CQA Engineer shall be given a copy of this certificate by the Resident CQA Engineer.

After the underlying soil has been accepted by the Installer, it is the Installer's responsibility to indicate to the General Contractor any change in the underlying soil condition that may require repair work. The General Contractor will consult with the Resident CQA Engineer regarding the need for repairs. If the Resident CQA Engineer concurs with the Installer, the General Contractor shall ensure that the underlying soil is repaired.

At any time before or during the GCL installation, the Resident CQA Engineer shall indicate to the General Contractor any locations which may not be adequately prepared for the geomembrane.

The Resident CQA Engineer shall verify that the **anchor trench** is constructed in accordance with the following:

1) The anchor trench has been constructed according to the project plans and specifications.

2) If the anchor trench is excavated in a clay material susceptible to desiccation, the amount of trench open at any time is minimized. The Resident CQA Engineer shall inform the Contractor and Project Engineer of any signs of significant desiccation associated with the anchor trench construction.

3) Rounded corners are provided in the trench so as to avoid sharp bends in the GCL.

4) Excessive amounts of loose soil are not allowed to underlie the GCL in the anchor trench.

5) The anchor trench is adequately drained to prevent ponding or softening of the adjacent soils while the trench is open.

6) The GCL is placed such that it extends across the anchor trench floor but not up the rear wall of the trench. Excess material should be cut off, not folded over on top of the existing material.

7) The anchor trench is backfilled and compacted as outlined in the project specifications.

Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetic components. The Resident CQA Engineer shall observe the backfilling operation and advise the Contractor and Project Engineer of any problems. Any problems shall be documented by the Resident CQA Engineer in his daily report.

1.5.4 Panel Placement

The Resident CQA Engineer shall observed and verify that the unrolling and placement of the GCL is performed in such a way that the GCL is not damaged or unduly stretched, folded, or creased during installation.

When GCL is placed on slopes and the GCL roll is suspended at the top of the slope and pulled down the slope, the Resident CQA Engineer shall observe and verify that excessive tension does not develop on the material and that the underside of the panel is not damaged by friction with the subgrade.

1.5.5 Seaming

The Resident CQA Engineer shall:

1. Observe and verify the minimum acceptable overlap for all seams (parallel to the slope and perpendicular to the slope).

2. Verify the quantity and continuity of accessory bentonite used for horizontal seams and other tie-in points.

3. Verify there is no dirt or other debris in the overlap zone or on the bottom geotextile on the overlying GCL panel.

1.5.6 Damage Repair

The Resident CQA Engineer shall inspect any GCL damaged during installation and verify that:

1. The damaged GCL is not on a slope steeper than 10H:1V. If the slope is steeper than 10H:1V then the entire GCL roll will be removed and replaced with an undamaged roll.

2. The damaged GCL is on a slope flatter than or equal to 10H:1V. If the slope is flatter than 10H:1V then the damage may be repaired in accordance with the Technical Specifications.

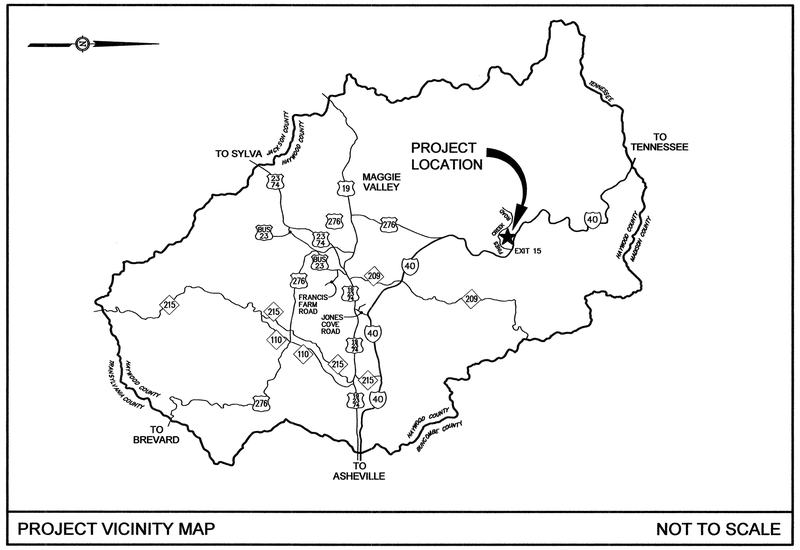
3. The repair is located and repaired in accordance with the Technical Specifications.

Section 4

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA



PROJECT VICINITY MAP NOT TO SCALE

SCHEDULE OF DRAWINGS

HAYWOOD COUNTY

COUNTY MANAGER : DAVID B. COTTON
SOLID WASTE DIRECTOR : STEPHEN KING
COUNTY ENGINEER : MARK SHUMPERT, P.E.

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC PH. (828) 252-0575

NORTH CAROLINA PROFESSIONAL SEAL 23574 ENGINEER JEFFREY R. BISHOP

MARCH 2009
CONFORMED FOR CONSTRUCTION
JUNE 2009

FOR CONSTRUCTION
JUNE 2009

GENERAL NOTES:

1. ALL CONSTRUCTION OUTSIDE RIGHTS-OF-WAY SHALL TAKE PLACE WITHIN THE PERMANENT AND TEMPORARY ACCESS EASEMENTS SHOWN.
2. CONTRACTOR SHALL REPAIR ALL DISTURBED AREAS TO EQUAL OR BETTER CONDITION THAN THE ORIGINAL SITE, OR AS NOTED.
3. LOCATIONS OF EXISTING UTILITIES AS SHOWN ARE APPROXIMATE ONLY. EXACT LOCATIONS ARE TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR. AT LEAST THREE DAYS PRIOR TO CONSTRUCTION, CONTRACTOR MUST NOTIFY EXISTING UTILITY OWNERS. CALL BEFORE YOU DIG. NORTH CAROLINA ONE CALL (1-800-632-4949).
4. ALL WORK NEAR AND AROUND WATERWAYS MUST CONFORM TO THE RULES OF THE STATE OF NORTH CAROLINA.
5. CONTRACTOR MUST PROVIDE EROSION CONTROL DEVICES TO CONTROL RUNOFF FROM THE CONSTRUCTION SITE. CONTRACTOR WILL BE RESPONSIBLE FOR ANY FINES THAT MAY BE LEVIED DUE TO POLLUTION CREATED DURING CONSTRUCTION.
6. CONTRACTOR SHALL FOLLOW ALL FEDERAL, STATE AND LOCAL HEALTH AND SAFETY REGULATIONS PERTAINING TO CONSTRUCTION OPERATIONS.
7. WATER LINES SHALL HAVE 3'-0" MINIMUM COVER UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
8. WATER AND SEWER LINES SHALL HAVE A MINIMUM 10' HORIZONTAL SEPARATION OR A MINIMUM 18" VERTICAL SEPARATION WITH THE WATER OVER SEWER, OR BOTH WATER AND SEWER LINES SHALL BE DUCTILE IRON PIPE 10' EITHER SIDE OF THE CROSSING.
9. WATER AND STORM SEWER LINES SHALL HAVE A MINIMUM 12" VERTICAL SEPARATION.
10. SEE PROJECT SPECIFICATIONS FOR ADDITIONAL INFORMATION.
11. LEGAL DESCRIPTIONS FOR PROPOSED EASEMENTS BY OTHERS.
12. CONTRACTOR SHALL NOTIFY THE PROPER LOCAL AUTHORITIES 24 HOURS PRIOR TO ANY ROAD BEING CLOSED FOR CONSTRUCTION, INCLUDING BUT NOT LIMITED TO LOCAL NEWSPAPER, RADIO STATION, FIRE DEPARTMENT, COUNTY SHERIFF'S DEPARTMENT, AMBULANCE, AND COUNTY EMERGENCY AGENCY. ALL TRAFFIC CONTROL SHALL CONFORM TO THE REQUIREMENTS OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION.
13. CONTRACTOR SHALL NOTIFY THE ENGINEER AFTER EXISTING BURIED UTILITIES HAVE BEEN LOCATED AND 24 HOURS PRIOR TO CONSTRUCTION.
14. ALL FENCE DAMAGED DURING CONSTRUCTION SHALL BE REPLACED WITH LIKE MATERIALS IN A WORKMANLIKE MANNER AND IN ACCORDANCE WITH STANDARD FENCE CONSTRUCTION PRACTICES AT THE CONTRACTOR'S EXPENSE.
15. CONTRACTOR SHALL FIELD LOCATE ALL BURIED TELEPHONE LINE IN CONFLICT WITH THE PROPOSED WATER LINE. WHERE NECESSARY, EXISTING BURIED TELEPHONE LINE SHALL BE TEMPORARILY MOVED DURING CONSTRUCTION OF THE PROPOSED WATER LINE AND RE-LAID AT NO ADDITIONAL COST TO THE OWNER.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING ROADS DURING CONSTRUCTION AND SHALL REPAIR ROADS PER REQUIREMENTS OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION. NO OPEN CUTS OF EXISTING ROADS SHALL BE ALLOWED EXCEPT WHERE INDICATED ON THE DRAWINGS OR WHERE SPECIFIC PERMISSION IS GRANTED BY THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION. SAND OR A SIMILAR MATERIAL APPROVED BY THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION SHALL BE PLACED AS A PROTECTIVE BARRIER BETWEEN TRACK EQUIPMENT AND THE ROAD AND CLEANED UP PROPERLY AFTER CONSTRUCTION. A MINIMUM OF 2" OF SAND SHALL BE PLACED ON THE ROAD PRIOR TO STOCKPILING SPOIL MATERIAL ON THE ROAD SURFACE TO FACILITATE CLEANUP.

NORTH CAROLINA LAND QUALITY SECTION EROSION CONTROL NOTES

GENERAL: ALL EROSION CONTROL MEASURES ARE TO BE PERFORMED IN STRICT ACCORDANCE WITH REQUIREMENTS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF LAND RESOURCES, LAND QUALITY SECTION. THE FOLLOWING CONSTRUCTION SEQUENCE SHALL BE COMPLIED WITH FOR ALL WORK.

1. – OBTAIN GRADING PERMIT
2. – INSTALL ALL EROSION CONTROL MEASURES AS REQUIRED BY THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF LAND RESOURCES, LAND QUALITY SECTION.
3. – OBTAIN CERTIFICATE OF COMPLIANCE THROUGH ON-SITE INSPECTION BY A REPRESENTATIVE OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF LAND RESOURCES, LAND QUALITY SECTION.
4. – PROCEED WITH GRADING, CLEARING AND GRUBBING. NOTE: NO OFF SITE DISPOSAL OF MATERIAL IS ALLOWED UNLESS THE DISPOSAL SITE HAS AN APPROVED EROSION CONTROL PLAN.
5. – ALL TEMPORARY STREAM AND CREEK CROSSINGS FOR EQUIPMENT DURING CONSTRUCTION SHALL BE MADE USING TEMPORARY BRIDGES. NO STREAMBANK OR STREAMBED DISTURBANCE SHALL BE ALLOWED FOR EQUIPMENT CROSSINGS.
6. – AREAS TO BE STABILIZED WITH PERMANENT VEGETATION MUST BE SEEDED OF PLANTED WITHIN 15 WORKING DAYS. UNLESS TEMPORARY STABILIZATION IS APPLIED.

   IN ANY EVENT, SLOPES LEFT EXPOSED WILL, WITHIN 21 CALENDAR DAYS OF COMPLETION OF ANY PHASE OF GRADING, BE PLANTED OF OTHERWISE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION.

   TEMPORARY SEEDING CONTROLS RUNOFF AND EROSION UNTIL PERMANENT VEGETATION OR OTHER EROSION CONTROL MEASURES CAN BE ESTABLISHED. IN ADDITION, IT PROVIDES RESIDUE FOR SOIL PROTECTION AND SEEDBED PREPARATION, AND REDUCES PROBLEMS OF MUD AND DUST PROTECTION FROM BARE SOIL SURFACES DURING CONSTRUCTION.

LIME	4,000 LBS
FERTILIZER (10-10-10)	1,000 LBS
KY-31 FESCUE	100 LBS
STRAW MULCH	60-80 BALES

FOR SUMMER SEEDING ADD TO THE ABOVE:

GERMAN MILLET	10 LBS
SUDAN GRASS	15 LBS

FOR WINTER SEEDING ADD TO THE ABOVE

RYE GRAIN	15 LBS

FOR ALL SLOPES 2:1 OR STEEPER ADD TO THE ABOVE:

SERICEA LESPEDEZA	40 LBS

IF HYDROSEEDING, WOOD CELLULOSE MAY BE USED IN ADDITION TO STRAW MULCH AT THE RATE OF 1,000 LBS PER ACRE.

ALL SEEDING SHALL BE MAINTAINED, WATERED ETC., UNTIL A PERMANENT VEGETATIVE GROUND COVER IS ESTABLISHED OVER ALL DISTURBED AREAS.

ALL SLOPES 2:1 OR STEEPER SHALL BE COVERED BY EROSION CONTROL MATTING.

NATIVE PLANT SEEDING MIX FOR STREAM OR RIVERBANK STABILIZATION

SEEDING FOR STREAM OR RIVERBANK STABILIZATION SHALL BE A MIXTURE OF NATIVE GRASSES, PLANTS AND TREES. NATIVE PLANT MIX SHALL INCLUDE THE FOLLOWING:

GRASSES – BIG BLUESTEM, INDIAN GRASS, LITTLE BLUESTEM, SWITCHGRASS	5 LBS/ACRE EACH
AUGUST THRU MAY – GREENRYE	25 LBS/ACRE EACH
MAY 1 THRU AUGUST – MILLET	25 LBS/ACRE EACH

TREES – SILKY DOGWOOD (CORNUS AMONUM), SILKY WILLOW (SALIX SERICEA), HAZEL ALDER (ALMUS SERRULATA) AND ELDERBERRY (SAMBUEUS CANADENSIS)

NATIVE PLANT MIX VARIATIONS SHALL BE APPROVED BY ENGINEER.

NOTE: NO FERTILIZER SHALL BE USED WITHIN 10' OF TOP OF STREAM OR RIVER BANK

7. – MAINTAIN SOIL EROSION CONTROL MEASURES UNTIL PERMANENT GROUND COVER IS ESTABLISHED.
8. – REMOVE SOIL EROSION CONTROL MEASURES AND STABILIZE THESE AREAS.
9. – REQUEST FINAL APPROVAL BY THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF LAND RESOURCES, LAND QUALITY SECTION.

GENERAL CONSTRUCTION NOTES

1. FINISH GRADE TOLERANCES SHALL BE AS NOTED IN THE SPECIFICATIONS. THE ENGINEER MAY MAKE GRADE CHANGES AS REQUIRED IN THE FIELD WITHOUT EFFECTING THE UNIT BID PRICE FOR UNCLASSIFIED EXCAVATION.
2. UNLESS OTHERWISE STATED, ALL FILL AREAS SHALL BE CONSTRUCTED IN LAYERS OF 8" MAXIMUM THICKNESS, WITH WATER ADDED OR SOIL CONDITIONED TO THE OPTIMUM MOISTURE CONTENT AS DETERMINED BY THE ENGINEER AND COMPACTED WITH A SHEEP'S FOOT ROLLER TO A COMPACTION EQUAL TO OR GREATER THAN 95% (100% IN THE TOP 2' OF THE SUB GRADE BELOW ROADWAYS AND PARKING LOTS) OF THE DENSITY OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH THE STANDARD PROCTOR METHOD OF MOISTURE-DENSITY RELATIONSHIP TEST, ASTM D698 OR AASHTO-99 UNLESS SPECIFIED IN OTHER SPECIFICATIONS.
3. ENTIRE AREA TO BE GRADED SHALL BE CLEARED AND GRUBBED. NO FILL SHALL BE PLACED ON ANY AREA NOT CLEARED AND GRUBBED.
4. ALL SOIL EROSION CONTROL MEASURES REQUIRED BY THE GRADING PLAN SHALL BE PERFORMED PRIOR TO GRADING, CLEARING OR GRUBBING. ALL EROSION CONTROL DEVICES SUCH AS SILT FENCES, ETC., SHALL BE MAINTAINED IN WORKABLE CONDITION FOR THE LIFE OF THE PROJECT AND SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT ONLY ON THE ENGINEER'S APPROVAL. PAYMENT SHALL BE CONSIDERED INCIDENTAL TO CLEARING AND GRUBBING. IF DURING THE LIFE OF THE PROJECT, A STORM CAUSES SOIL EROSION WHICH CHANGES FINISH GRADES OR CREATES "GULLIES" AND "WASHED AREAS", THESE SHALL BE REPAIRED AT NO EXTRA COST, AND ALL SILT WASHED OFF OF THE PROJECT SITE ONTO ADJACENT PROPERTY SHALL BE REMOVED AS DIRECTED BY THE ENGINEER AT NO EXTRA COST. THE CONTRACTOR SHALL ADHERE TO ANY APPROVED EROSION CONTROL PLANS WHETHER INDICATED IN THE CONSTRUCTION PLANS OR UNDER SEPARATE COVER.
5. DISPOSABLE MATERIAL

   A. CLEARING AND GRUBBING WASTES SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF BY THE CONTRACTOR AT HIS EXPENSE, UNLESS SPECIFIED OTHERWISE.

   B. SOLID WASTES TO BE REMOVED, SUCH AS SIDEWALKS, CURBS, PAVEMENT, ETC., MAY BE PLACED IN SPECIFIC DISPOSAL AREAS DELINEATED ON THE PLANS OR REMOVED FROM THE SITE AS REQUIRED BY THE SPECIFICATIONS. THIS MATERIAL SHALL HAVE A MINIMUM COVER OF 2'. THE CONTRACTOR SHALL MAINTAIN SPECIFIED COMPACTION REQUIREMENTS IN THESE AREAS. WHEN DISPOSAL SITES ARE NOT PROVIDED, THE CONTRACTOR SHALL REMOVE THIS WASTE FROM THE SITE AND PROPERLY DISPOSE OF IT AT HIS EXPENSE.

   C. ABANDONED UTILITIES SUCH AS CULVERTS, WATER PIPE, HYDRANTS, CASTINGS, PIPE APPURTENANCES, UTILITY POLES, ETC., SHALL BE THE PROPERTY OF THE SPECIFIC UTILITY AGENCY, OR COMPANY HAVING JURISDICTION. BEFORE THE CONTRACTOR CAN REMOVE, DESTROY, SALVAGE, REUSE, SELL OR STORE FOR HIS OWN USE ANY ABANDONED UTILITY, HE MUST PRESENT TO THE OWNER WRITTEN PERMISSION FROM THE UTILITY INVOLVED.

6. IN THE EVENT EXCESSIVE GROUNDWATER OR SPRINGS ARE ENCOUNTERED WITHIN THE LIMITS OF CONSTRUCTION, THE CONTRACTOR SHALL INSTALL NECESSARY UNDER DRAINS AND STONE AS DIRECTED BY THE ENGINEER. ALL WORK SHALL BE PAID BASED UPON UNIT BIDS, UNLESS SPECIFIED OTHERWISE.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE COORDINATION OF ADJUSTMENT OF ALL UTILITY SURFACE ACCESSES WHETHER HE PERFORMS THE WORK OR A UTILITY COMPANY PERFORMS THE WORK.
8. THE CONTRACTOR SHALL CONTROL ALL "DUST" BY PERIODIC WATERING AND SHALL PROVIDE ACCESS AT ALL TIMES FOR PROPERTY OWNERS WITHIN THE PROJECT AREA AND FOR EMERGENCY VEHICLES. ALL OPEN DITCHES AND HAZARDOUS AREAS SHALL BE CLEARLY MARKED IN ACCORDANCE WITH THE SPECIFICATIONS.
9. ALL AREAS WHERE THERE IS EXPOSED DIRT SHALL BE SEEDED, FERTILIZED AND MULCHED ACCORDING TO THE SPECIFICATIONS. THE FINISHED SURFACE SHALL BE TO GRADE AND SMOOTH, FREE OF ALL ROCKS LARGER THAN 3", EQUIPMENT TRACKS, DIRT CLODS, BUMPS, RIDGES AND GOUGES PRIOR TO SEEDING; THE SURFACE SHALL BE LOOSENED TO A DEPTH OF ±4"-6" TO ACCEPT SEED. THE CONTRACTOR SHALL NOT PROCEED WITH SEEDING OPERATIONS WITHOUT FIRST OBTAINING THE ENGINEER'S APPROVAL OF THE GRADED SURFACE. ALL SEEDING SHALL BE PERFORMED BY A MECHANICAL "HYDRO-SEEDER". HAND SEEDING SHALL BE AUTHORIZED ON AN AREA BY AREA APPROVAL BY THE ENGINEER.
10. WHERE SPECIFIED, STORM DRAIN PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP) CONFORMING TO AASHTO M-170, AS CONTAINED IN NCDOT STANDARD SPECIFICATION 1032-9 FOR WALL "B" TYPE.

    WHERE SPECIFIED, ALL STORM DRAIN PIPE SHALL BE HIGH DENSITY POLYETHELENE (HDPE). SMOOTH WALL INTERIOR, WITH WATER TIGHT JOINTS, BACKFILLED WITH # 57 WASHED STONE UP TO MIN. 6" OVER THE TOP OF THE PIPE. HDPE PIPE SHALL BE "HANCOR BLUE SEAL" OR APPROVED EQUAL.

    ALL CORRUGATED METAL STORM DRAIN PIPE (CMP) SHALL BE ALUMINIZED TYPE 2 CORRUGATED STEEL MANUFACTURED IN ACCORDANCE WITH THE REQUIREMENTS OF AASHTO M-36. THE PIPE SHALL BE MANUFACTURED FROM ALUMINIZED STEEL TYPE 2 MATERIAL CONFORMING TO THE REQUIREMENTS OF AASHTO M-274. ALL PIPE SHALL BE FURNISHED WITH REROLLED ENDS AND SHALL BE JOINED WITH HUGGER BANDS. THE USE OF DIMPLE BANDS WILL NOT BE ALLOWED. PIPE THROUGH 24" DIAMETER SHALL BE 16 GAUGE, PIPE THROUGH 42" DIAMETER SHALL BE 14 GAUGE, PIPE THROUGH 54" DIAMETER SHALL BE 12 GAUGE.
11. CONTRACTOR SHALL VERIFY ALL ELEVATIONS BEFORE INSTALLATION OF FACILITIES.
12. CATCH BASINS CAST-IN-PLACE SHALL CONFORM TO THE REQUIREMENTS OF NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES (LATEST EDITION) ARTICLES 840-1 THROUGH 840-3. CURB INLET CATCH BASIN SHALL CONFORM TO NCDOT STANDARD DETAILS 840.02 THROUGH 840.04. DROP INLETS SHALL CONFORM TO STANDARD DETAIL 840.14. JUNCTION BOXES SHALL CONFORM TO STANDARD DETAIL 840.31.
13. CURB INLET FRAME, GRATE AND HOOD SHALL BE NEENAH R-3233D, PRODUCTS BY DEWEY BROS., U.S. FOUNDRY OR EQUAL. DROP INLET FRAME AND GRATE SHALL BE NEENAH R-3339A OR EQUAL. FIELD INLET COVER SHALL CONFORM TO NCDOT STANDARD DETAIL 840.04, OPENING FACING UPSTREAM.
14. CONCRETE AND MASONRY SHALL MEET THE REQUIREMENTS OF APPROPRIATE SECTION OF NCDOT STANDARD SPECIFICATIONS FOR ROAD AND STRUCTURES (LATEST EDITION). CONCRETE SHALL BE CLASS A OR B, 4000 PSI MINIMUM, MEETING THE REQUIREMENTS OF SECTION 1000. CONSTRUCTED IN ACCORDANCE WITH SECTION 825. MASONRY SHALL MEET THE REQUIREMENTS OF SECTION 1040, CONSTRUCTED IN ACCORDANCE WITH SECTION 830 AND/OR 834.
15. TOPS OF PROPOSED FRAMES AND GRATES SHALL BE FLUSH WITH FINISHED GRADE.
16. TINDALL PRE CAST CONCRETE BOXES ARE ACCEPTABLE ALTERNATIVES FOR PROPOSED CATCH BASINS.

LEGEND - EXISTING CONDITIONS

TEL. PED.	TELEPHONE PEDESTAL
ELEC PED.	ELECTRIC PEDESTAL
SIGN	SIGN
CATV	UNDERGROUND CABLE TV SIGN
UG FOC	UNDERGROUND FIBER OPTIC CABLE SIGN
UG TEL	UNDERGROUND TELEPHONE CABLE SIGN
UG GAS	UNDERGROUND GAS LINE SIGN
UG ELEC	UNDERGROUND ELECTRIC SIGN
26	INTERSTATE HIGHWAY
66	U.S. HIGHWAY
	CONCRETE MONUMENT
CM-R/W	RIGHT-OF-WAY MONUMENT
MB	MAILBOX OR PAPER BOX
PB	POSTAL DROP BOX
LP	STREET LIGHT
LP	LIGHT POLE
PP	UTILITY POLE
	GUY WIRE ANCHOR
MW	MONITORING WELL
PZ	PIEZOMETER
MH	MANHOLE
J.B.	JUNCTION BOX
C.O.	SEWER CLEAN-OUT
E.SS	ELECTRIC SERVICE STUB-OUT
G.SS	GAS SERVICE STUB-OUT
CB	CATCH BASIN
WM	WATER METER
FH	FIRE HYDRANT
WV	WATER VALVE
G/M	GAS METER
G/V	GAS VALVE
ICV	IRRIGATION CONTROL VALVE
PIV	POST INDICATOR VALVE
E.CAB	ELECTRIC CABINET
E.JUNC	ELECTRIC JUNCTION BOX OR OUTLET
E.TRANS	E.TRANS= ELECTRIC TRANSFORMER
IPF	IRON PIPE/PIN FOUND (PROPERTY CORNER)
PK NL	PK NAIL FOUND
	CONTROL POINT/NAIL SET
	CULVERT
X	FENCE
	GUARD RAIL
SS	APPROXIMATE LOCATION OF EXISTING SEWER LINES
W	APPROXIMATE LOCATION OF EXISTING WATER LINES
GAS GAS GAS	APPROXIMATE LOCATION OF EXISTING GAS LINES
	TOP & TOE LINES
DL	DITCH LINES
CTV	APPROXIMATE LOCATION OF UNDERGROUND CABLE TV LINE
CTV	APPROXIMATE LOCATION OF OVERHEAD CABLE TV LINE
FOC	APPROXIMATE LOCATION OF UNDERGROUND FIBER OPTIC CABLE LINE
E	APPROXIMATE LOCATION OF UNDERGROUND ELECTRIC LINE
E	APPROXIMATE LOCATION OF OVERHEAD ELECTRIC LINE
UGT	APPROXIMATE LOCATION OF UNGERGROUND TELEPHONE LINES
T	APPROXIMATE LOCATION OF OVERHEAD TELEPHONE LINES
ROW	RIGHT-OF-WAY
	TREES/SHRUBS
	TREELINE

E.I.P.	EXISTING IRON PIPE OR PIN
RBF	REBAR FOUND
OTIPF	OPEN TOP IRON PIN FOUND
CTIPF	CRIMPED TOP IRON PIN FOUND
R/W	RIGHT OF WAY
℄	CENTERLINE
C	CURVE (SEE CURVE TABLE)
POB	POINT OF BEGINNING
CP	CALCULATED POINT
PB	PLAT BOOK
DB	DEED BOOK
L	LINE (SEE LINE TABLE)
BLDG	BUILDING
CIP	CAST IRON PIPE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CPP	CORRUGATED PLASTIC PIPE
DIP	DUCTILE IRON PIPE
E&T	ELECTRIC & TELEPHONE
FOC	FIBER OPTIC CABLE
GIP	GALVANIZED IRON PIPE
O/H	OVERHEAD
RCP	REINFORCED CONCRETE PIPE
U/G	UNDERGROUND
VCP	VITRIFIED CLAY PIPE
PVC	POLYVINYL CHLORIDE PIPE

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP, JH,KS
CADD BY: DP, JH,KS
DESIGN REVIEW: ____
CONST. REVIEW: ____
FILE NAME: 07518-G1-G2.dwg

GENERAL NOTES & LEGEND

SHEET
G2

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LEGEND

- EXISTING GROUNDWATER MONITORING WELL, PIEZOMETER, OR BORING
- EXISTING LFG MONITORING WELL
- PROPOSED GROUNDWATER MONITORING WELL (NOT IN CONTRACT)
- PROPOSED LFG MONITORING WELL (NOT IN CONTRACT)
- PRIVATE POTABLE WATER WELL

INSTALL 3,820 L.F. 8' HIGH CHAIN LINK FENCE. EXISTING FENCING TO BE REMOVED AND ROLLED UP. FENCING AND POSTS TO BE STORED NEAR THE MAINTENANCE BUILDING. LOCATION TO BE DETERMINED BY LANDFILL OPERATOR. INSTALL 3 DOUBLE-SWING 20' GATES, TO BE FIELD LOCATED.

EXISTING CHAIN LINK FENCE

HAYWOOD COUNTY PROPERTY LINE

LIMITS OF DISTURBANCE

HAYWOOD COUNTY PROPERTY LINE

LIMITS OF DISTURBANCE

CP #6558
N: 721,285.08
E: 810,728.47
ELEV.: 2616.89

CP #6592
N: 721,903.68
E: 812,090.99
ELEV.: 2459.66

CP #6591
N: 720,606.07
E: 812,439.22
ELEV.: 2637.94

CP #6595
N: 721,086.56
E: 811,709.04
ELEV.: 2613.02

CP #6597
N: 720,125.00
E: 811,652.44
ELEV.: 2639.50

MW-1A, MW-2, MW-2D, MW-3D, MW-3, MW-4A, MW-4S, MW-5A, MW-5D, MW-8, MW-11D, MW-11S, MW-12, MW-13D, MW-13S, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20

LFG-1, LFG-4, LFG-6, LFG-7, LFG-8, LFG-9, LFG-10

PZ-1S, PZ-3D, PZ-3S, PZ-4S, PZ-9 (DISTURBED), PZ-14

LEACHATE LAGOON

EXISTING PHASE 1
CELL 1
CELL 2
CELL 3

EXISTING PHASE CELL 4

EXISTING PHASE 2

FUTURE PHASE 4 (6.7 ACRES)

PHASE 3 (8.8 ACRES)

SOIL STOCKPILE AREA #2

SOIL STOCKPILE AREA #3

SOIL STOCKPILE AREA #4

SOIL STOCKPILE AREA #5

LCID

C & D PHASE 1

TYPE 2 COMPOSTING

MULCHING AND GRINDING TREATMENT AND PROCESSING

PROPOSED LANDSCAPING BERM (STOCKPILE AREA #1)

MAINTENANCE BUILDING

SCALE HOUSE AND SCALES

LANDFILL ENTRANCE

PIGEON RIVER

INTERSTATE 40

EXIT 15

EXIT 15

TIMES CREEK ROAD SR 1336

PLAN

GRAPHIC SCALE 200 0 100 200 400 600 — 1 INCH = 200 FEET

NOTE:
1. EXISTING TOPOGRAPHIC INFORMATION OF PROPOSED PHASE 3 EXPANSION AREA PREPARED FROM AERIAL SURVEY PERFORMED BY SOUTHEAST AERIAL, DATED MARCH 25, 2007, AND UPDATED MARCH 28, 2008 & MARCH 6, 2009.
2. A PORTION OF PROPERTY LINES SHOWN WERE OBTAINED FROM PLATS AND DEEDS PREPARED BY RANDY HERRON, P.L.S. AND ARE APPROXIMATE ONLY.
3. HORIZONTAL COORDINATES ARE NAD 83 (1986) RELATIVE TO NCGS STATIONS WATERVILLE, JAMES AND C144. VERTICAL DATUM IS NAVD 88 AND ALL ELEVATIONS ARE RELATIVE TO NCGS STATIONS JAMES AND C144.
4. CONTRACTOR WILL BE GIVEN A DIGITAL COPY OF EXISTING & PROPOSED CONTOURS AND FEATURES.
5. CONTRACTOR TO COMPLETELY FILL STOCKPILES IN SEQUENCE, 1,2,3,4,5 BEFORE MOVING ON TO NEXT STOCKPILE AREA.

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

McGill ASSOCIATES
ENGINEERING-PLANNING-FINANCE
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PROFESSIONAL ENGINEER SEAL 23574 JAMES H. SOUTHERLAND REGISTERED

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP,JH,KS
CADD BY: DP, JH,KS
DESIGN REVIEW: ____
CONST. REVIEW: ____
FILE NAME: 07518-C1-Overall-Site-Plan.dwg

OVERALL SITE PLAN

SHEET
C1

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NOTES:

1. AT TEMPORARY SEDIMENT TRAP/BASIN #1, CONTRACTOR MAY INSTALL RISER/BARREL AS SHOWN ON SEDIMENT BASIN SCHEDULE ON SHEET D9, OR BYPASS PUMP STORMWATER RUNOFF TO EXISTING SEDIMENT BASIN #1.

2. CONTRACTOR SHALL INSTALL TEMPORARY BERMS/DITCHES AS NECESSARY, A)TO DIVERT STORMWATER RUNOFF FROM UNDISTURBED AREAS AROUND GRADING ACTIVITIES, B)TO DIVERT RUNOFF FROM DISTURBED AREAS TO SEDIMENT CONTROL DEVICES.

NOTE:
THE FOLLOWING PIEZOMETERS, BORINGS, GAS PROBES AND MONITORING WELLS ABANDONED BY OTHERS IN ACCORDANCE WITH NCDENR STANDARDS PRIOR TO CONSTRUCTION:
P-4
P-5
P-6
PZ-9(SEE SHEET C1 FOR LOCATION)
MW-3
MW-3D
MW-5A
MW-5D
MW-12
MW-13D
MW-13S
BLE-1
BLE-2
BLE-3
BLE-4
BLE-5
BLE-6
BLE-7
BLE-7D
BLE-8
BLE-9
BLE-10
BLE-11
BLE-12
BLE-13
BLE-14
BLE-15
BLE-16
BLE-17
LFG-4
LFG-6

NOTE:
THE CONTRACTOR SHALL LOWER MW-4A AND RAISE MW-8, PER THE DETAILS. CONTRACTOR SHALL PROTECT THE MONITORING WELLS TO REMAIN IN SERVICE TO ENSURE THAT RUNOFF AND SEDIMENTATION DOES NOT ENTER WELL.

LIMITS OF DISTURBANCE

STREAM IMPACT LIMITS
N: 721,908.75
E: 811,678.01
(SEE UNDERDRAIN INSTALLATION CONSTRUCTION SEQUENCE NOTE 1)

SILT FENCE,TYP.

TEMPORARY DIVERSION DITCH #1

ENERGY DISSIPATER STRUCTURE S-2

PROPOSED TEMPORARY SEDIMENT TRAP/BASIN #1

EXISTING CMP TO BE REMOVED

EXISTING MONITORING WELL, PIEZOMETER, OR BORING, TYP.

EXISTING SEDIMENT BASIN 1 TO REMAIN IN SERVICE

DOUBLE SILT FENCE ⚠

EXISTING LEACHATE POND

185 L.F. OF STREAM AND 0.45 AC OF WETLANDS WILL BE IMPACTED.
NOTE: 404 AND 401 PERMITS FOR WETLANDS AND STREAM IMPACT HAVE BEEN APPROVED.

PROPOSED UNDERDRAIN COLLECTION LINES
INSTALL 2,350 L.F. 8" HDPE UNDERDRAIN

REMOVE UNSUITABLE SOILS AS NECESSARY AS DIRECTED BY ENGINEER

8" PERFORATED HDPE

8" PERFORATED HDPE

8" PERFORATED HDPE

EXISTING SEDIMENT BASIN 2

CONNECT PROPOSED UNDERDRAIN TO EXISTING UNDERDRAIN LOCATION TO BE DETERMINED IN FIELD

PROPOSED MSW PHASE 3

FUTURE MSW PHASE 4

EXISTING MSW PHASE 1 CELLS 1,2, AND 3

EXISTING MSW PHASE 1 CELL 4

EXISTING MSW PHASE 2

BLE-1 BLE-2 BLE-3 BLE-4 BLE-5 BLE-6 BLE-7 BLE-7D BLE-8 BLE-9 BLE-10 BLE-11 BLE-12 BLE-13 BLE-14 BLE-15 BLE-16 BLE-17

P-4 P-6

MW-3D MW-3 LFG-4

MW-4A MW-8

MW-5D MW-5A

MW-13D MW-13S MW-12

LFG-6

PLAN

GRAPHIC SCALE 60 0 30 60 120 180 — 1 INCH = 60 FEET

UNDERDRAIN INSTALLATION CONSTRUCTION SEQUENCE NOTES

1. NO GRADING, TEMPORARY OR PERMANENT PAST STREAM IMPACT LIMITS SHOWN. NO EROSION OR SEDIMENT PAST LIMITS SHOWN. ALL RIP RAP MUST TERMINATE AT LIMITS SHOWN.

2. INSTALL ENERGY DISSIPATER STRUCTURE. INSTALL SILT FENCE AROUND STRUCTURE WORK AS NECESSARY TO RESTRAIN SEDIMENTATION.

3. BLOCK STREAM FLOW AT EXISTING SEDIMENT BASIN 2 BY PLUGGING BASIN OUTLET PIPE. INSTALL BY-PASS PUMP AND FORCE-MAIN. INSTALL DISCHARGE OF FORCE MAIN IN ENERGY DISSIPATER STRUCTURE. ALLOW SUFFICIENT AMOUNT OF TIME FOR WETLANDS TO DRAIN PRIOR TO THE BEGINNING UNDERDRAIN INSTALLATION WORK.

4. INSTALL FIRST SECTION OF UNDERDRAIN IN NEW CHANNEL ADJACENT TO EXISTING STREAM CHANNEL. INSTALL SILT FENCE AS NECESSARY AROUND UNDERDRAIN INSTALLATION. INSTALL DIVERSION BERMS AS NECESSARY TO DIRECT STORMWATER RUNOFF AWAY FROM GRADING AREAS.

5. CONSTRUCT PROPOSED TEMPORARY SEDIMENT TRAP 1. INSTALL SILT FENCE AT TOE OF SLOPE OF SEDIMENT TRAP. PLUG UPSTREAM END OF UNDERDRAIN INSTALLED BENEATH TEMPORARY SEDIMENT TRAP 1. INSTALL TEMPORARY DIVERSION DITCHES TO DIRECT RUNOFF FROM GRADING ACTIVITIES TO NEWLY CONSTRUCTED SEDIMENT TRAP.

6. CONTRACTOR MAY NOW BEGIN WORK OF REMOVING UNSUITABLE MATERIALS IN AREA OF WETLANDS, AS DIRECTED BY THE ENGINEER. THIS WORK WILL BE PERFORMED IN CONJUNCTION WITH THE INSTALLATION OF THE UNDERDRAIN. CONTRACTOR SHALL MAINTAIN BY-PASS PUMPING OF STREAM AROUND GRADING AREA. CONTRACTOR SHALL PLUG UPSTREAM END OF UNDERDRAIN TO ENSURE THAT SEDIMENTATION DOES NOT ENTER UNDERDRAIN.

7. CONTRACTOR SHALL CONTINUE UPSTREAM WITH THE CONSTRUCTION OF THE UNDERDRAIN. REPEATING STEPS 2 THROUGH 5 IN ORDER TO COMPLETE UNDERDRAIN INSTALLATION. CONTRACTOR SHALL USE COFFER DAM AS SHOWN ON DETAIL SHEET D11 TO BLOCK STREAM FLOW AND BY-PASS PUMP. THE HEIGHT OF TEMPORARY SEDIMENT TRAP 1 SHALL BE INCREASED TO ACCOMMODATE INCREASED RUNOFF.

FOR CONSTRUCTION
JUNE 2009

LEGEND
- WETLANDS/ STREAMS
- EXISTING PIPES
- CERTIFIED LINER EDGE
- TD — TEMPORARY DIVERSION DITCH
- SEDIMENT FENCE
- UNDERDRAIN
- RIP RAP OUTLET PROTECTION

NO.	DATE	BY	REVISION DESCRIPTION
⚠1	4/22/09	KS	ADDENDUM #1

McGill ASSOCIATES
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PROFESSIONAL ENGINEER SEAL 23574 JAMES H. KELLY

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP,JH,KS
CADD BY: DP,JH,KS
DESIGN REVIEW: ____
CONST. REVIEW: ____
FILE NAME: 07518-C2-Underdrain-Installation-Erosion-Control-Plan.dwg

UNDERDRAIN INSTALLATION EROSION CONTROL PLAN

SHEET C2

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PLAN

GRAPHIC SCALE 60 0 30 60 120 180 — 1 INCH = 60 FEET

LINER EDGE
N: 721770.78
E: 811303.15
ELEV.: 2341.5

TRANSITION FROM LINER EDGE #1 TO LINER EDGE #2 THIS AREA

LINER EDGE
N: 721628.17
E: 811255.66
ELEV.: 2539.7

PROPOSED LINER EDGE MARKER, TYP. OF 10

LINER EDGE
N: 721628.17
E: 811255.66
ELEV.: 2552.6

PROPOSED 20' WIDE GRAVEL ACCESS ROAD

PROPOSED PHASE 3 STOCKPILE

LINER EDGE
N: 720862.61
E: 811322.17
ELEV.: CONNECT TO EXISTING

LINER EDGE
N: 721863.21
E: 811478.20
ELEV.: 2525.5

PERMANENT LINER EDGE #1A

TEMPORARY LINER EDGE #2

TEMPORARY LINER EDGE #3

PERMANENT LINER EDGE #1

PROPOSED 16' WIDE GRAVEL ACCESS ROAD

EXISITING LEACHATE LAGOON

LINER EDGE
N: 721661.20
E: 811802.72
ELEV.: CONNECT TO EXISTING

PROPOSED 20' WIDE GRAVEL ACCESS ROAD

PROPOSED 8'x60' SUMP WITH LEACHATE PUMP STATIONS/RISER PIPES SUMP @ 2495.0 SEE SHEET D1

PHASE 1 LINER EDGE

CONNECT PROPOSED GEOMEMBRANE TO EXISTING PHASE 1 GEOMEMBRANE SEE SHEET D4

PHASE 3

PHASE 1
Cell 1-3 Clay Grades

CONNECT PROPOSED GEOMEMBRANE TO EXISTING PHASE 1 GEOMEMBRANE SEE SHEET D4

PHASE 1
Cell 4 Clay Grades

CONNECT PROPOSED GEOMEMBRANE TO EXISTING PHASE 2 GEOMEMBRANE SEE SHEET D4

PHASE 2 LINER EDGE

REMOVE WASTES AS NECESSARY IN ORDER TO CONNECT PROPOSED LINER TO EXISTING LINER. SEE SHEET C5 FOR EXISTING GRADES IN THIS VICINITY

PHASE 2
Clay Grades

NOTES:
1. EXISTING SOLID CONTOURS SHOWN WITHIN PHASE 1&2 REPRESENT TOP OF CLAY GRADES AND ARE APPROXIMATE ONLY. CONTRACTOR TO VERIFY ELEVATIONS IN FIELD PRIOR TO CONSTRUCTION.
2. PROPOSED CONTOURS SHOWN WITHIN PHASE 3 WASTE LIMITS REPRESENT TOP OF CLAY ELEVATIONS.

LEGEND
- 2580 EXISTING CONTOUR
- 2550 PROPOSED GRADING
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- CERTIFIED LINER EDGE

FOR CONSTRUCTION
JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH: (828) 252-0575

JOHN H. HARRIS 23574 REGISTERED PROFESSIONAL ENGINEER

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP,JH,KS
CADD BY: DP,JH,KS
DESIGN REVIEW:
CONST. REVIEW:
FILE NAME: 07518-C3-Phase-3-Clay.dwg

CLAY LINER GRADES

SHEET
C3

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PLAN

60 0 30 60 120 180

GRAPHIC SCALE 1 INCH = 60 FEET

PROPOSED
DUAL CONTAINED HDPE FORCE MAIN,
6" SECONDARY, 3" CARRIER PIPE,
MAINTAIN 4' MINIMUM COVER
BENDS AS NECESSARY

PROPOSED
RAISE LEACHATE
STORAGE POND
(SEE DETAIL SHEET D7)

EXISITING
LEACHATE
LAGOON

EXISTING
WETWELL

PROPOSED
LEACHATE
MANHOLE #1

PROPOSED
LEACHATE
MANHOLE #2

EXISTING VALVE
(TO BE REMOVED)

PROPOSED
LEACHATE HEAD
TEST WELL, TYP. OF 2

PROPOSED
LEACHATE PUMP STATION #1
INSTALL IN EXISTING RISER PIPE

PROPOSED
8'X60' SUMP WITH LEACHATE
PUMP STATIONS/RISER PIPES
SEE SHEET D1

EXISTING LEACHATE GRAVITY SEWER

EXISTING LEACHATE MANHOLE
(TO BE REMOVED, TYP. OF 5)

PROPOSED
DUAL CONTAINED HDPE LEACHATE GRAVITY SEWER,
12" SECONDARY, 8" CARRIER PIPE
SEE SHEET C6 & C7 FOR ADDITIONAL INFORMATION

PROPOSED
CONNECT TO EXISTING PHASE 1
LEACHATE SEWER LINE

APPROXIMATE LOCATION OF EXISTING
LEACHATE GRAVITY SEWER

PROPOSED
CONNECT TO EXISTING PHASE 2
LEACHATE SEWER LINE

EXISTING LEACHATE
COLLECTION LINES

INSTALL CLEANOUT
@ TERMINATION OF LEACHATE
COLLECTION PIPE, TYP. OF 9

PROPOSED
LEACHATE COLLECTION LINES, TYP.
MAINTAIN MINIMUM 2.5% SLOPE

PROPOSED
LEACHATE PUMP STATIONS #2 & #3

PROPOSED
CAP END OF LEACHATE
COLLECTION PIPE,
TYP. OF 8

PHASE 1
CELL 1-3(DRAINAGE GRADES)

PHASE 1
CELL 4(DRAINAGE GRADES)

PHASE 2
DRAINAGE GRADES

PHASE 3

NOTES:
1. EXISTING SOLID CONTOURS SHOWN WITHIN PHASE 1&2 REPRESENT TOP OF DRAINAGE LAYER ELEVATIONS AND ARE APPROXIMATE ONLY. CONTRACTOR TO VERIFY IN FIELD PRIOR TO CONSTRUCTION.
2. PROPOSED CONTOURS SHOWN WITHIN PHASE 3 WASTE LIMITS REPRESENT TOP OF DRAINAGE LAYER GRADES.

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- CERTIFIED LINER EDGE
- PROPOSED LEACHATE PIPES
- EXISTING LEACHATE PIPES
- FM — FM — PROPOSED FORCE MAIN

FOR CONSTRUCTION
JUNE 2009

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McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
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DESIGN REVIEW: ____
CONST. REVIEW: ____
FILE NAME: 07518-C4-Phase-3-Drainage.dwg

DRAINAGE LAYER GRADES
&
LEACHATE COLLECTION
SYSTEM

SHEET
C4

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LEGEND
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- CERTIFIED LINER EDGE

NOTES:
1. PROPOSED CONTOURS SHOWN WITHIN PHASE 3 WASTE LIMITS REPRESENT TOP OF DRAINAGE LAYER GRADES.
2. EXISTING CONTOURS ARE FROM MARCH 25, 2007 AERIAL TOPO AND UPDATED MARCH 28, 2008 & MARCH 6, 2009.
3. FOR PIPE TABLE SEE SHEET D11.
4. SLOPE STABILIZATION MATTING, (N.A.G. S150), SHALL BE PLACED ON ALL PERMANENT SLOPES 2.5:1 OR GREATER, INCLUDING SOIL STOCKPILES.
5. INSTALL SLOPE STABILIZATION MATTING, (N.A.G. S150), AT ALL DISTURBED AREAS AT SEDIMENT BASIN #4.

STREAM IMPACT LIMITS – NO GRADING TEMPORARY OR PERMANENT, PAST THIS POINT
PROPOSED EMERGENCY SPILLWAY
PROPOSED SILT FENCE, TYP.
PROPOSED SEDIMENT BASIN #7
PROPOSED DITCH D5
"U" SHAPED CONCRETE ENDWALL #1 (SEE DETAIL SHEET D9)
PROPOSED TEMPORARY SEDIMENT TRAP #2, WITH SKIMMER
PROPOSED SEDIMENT BASIN #6
STREAM
PROPOSED DITCH D12
PROPOSED EMERGENCY SPILLWAY
PROPOSED STRUCTURE S-2
PROPOSED DITCH D4
STREAM IMPACT LIMITS
EXISTING SEDIMENT BASIN TO REMAIN IN SERVICE
EXISTING SEDIMENT BASIN #1
PROPOSED SEDIMENT BASIN #5
EXTEND EXISTING 18" HDPE PIPE AS NECESSARY TO DISCHARGE TO EXISTING SEDIMENT BASIN
PROPOSED SILT FENCE, TYP.
PROPOSED RIP RAP OUTLET PROTECTION, TYP.
REMOVE EXISTING F.E.S. & CONNECT PROPOSED PIPE P1 TO EXISTING 54" CMP W/COUPLING
EXISTING 54" CMP
CONNECT DITCH D1 TO EXISTING SEDIMENT BASIN WITH 1'X5' GRASSED CHANNEL. LOCATION TO BE DETERMINED IN FIELD
EXISTING LEACHATE LAGOON
EXISTING 18" CPP (TO REMAIN IN SERVICE)
PROPOSED DITCH D1
PROPOSED STRUCTURE S-3
EXISTING 30" CMP
PROPOSED DITCH D2
PROPOSED DITCH D3
STREAM
EXISITING CONCRETE FLUME (TO REMAIN IN SERVICE CONNECT TO DITCH D2)
"U" SHAPED CONCRETE ENDWALL #2 (SEE DETAIL SHEET D9)
"L" CONCRETE ENDWALL (SEE DETAIL SHEET D11)
PROPOSED AREA OF STORMWATER CONTROL LINER (SHADED)
PHASE 3 8.8 Ac.
EXISTING PHASE 1
EXISTING PHASE 2
Stockpile Area #4 200,000 c.y.
PROPOSED DITCH D6
PROPOSED DITCH D7
Potential Stockpile Area #5
EXISTING SOIL ROAD
PROPOSED CHECK DAM TYP
PROPOSED SEDIMENT BASIN #4
PROPOSED EMERGENCY SPILLWAY
PROPOSED DITCH D11
STREAM
PROPOSED DITCH D9
PROPOSED SILT FENCE, TYP.
EXISTING SOIL ROAD
PROPOSED DITCH D10
STREAM
Stockpile Area #3 3,500 c.y.
PROPOSED DITCH D8
END GRADING LIMITS
Stockpile Area #2 185,000 c.y.
PROPOSED DITCH D8A
INSTALL 20' WIDE GRAVEL ACCESS ROAD (GRADING BY OTHERS, THIS AREA ONLY)
TRUCK WASH AREA (APPROX. 80'LX15'W)

PLAN
GRAPHIC SCALE 100 0 50 100 200 300 — 1 INCH = 100 FEET

LEGEND–PROPOSED CONDITIONS
EROSION CONTROL AND STORM DRAINAGE
- TEMPORARY SILT FENCE
- STORM DRAINAGE PIPE
- EXISTING STORM DRAINAGE PIPE
- STORM DRAINAGE PIPE WITH FLARED END SECTION AND RIPRAP OUTLET PROTECTION
- FLARED END SECTION WITH RIPRAP OUTLET PROTECTION
- TEMPORARY SLOPE DRAIN
- ROCK CHECK DAM
- TD — TEMPORARY DIVERSION DITCH
- D — PERMANENT DIVERSION DITCH
- RR — RIPRAP LINED DITCH

FOR CONSTRUCTION
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JOHN D. BROWN SEAL 23574 NORTH CAROLINA PROFESSIONAL ENGINEER

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
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DESIGN REVIEW: ____
CONST. REVIEW: ____
FILE NAME: 07518-C5-Phase-3-Stormwater.dwg

FINAL GRADING, DRAINAGE & EROSION CONTROL PLAN

SHEET C5

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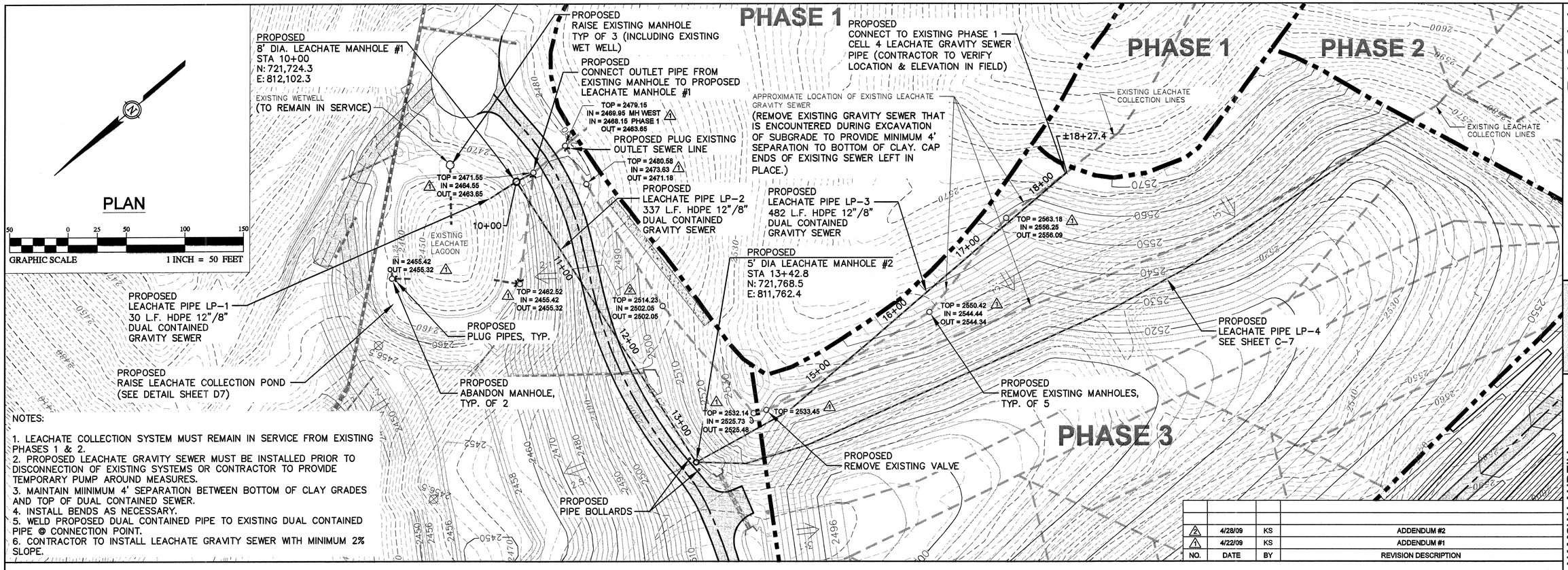

NO.	DATE	BY	REVISION DESCRIPTION
2	4/28/09	KS	ADDENDUM #2
1	4/22/09	KS	ADDENDUM #1

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WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3
HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DAP
CADD BY: KS
DESIGN REVIEW:
CONST. REVIEW:
FILE NAME: 07518-C6-Phase-3-Leachate-Profile.dwg

LEACHATE SEWER PLAN - PROFILE

SHEET C6

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PLAN

50 0 25 50 100 150

GRAPHIC SCALE 1 INCH = 50 FEET

PROPOSED RAISE LEACHATE COLLECTION POND (SEE DETAIL SHEET D7)

EXISTING LEACHATE LAGOON

EXISTING WETWELL (TO REMAIN IN SERVICE)

PROPOSED LEACHATE MANHOLE #1

PROPOSED LEACHATE PIPE LP-2 SEE SHEET C-6

APPROXIMATE LOCATION OF EXISTING LEACHATE GRAVITY SEWER (REMOVE EXISTING GRAVITY SEWER THAT IS ENCOUNTERED DURING EXCAVATION OF SUBGRADE TO PROVIDE MINIMUM 4' SEPARATION TO BOTTOM OF CLAY. CAP ENDS OF EXISITNG SEWER LEFT IN PLACE.)

PROPOSED LEACHATE PIPE LP-3 SEE SHEET C-6

PROPOSED 5' DIA. LEACHATE MANHOLE #2 STA 10+00 N: 721,768.5 E: 811,762.4

PROPOSED LEACHATE PIPE LP-4 805 L.F. HDPE 12"/8" DUAL CONTAINED GRAVITY SEWER

PHASE 1

PHASE 1

PHASE 2

PHASE 3

EXISTING LEACHATE COLLECTION LINES

EXISTING LEACHATE COLLECTION LINES

PROPOSED CONNECT TO EXISTING PHASE 2 LEACHATE GRAVITY SEWER PIPE (CONTRACTOR TO VERIFY LOCATION & ELEVATION IN FIELD)

±18+08.1

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00

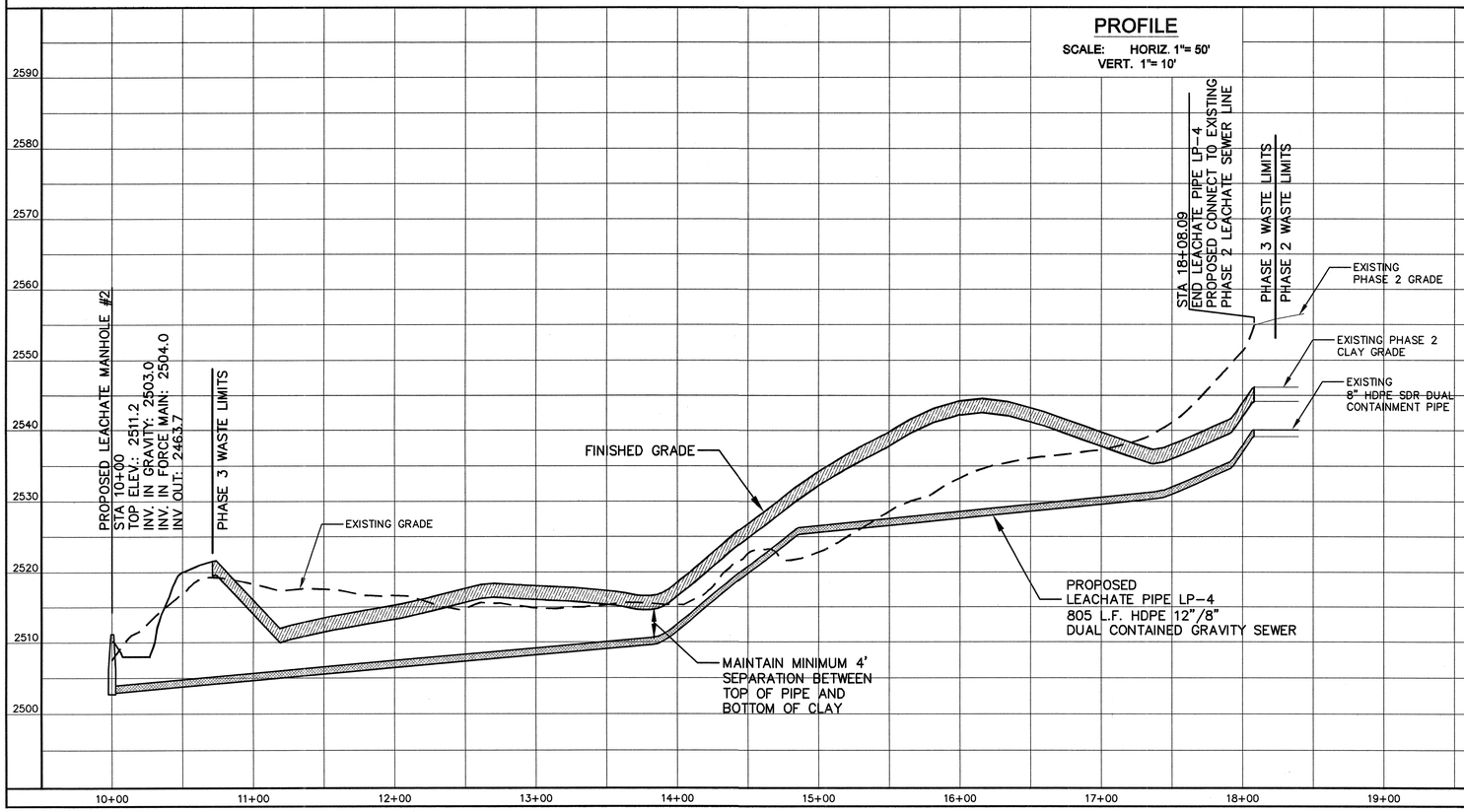
NOTES:

1. LEACHATE COLLECTION SYSTEM MUST REMAIN IN SERVICE FROM EXISTING PHASES 1 & 2.
2. PROPOSED LEACHATE GRAVITY SEWER MUST BE INSTALLED PRIOR TO DISCONNECTION OF EXISTING SYSTEMS OR CONTRACTOR TO PROVIDE TEMPORARY PUMP AROUND MEASURES.
3. MAINTAIN MIINIMUM 4' SEPARATION BETWEEN BOTTOM OF CLAY GRADES AND TOP OF DUAL CONTAINED SEWER.
4. INSTALL BENDS AS NECESSARY.
5. WELD PROPOSED DUAL CONTAINED PIPE TO EXISTING DUAL CONTAINED PIPE @ CONNECTION POINT.
6. CONTRACTOR TO INSTALL LEACHATE GRAVITY SEWER WITH MINIMUM 2% SLOPE.

NO.	DATE	BY	REVISION DESCRIPTION

PROFILE

SCALE: HORIZ. 1"= 50'
VERT. 1"= 10'



FOR CONSTRUCTION

JUNE 2009

McGill ASSOCIATES
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55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
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DESIGNED BY: DAP
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FILE NAME: 07518-C7-Phase-3-Leachate-Profile.dwg

LEACHATE SEWER PLAN - PROFILE

SHEET C7

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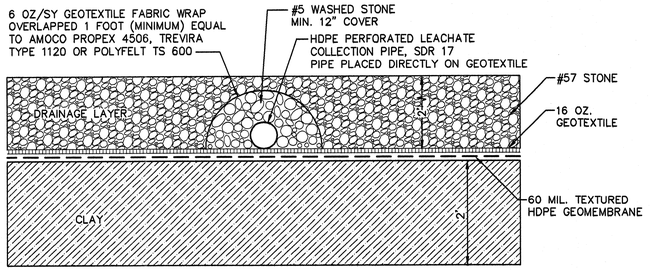
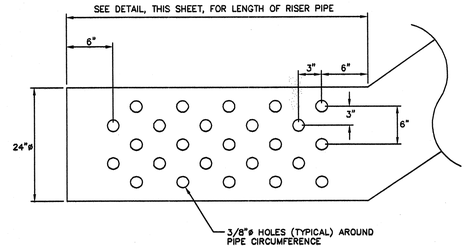
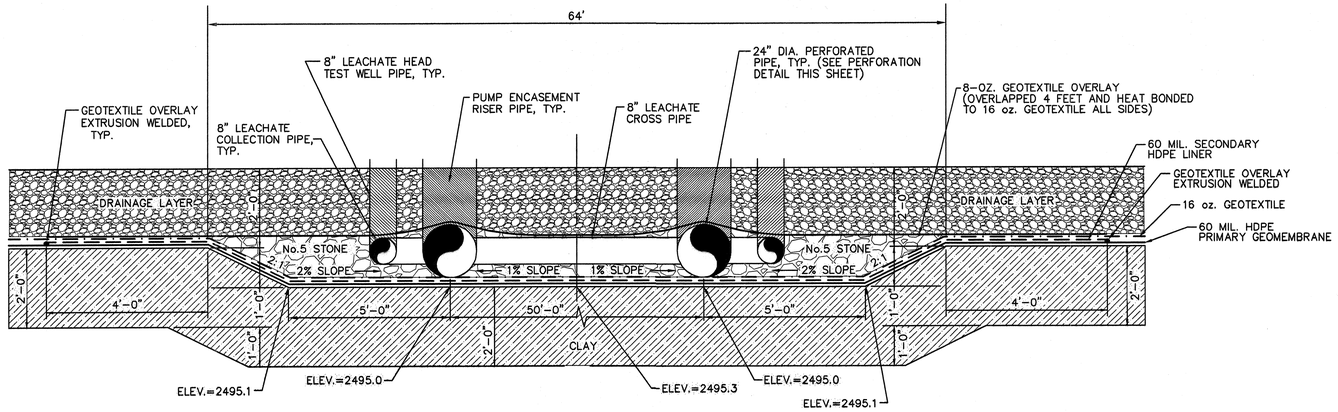


LEACHATE COLLECTION PIPE

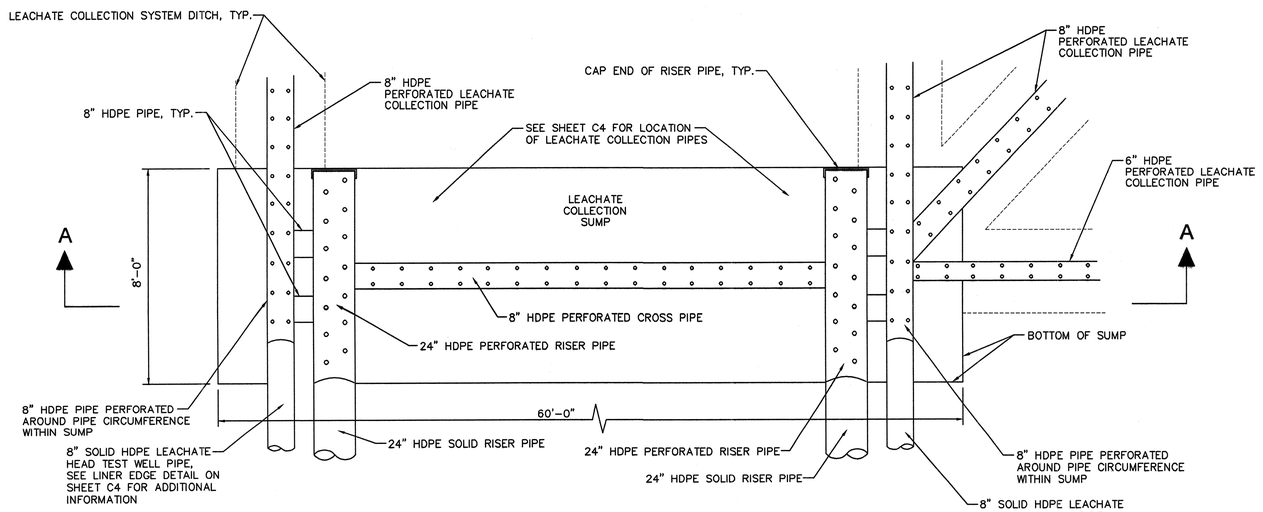


PIPE PERFORATION



PUMP STATION/RISER PIPE (SECTION A-A)

N.T.S.



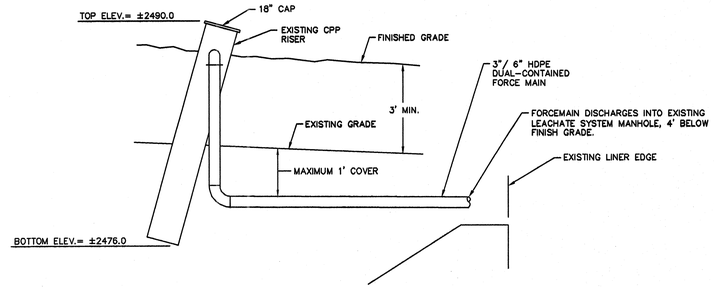
LEACHATE COLLECTION PIPING TERMINATION @ SUMP

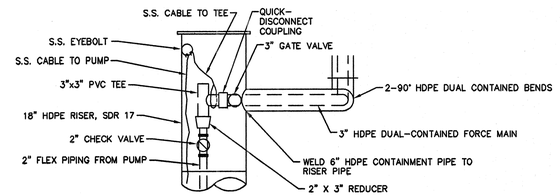
PLAN VIEW

N.T.S.

NOTES:

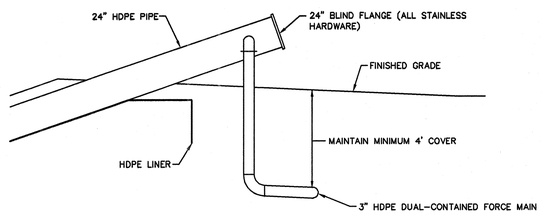
1. ADD FILL DIRT AS NECESSARY TO ENSURE POSITIVE DRAINAGE @ 5% MIN. SLOPE
2. ADD COMPACTED FILL AS NECESSARY TO ENSURE 4' MIN. COVER OVER FORCE MAIN AND ELECTRICAL LINES

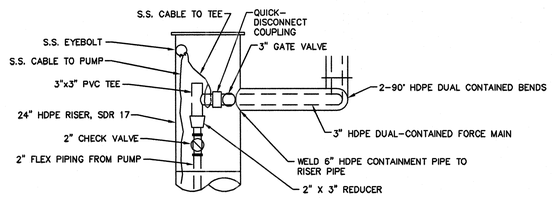




FORCE MAIN CONNECTION DETAILS

PUMP STATION #1





FORCE MAIN CONNECTION DETAILS

PUMP STATIONS #2 & #3

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WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA

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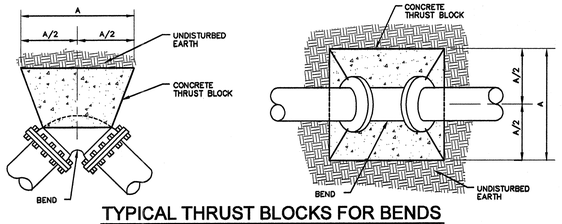
FILE NAME: 07518-Miscellaneous-Details.dwg

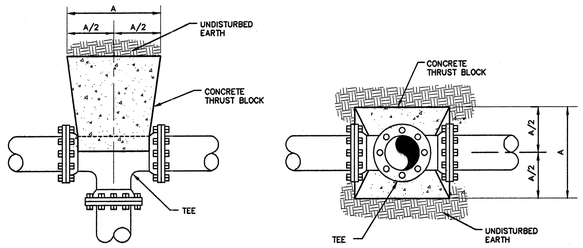
MISCELLANEOUS DETAILS

SHEET

D1



TYPICAL THRUST BLOCKS FOR BENDS

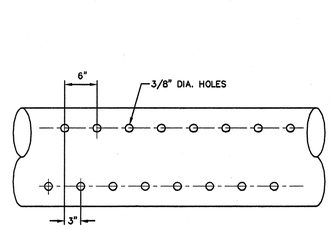


TYPICAL THRUST BLOCKS FOR TEES

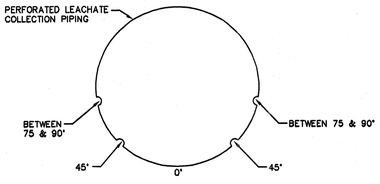
NOTES:
1. FITTING JOINTS SHALL NOT BE POURED IN CONCRETE OR HAVE CONCRETE SPILLED ON THE BOLTS OR NUTS. THE FITTING SHALL BE WRAPPED IN A LAYER OF POLYETHYLENE PLASTIC PRIOR TO POURING THE THRUST BLOCK.
2. ROD AND EYE BOLT DIAMETER SHALL BE A MINIMUM OF 3/4" AND SHALL MATCH THE SIZE OF THE BOLT PROVIDED WITH THE FITTING.
3. CONTRACTOR SHALL REPLACE FITTING BOLTS WITH THREADED ROD FOR 1/2 OF THE BOLTS SUPPLIED WITH EACH FITTING. RODS SHALL BE EQUALLY SPACED.

	TYPE					
SIZE	11-1/4° BEND	22-1/2° BEND	45° BEND	90° BEND	TEE	PLUG
2-6	12	12	12	16	16	14
8	12	12	16	22	22	18

THRUST BLOCK DIMENSION "A"



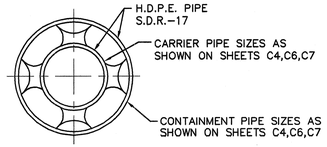
PERFORATED PIPE DETAIL



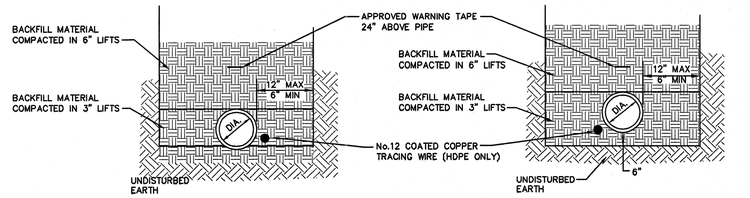
NOTES:
1. 0° CORRESPONDS TO PIPE INVERT.
2. FOUR 3/8" DIAMETER PERFORATIONS, 6" O.C.

PERFORATION PATTERN DETAIL

LEACHATE COLLECTION SYSTEM PIPING



DUAL CONTAINED LEACHATE PIPING



STANDARD EXCAVATION

NOTE:
BELL HOLES NOT SHOWN

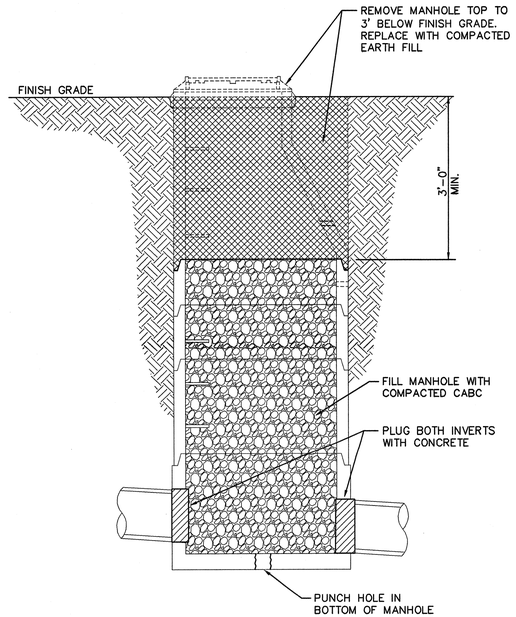
OVERCUT EXCAVATION

NOTES:
1. CONSTRUCTION OF TRENCHES SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY AND HEALTH REGULATIONS WHICH HAVE JURISDICTION AT THE PROJECT SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE APPLICABLE REGULATIONS AND FOLLOW THEM ACCORDINGLY.

2. PAYMENT FOR ROCK EXCAVATION AND SELECT BACKFILL IN TRENCH SHALL BE FOR ACTUAL QUANTITIES AND SHALL NOT EXCEED THE WIDTH OF TRENCH SHOWN ON THIS DETAIL.

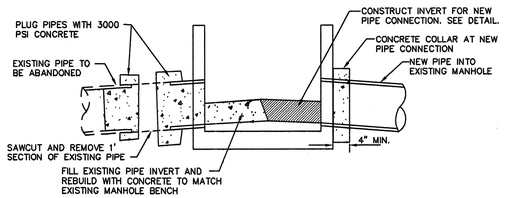
TYPICAL TRENCHING DETAILS

SEWER FORCE MAIN

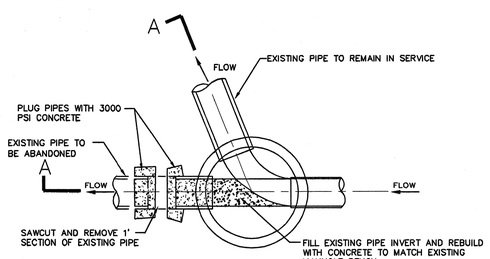


ELEVATION VIEW

MANHOLE DEMOLITION AND ABANDONMENT

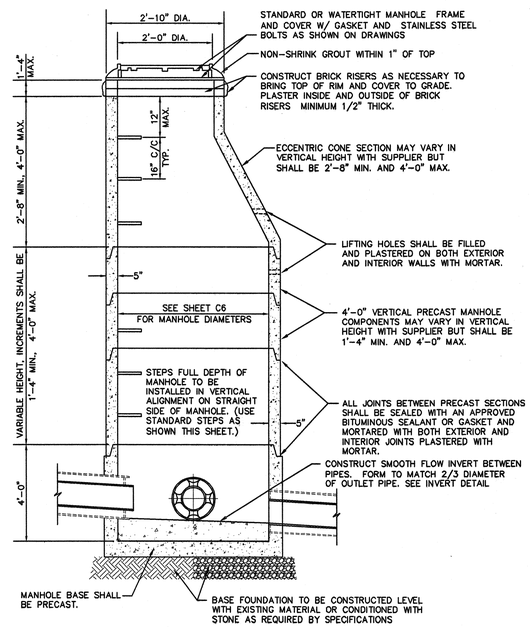


SECTION A-A



PLAN

MANHOLE LINE ABANDONMENT



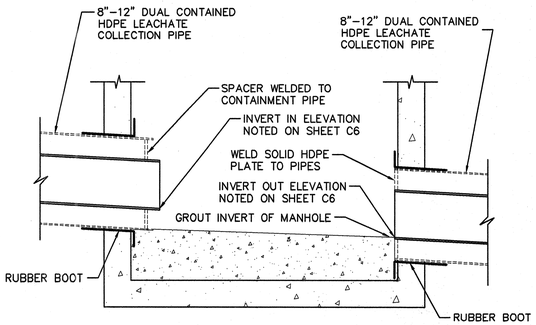
ELEVATION VIEW

PRECAST MANHOLE NOTES:
1. ALL PRECAST MANHOLE COMPONENTS SHALL MEET REQUIREMENTS OF ASTM C-478, LATEST REVISION.
2. ALL MANHOLES SHALL BE CONSTRUCTED PLUMB
3. IF MANHOLE IS SET IN LOCATION OF HIGH WATER TABLE OR UNDERGROUND WATER IS ENCOUNTERED, THE CONTRACTOR SHALL INSTALL UNDERDRAINS AND STONE AS DIRECTED IN THE FIELD BY THE ENGINEER.
4. STEPS SHALL BE INSTALLED ON STRAIGHT SIDE OF MANHOLE.
5. INSTALL PARSON POXY SEL-80 (BY PARSON ENVIRONMENTAL, INC.), MANHOLE LINER OR APPROVED EQUAL ON INSIDE SURFACE OF MANHOLE, PER MANUFACTURERS RECOMMENDATION. INSTALL 80-MIL COATING.

PRECAST CONCRETE MANHOLE

NOTE:

INSTALL PARSON POXY SEL-80 MANHOLE LINER, OR APPROVED EQUAL, ON INSIDE SURFACE OF MANHOLE, PER MANUFACTURERS RECOMMENDATON. GROUT HOLES AND SEAMS PRIOR TO INSTALLATION OF LINER MATERIAL. INSTALL LINER ON FINISHED INVERT OF MANHOLE.



TYPICAL LEACHATE MANHOLE INVERTS DETAIL

N.T.S.

FOR CONSTRUCTION

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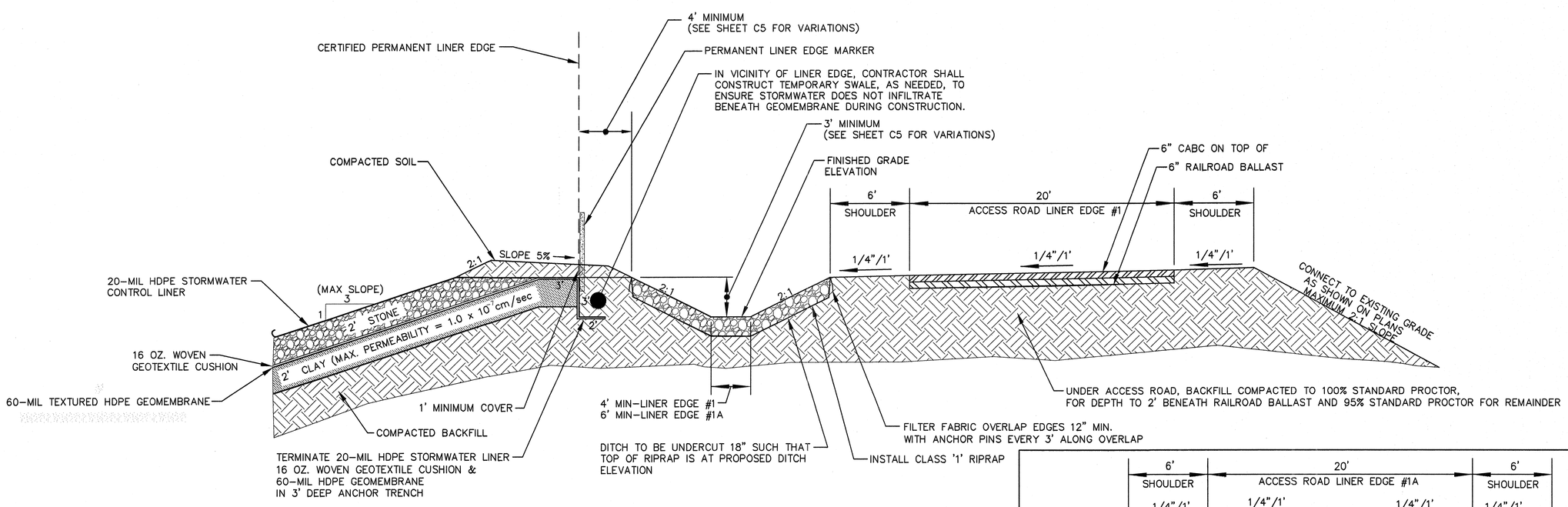
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3
HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP,JH,KS
CADD BY: DP,JH,KS
DESIGN REVIEW:
CONST. REVIEW:
FILE NAME: 07518-Miscellaneous-Details.dwg

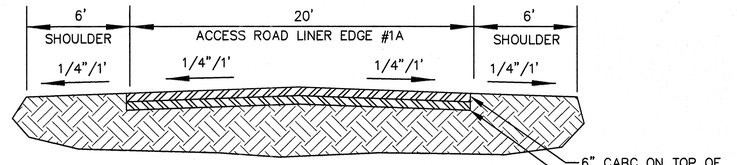
MISCELLANEOUS DETAILS

SHEET
D2



PERMANENT LINER EDGE #1 & #1A

NTS



LINER EDGE #1A ROAD

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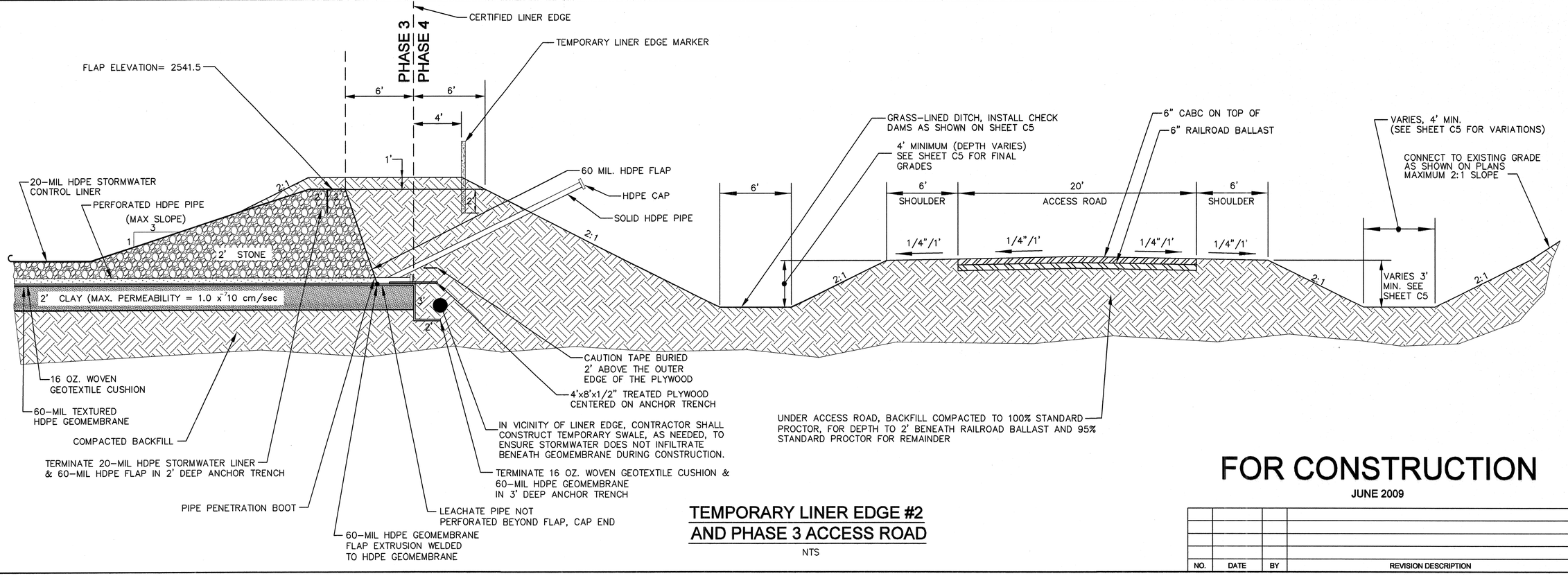

TEMPORARY LINER EDGE #2 AND PHASE 3 ACCESS ROAD

NTS

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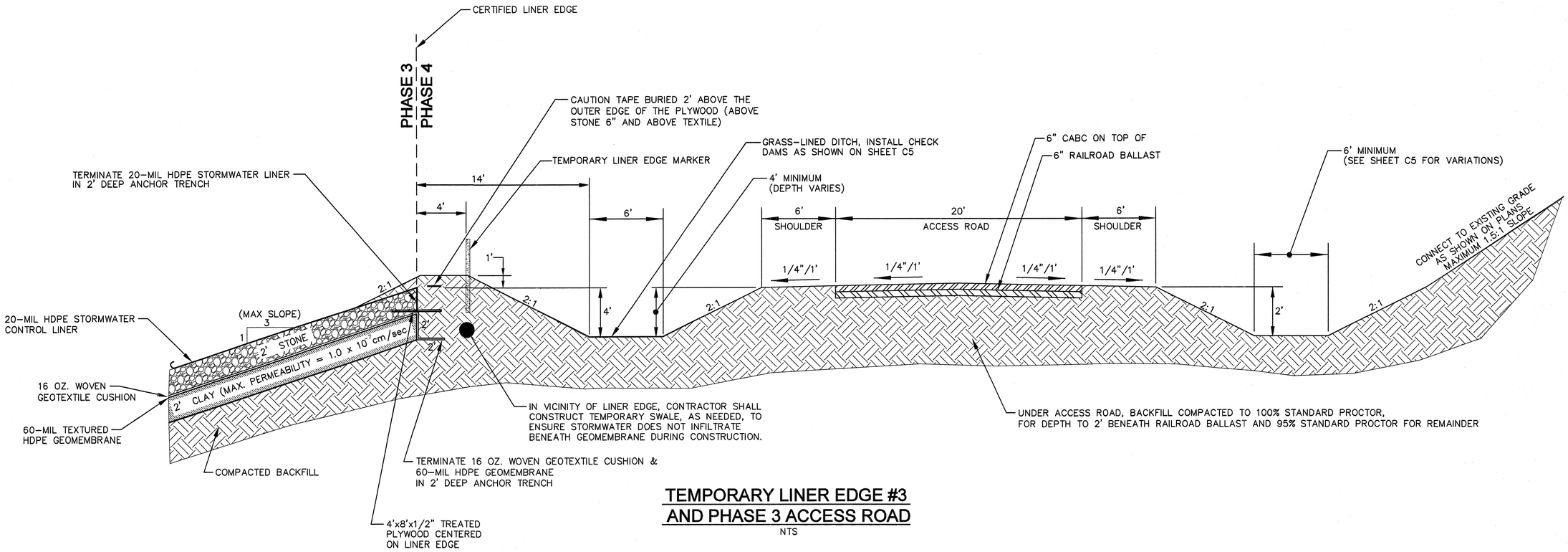
MISCELLANEOUS DETAILS

SHEET
D3



TEMPORARY LINER EDGE #3 AND PHASE 3 ACCESS ROAD

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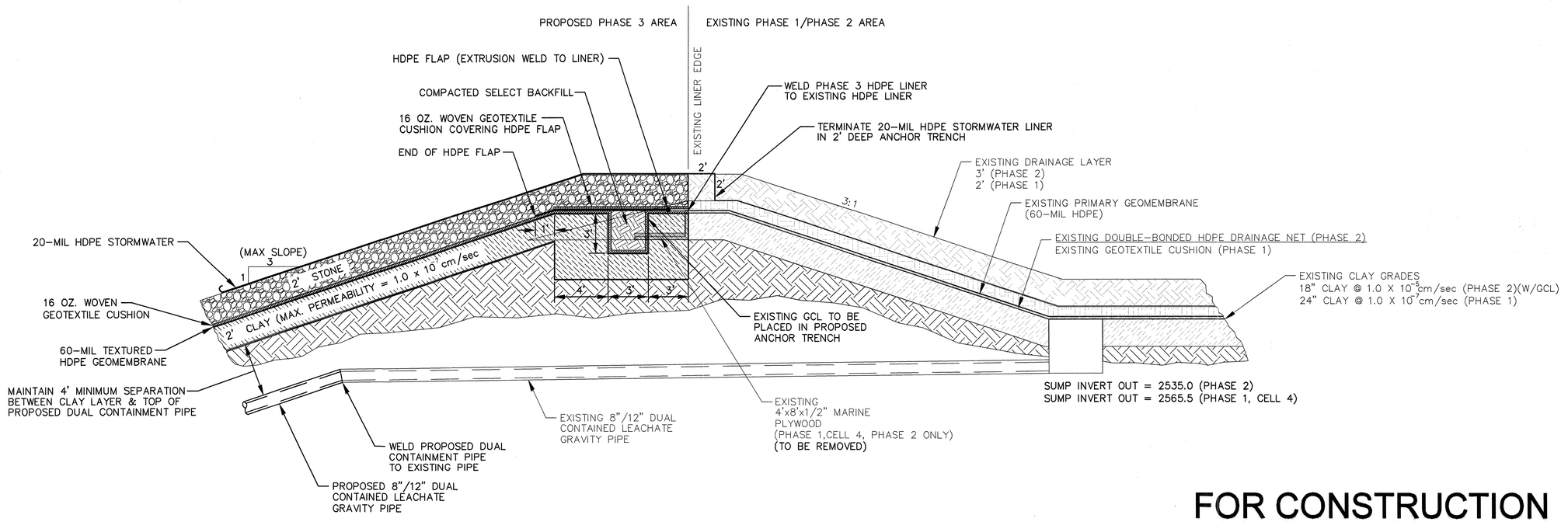

CONNECTION TO EXISTING PHASE 1 & PHASE 2 LINER EDGE

NTS

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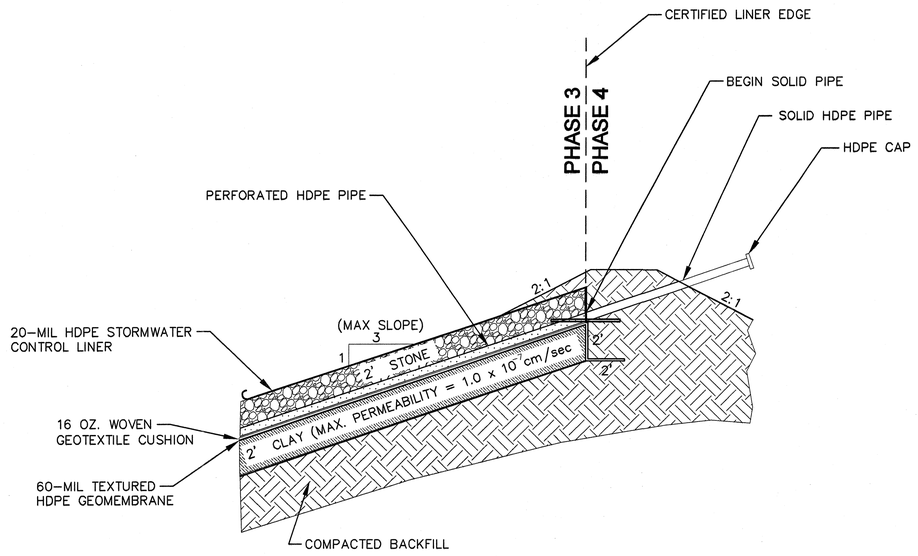
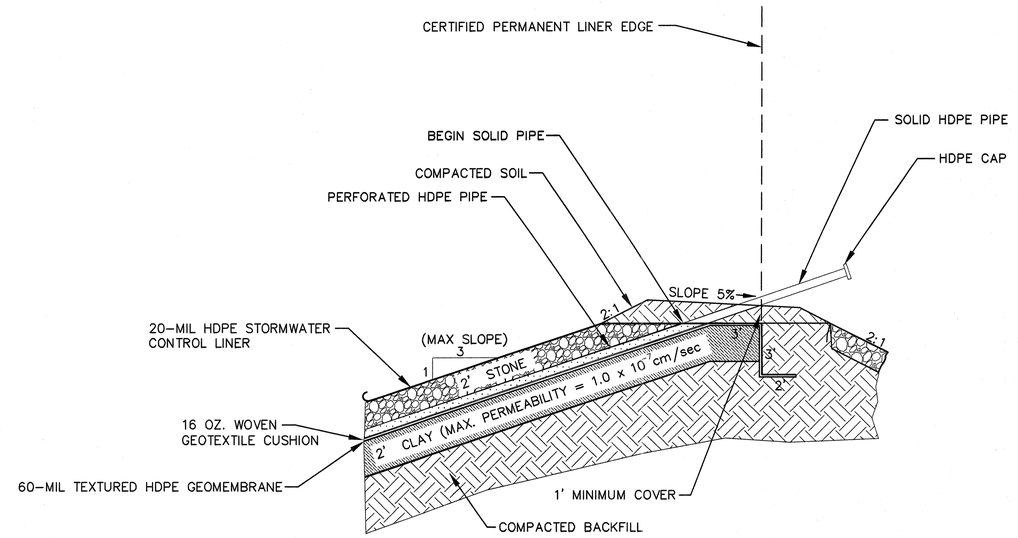
SHEET
D4



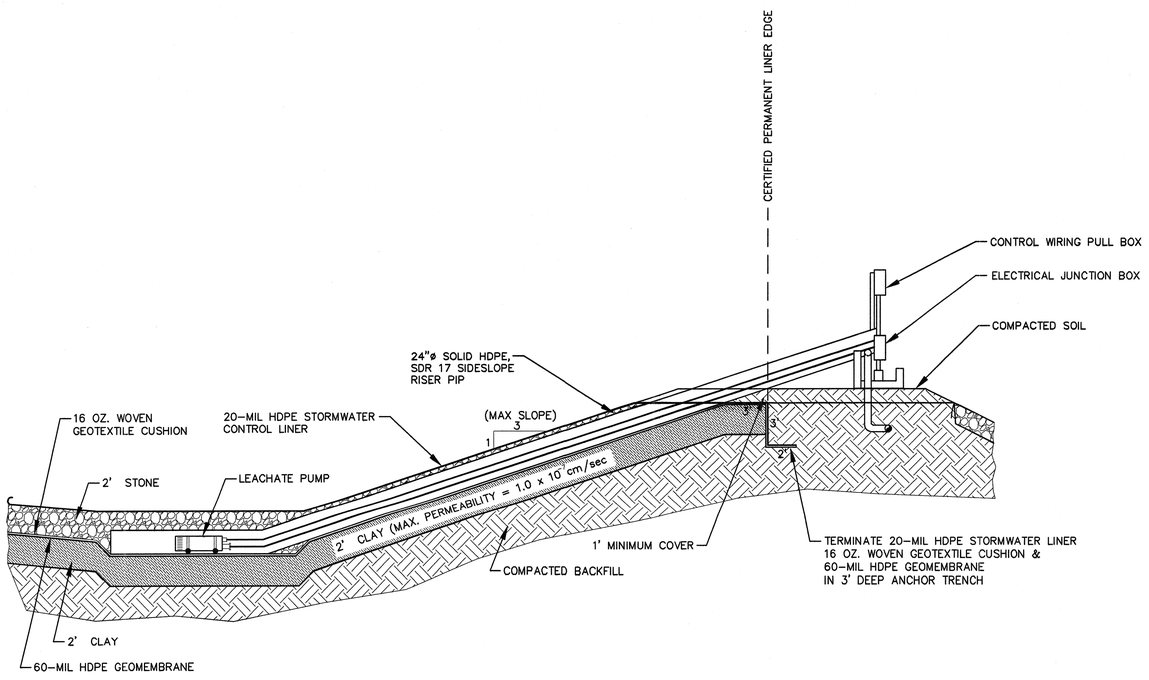
TYPICAL LEACHATE COLLECTION SYSTEM CLEANOUT @ TEMPORARY LINER EDGE #3

NTS



LEACHATE COLLECTION SYSTEM CLEANOUT @ PERMANENT LINER EDGE #1A

NTS

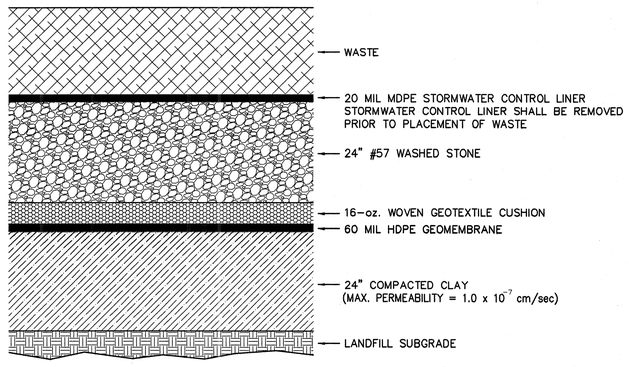


PUMP STATIONS #1 & #2 PUMP STATION/RISER PIPE DETAIL

NTS

NOTES:

SEE SHEET D1 FOR SUMP DETAILS



LANDFILL BASE DETAIL

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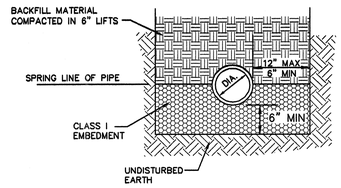
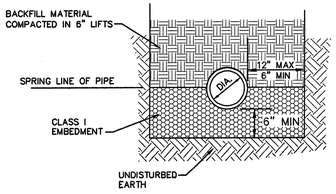
SHEET

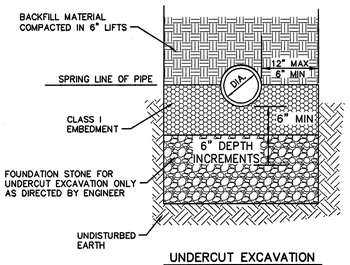
D5



STANDARD EXCAVATION



STANDARD EXCAVATION
IN WET CONDITIONS



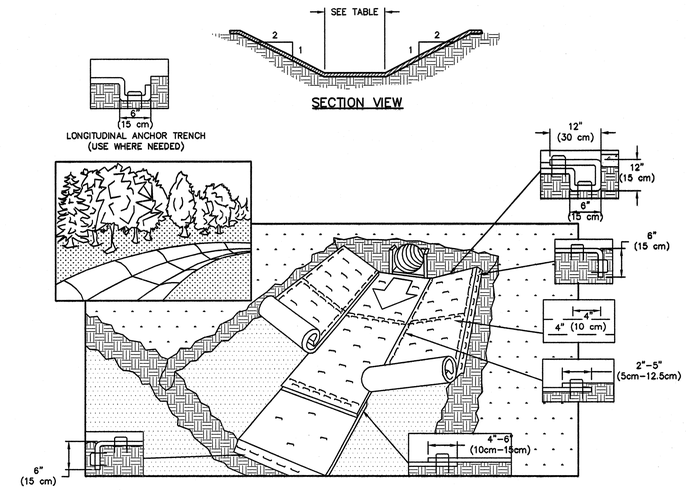
UNDERCUT EXCAVATION
IN UNSTABLE SOILS TYPES

PIPE IN WET OR UNSTABLE CONDITIONS
HDPE GRAVITY SEWER
(AS DIRECTED BY ENGINEER)

NOTES:

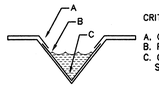
1. CONSTRUCTION OF TRENCHES SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY AND HEALTH REGULATIONS WHICH HAVE JURISDICTION AT THE PROJECT SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE APPLICABLE REGULATIONS AND FOLLOW THEM ACCORDINGLY.
2. FOR UNIT PRICE CONTRACTS ONLY, PAYMENT FOR ROCK EXCAVATION AND SELECT BACKFILL IN TRENCH SHALL BE FOR ACTUAL QUANTITIES AND SHALL NOT EXCEED THE WIDTH OF TRENCH SHOWN ON THIS DETAIL.
3. FOR UNIT PRICE CONTRACTS ONLY, PAYMENT FOR FOUNDATION STONE UNDERCUT SHALL BE FOR THE LENGTH OF THE TRENCH REQUIRING UNDERCUT X 6" DEPTH INCREMENTS TO THE DEPTH REQUIRED.
4. CLASS I EMBEDMENT SHALL BE NCDOT STANDARD # 67 STONE OR APPROVED EQUAL. FOUNDATION STONE SHALL BE NCDOT STANDARD # 57 OR # 67 STONE OR APPROVED EQUAL.

TYPICAL GRAVITY SEWER TRENCHING DETAILS



NOTES:

1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP'S), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE RECP'S IN A 12" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF RECP'S EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE RECP'S.
3. ROLL CENTER RECP'S IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. RECP'S WILL UNROLL WITH APPROXIMATE SIDE AGAINST THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES PER MANUFACTURER'S RECOMMENDATIONS.
4. PLACE CONSECUTIVE RECP'S END OVER END WITH A 4" – 6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE RECP'S
5. FULL LENGTH EDGE OF OF RECP'S AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT RECP'S MUST BE OVERLAPPED APPROXIMATELY 2" – 5" (DEPENDING ON TYPE) AND STAPLED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK IS RECOMMENDED AT 30 TO 40 FOOT INTERVALS. USE A DOUBLE ROW OF STAPES STAGGERED 4" APART AND 4" ON CENTER OVER ENTIRE WIDTH OF CHANNEL.
8. THE TERMINAL END OF THE RECP'S MUST BE ANCHORED WITH A ROW OF STAPLE/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
9. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.
10. SEE SCHDULE FOR PRODUCT TYPES.
11. PRESS ENDS OF MATTING 4" INTO GROUND AROUND STRUCTURES AND STAPLE SECURELY.



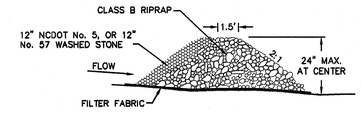
CRITICAL POINTS
A. OVERLAPS AND SEAMS
B. PROJECTED WATER LINE
C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

NOTES:

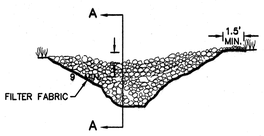
1. HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
2. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE NECESSARY TO PROPERLY ANCHOR THE RECP'S.

CHANNEL STABILIZATION WITH MATTING

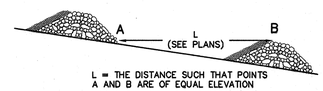
REVISION DATE - NOVEMBER 3, 2008



SECTION A–A



FACE VIEW



L = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION

DETAIL

THE FOLLOWING CRITERIA SHOULD BE USED WHEN DESIGNING A CHECK DAM:
- DRAINAGE AREA IS LIMITED TO ONE HALF ACRE.
- KEEP THE MAXIMUM HEIGHT OF 2 FT AT THE CENTER OF THE CHECK DAM.
- KEEP THE CENTER OF THE CHECK DAM AT LEAST 9 INCHES LOWER THAN THE OUTER EDGES AT NATURAL GROUND ELEVATION.
- KEEP THE SIDE SLOPES OF THE DAM AT 2:1 OR FLATTER.
- KEY THE STONE INTO THE DITCH BANKS AND EXTEND BEYOND THE ABUTMENTS 1.5 FEET MINIMUM TO AVOID WASHOUTS FROM OVERFLOW AROUND DAM.
- STABILIZE OUTFLOW AREAS ALONG THE CHANNEL TO RESIST EROSION CAUSED BY CHECK DAMS.

NOTES:

1. INSPECT CHECK DAMS AND CHANNELS WEEKLY AND AFTER EACH RAINFALL OF 1/2" OR GREATER AND REPAIR IMMEDIATELY.
2. CLEAN OUT SEDIMENT AND DEBRIS.
3. ADD STONES TO DAM IF NEEDED TO MAINTAIN DESIGN HEIGHT AND WIDTH.
4. REFERENCE NCDENR LAND QUALITY SECTION DESIGN MANUAL: 6.83

RIPRAP CHECK DAM

REVISION DATE - NOVEMBER 3, 2008

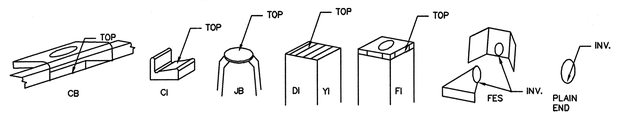
STORM DRAINAGE STRUCTURE SCHEDULE

DRAINAGE STRUCTURE	TYPE	STRUCTURE I.D. DIMENSIONS	TOP ELEVATION	INV. ELEV. (IN)	INV. ELEV. (OUT)
S2	JB	4'X5'	2486.5	2480.0	2479.0
S3 *	JB	4'X5'	2464.0	2454.5	2453.5

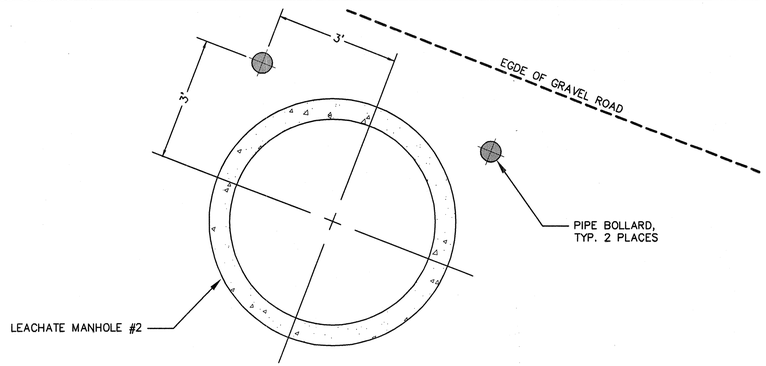
* PER NCDOT STANDARD DETAIL 840.04, WITH STEPS PER NCDOT STANDARD DETAIL 840.66

STORM DRAINAGE STRUCTURE NOTES:

1. SEDIMENT PROTECTION REQUIRED AROUND EACH STRUCTURE IMMEDIATELY AFTER INSTALLATION OF STRUCTURE.

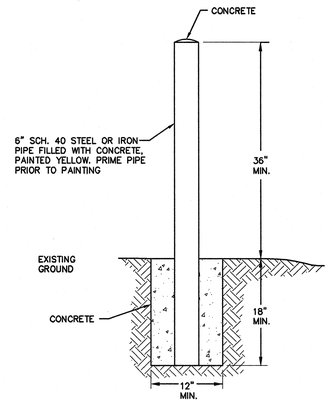


STRUCTURE & PIPE SCHEDULES



LEACHATE MANHOLE #2 BOLLARD LOCATION PLAN

N.T.S.



BOLLARD DETAIL

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PROFESSIONAL ENGINEER SEAL 23574 DAVID P. JOHNSON REGISTERED NORTH CAROLINA

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SHEET
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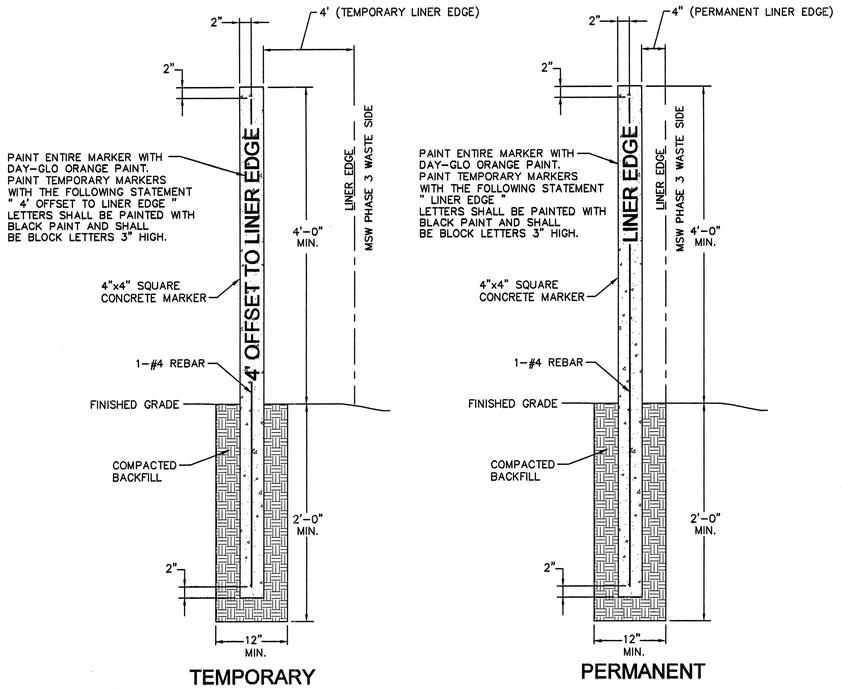
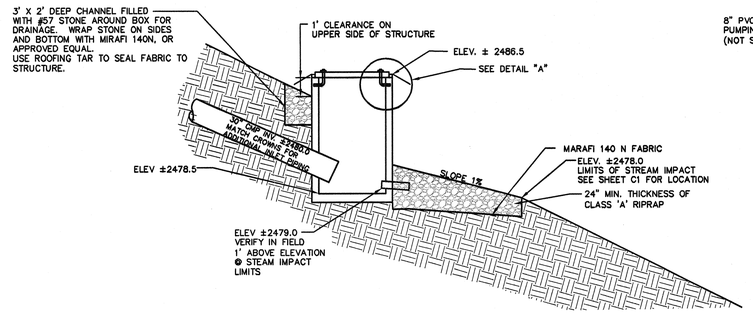


NOTES:

1. LINER EDGE MARKERS INSTALLED ALONG LINER EDGE AT CORNERS AND AT MAX. 200' INTERVALS

PERMANENT/TEMPORARY LINER EDGE MARKER DETAIL

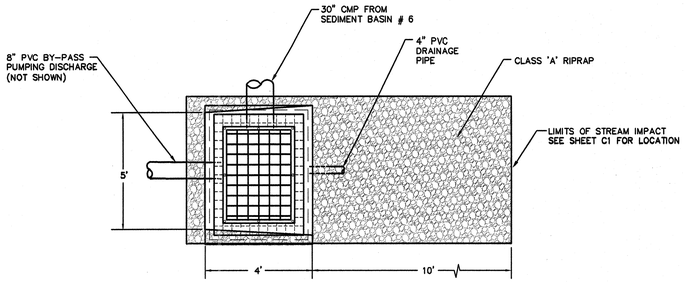
N.T.S.



ELEVATION VIEW

NOTES:

1. PRECAST DRAINAGE STRUCTURE SHALL BE INSTALLED IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATION SECTION 840.04.
2. STEPS PER NCDOT STANDARD DETAIL 840.66.
3. MATCH CROWNS FOR ADDITIONAL PIPES ENTERING STRUCTURE.

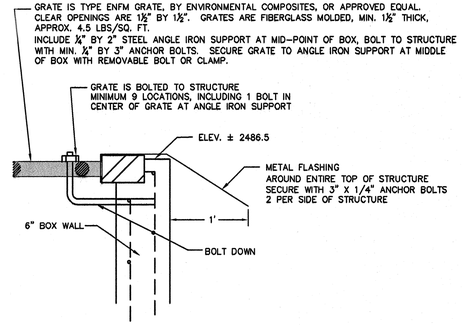


PLAN VIEW

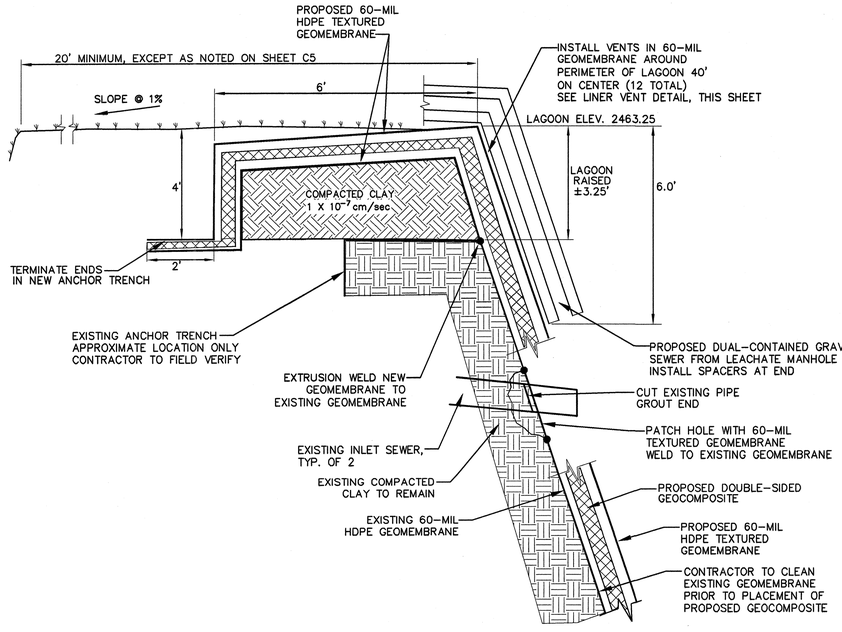
ENERGY DISSIPATER

STRUCTURE S-2

N.T.S.

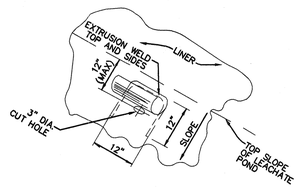


DETAIL "A"



LEACHATE STORAGE LAGOON IMPROVEMENTS

N.T.S.



LINER VENT DETAIL

N.T.S.

LEACHATE STORAGE LAGOON RAISING NOTES:

1. THE LEACHATE LAGOON SHALL BE OFF-LINE A MINIMUM AMOUNT OF TIME TO COMPLETE THE WORK.

2. PLUG OUTLET OF PROPOSED MANHOLE 1, THEN CONTRACTOR SHALL PROVIDE AND OPERATE A TEMPORARY LEACHATE PUMP. PUMP SHALL BE CAPABLE OF PUMPING MINIMUM 150 GPM AT APPROXIMATELY 12' OF HEAD. OWNER WILL PROVIDE 40,000 GALLONS OF LEACHATE STORAGE CAPACITY AND WILL BE RESPONSIBLE FOR FINAL DISPOSAL OF LEACHATE. AFTER 30 CALENDAR DAYS THAT LAGOON IS OFF-LINE, CONTRACTOR IS RESPONSIBLE FOR PROVIDING TWO 20,000 GALLON TRACK STORAGE TANKS FOR THE STORAGE OF LEACHATE. THE COUNTY WILL STILL BE RESPONSIBLE FOR TRANSPORTING LEACHATE DURING THIS TIME.

3. ABANDON EXISTING INLET MANHOLE STRUCTURES, AT NORTH AND SOUTH SIDES OF LAGOON.

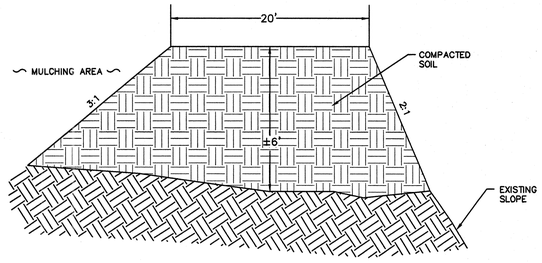
4. INSTALL ACCESS TO EXISTING LEACHATE WETWELL, PRIOR TO COVERING LID OF WETWELL. ACCESS SHOULD EXTEND 1' ABOVE FINAL GRADE.

5. INSTALL NEW LINER AND GEOCOMPOSITE. GROUT TWO PIPES AT EXISTING INLET TO LAGOON.

6. INSTALL ADDITIONAL 6' WIDE HDPE TEXTURED GEOMEBRANE UNDER INCOMING LEACHATE SEWER FROM MANHOLE 1. SECURE GEOMEMBRANE IN ANCHOR TRENCH, DO NOT WELD TO ANY OTHER GEOMEMBRANE. EXTEND 6' WIDE PIECE TO 2' ABOVE TOE OF SLOPE AT BOTTOM OF LAGOON.

7. SECURE INCOMING LEACHATE SEWER WITH 1' WIDE BY 3' LONG BY 2' THICK CONCRETE NEAR TOP OF LAGOON. DO NOT PENETRATE PROPOSED GEOMEMBRANE WITH CONCRETE ANCHOR.

8. GRADE AREA AROUND POND TO PROVIDE POSTIVE DRAINAGE AWAY FROM POND TO PERIPHERY DITCHES.



LANDSCAPING BERM

N.T.S.

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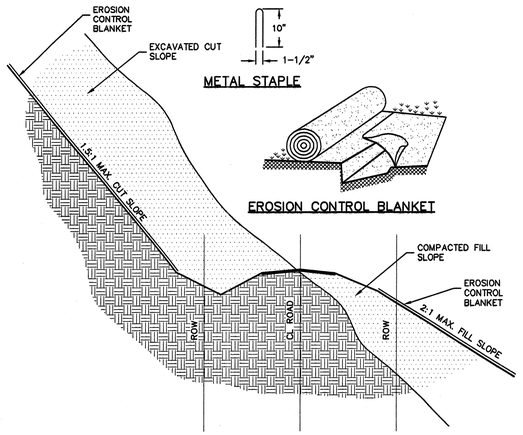
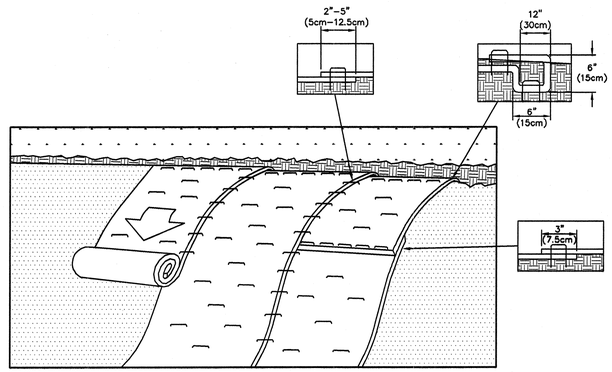


NOTES:

1. INSTALLATION OF MATTING SHALL CONFORM TO MANUFACTURER'S REQUIREMENTS.
2. SEE GRADING PLAN FOR LOCATIONS OF CUT AND FILL SLOPES.
3. MATTING SHALL BE: NORTH AMERICAN GREEN SC150, AMERICAN EXCELSIOR EROSION CONTROL BLANKET, OR EQUAL, INSTALL ON ALL DISTURBED SLOPES (CHOSEN PRODUCT MUST BE RATED FOR SLOPES 2:1 TO 1:1).
4. ALLOW 3" MIN. OVERLAP BETWEEN PARALLEL STRIPS.
5. BURY THE TOP END OF THE MAT IN A TRENCH 4" OR MORE IN DEPTH. TAMP THE TRENCH FULL OF SOIL. SECURE WITH ROW OF STAPLES, 10" SPACING, 4" DOWN FROM THE TRENCH. OVERLAP END OF TOP STRIP 4" AND STAPLE.

SLOPE STABILIZATION WITH MATTING

REVISION DATE - NOVEMBER 3, 2008

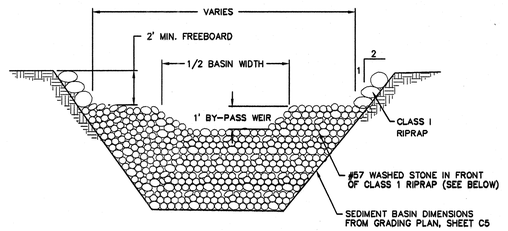


NOTES:

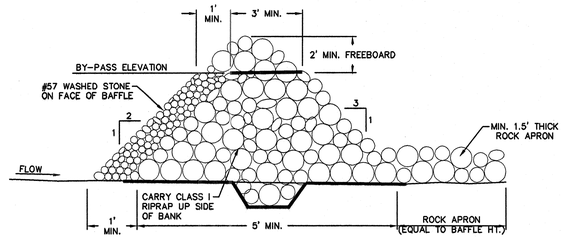
1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP'S), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP'S IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF RECP'S EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE RECP'S.
3. ROLL THE RECP'S DOWN OR HORIZONTALLY ACROSS THE SLOPE. RECP'S WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING AND SPACING STAPLES/STAKES IN APPROPRIATE LOCATIONS PER MANUFACTURER RECOMMENDATIONS.
4. THE EDGES OF PARALLEL RECP'S MUST BE STAPLED WITH APPROXIMATELY 2"-5" OVERLAP DEPENDING ON RECP'S TYPE.
5. CONSECUTIVE RECP'S SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE RECP'S WIDTH.
6. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.

STAPLE/ROLL INSTALLATION

REVISION DATE - NOVEMBER 3, 2008



FACE VIEW



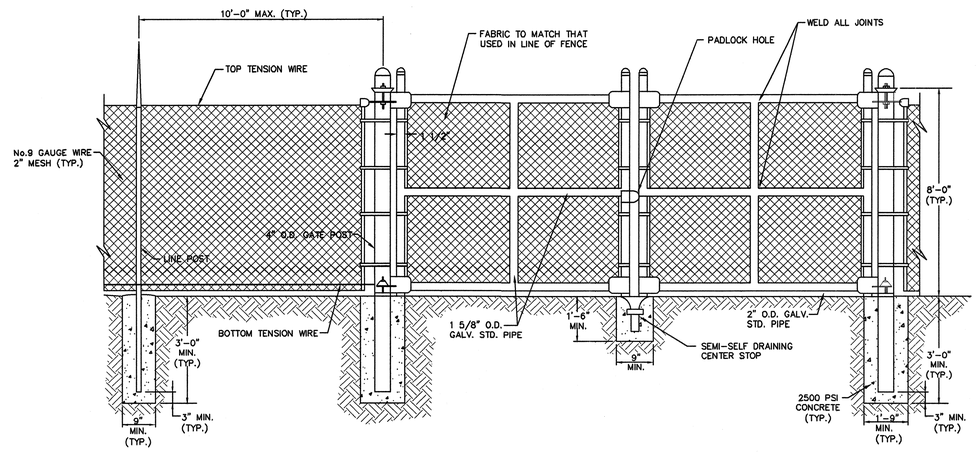
SIDE VIEW

NOTES:

1. RIRAP AND WASHED STONE SHALL BE CHECKED AFTER EACH RAINFALL TO ENSURE AGAINST EROSION AND SHALL BE REPAIRED AS REQUIRED.
2. SEDIMENT SHALL BE REMOVED WHEN DEPTH OF SEDIMENT REACHES 1/2 HEIGHT OF BAFFLE.
3. SEDIMENT BASINS REQUIRE A MIN. OF 3 BAFFLES, EXCEPT SEDIMENT BASIN #4 TO HAVE 4 BAFFLES AND SEDIMENT BASIN #6 TO HAVE 2 BAFFLES.

ROCK BAFFLE

N.T.S.

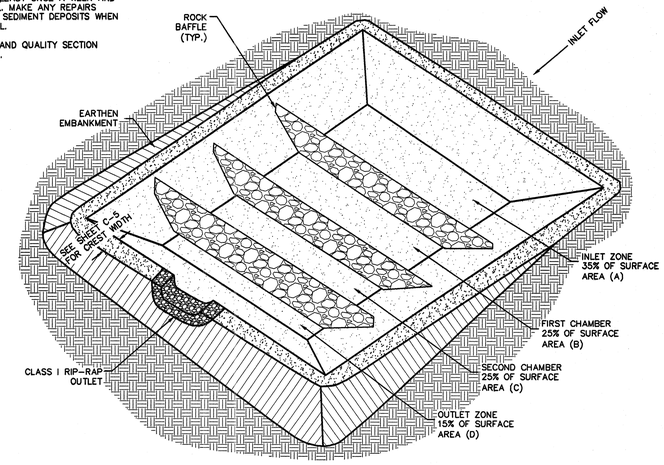


CHAIN LINK FENCE AND DOUBLE GATE ACROSS ACCESS ROAD DETAIL

N.T.S.

NOTES:

1. INLET ZONE (A) SHOULD HAVE 35% OF SURFACE AREA. FIRST CELL (B) SHOULD HAVE 25% OF SURFACE AREA, SECOND CELL (C) SHOULD HAVE 25% OF SURFACE AREA AND THE OUTLET ZONE (D) SHOULD HAVE 15% OF SURFACE AREA.
2. INSPECT BAFFLES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REPAIRS IMMEDIATELY. REMOVE SEDIMENT DEPOSITS WHEN IT REACHES HALF FULL.
3. REFERENCE NCDENR LAND QUALITY SECTION DESIGN MANUAL: 6.65.



POROUS BAFFLES

N.T.S.

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

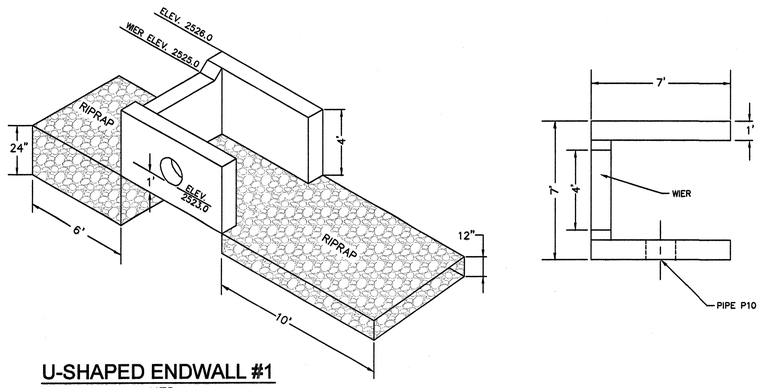
McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3
HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP,JH,KS
CADD BY: DP,JH,KS
DESIGN REVIEW: ___
CONST. REVIEW: ___
FILE NAME: 07518-Miscellaneous-Details.dwg

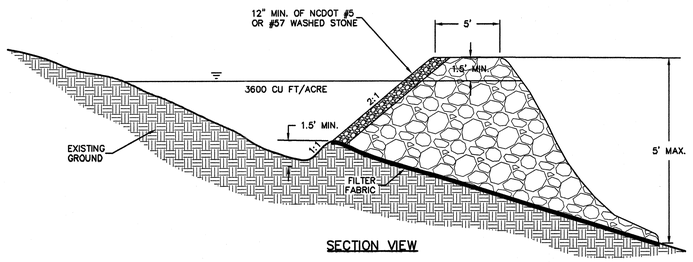
MISCELLANEOUS DETAILS

SHEET
D8

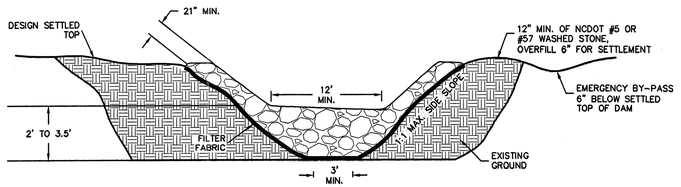


U-SHAPED ENDWALL #1

NTS



SECTION VIEW



WEIR VIEW

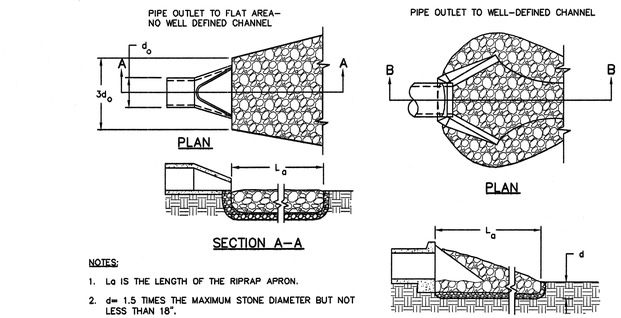
MAINTENANCE SCHEDULE:

1. AT A MINIMUM, TEMPORARY SEDIMENT TRAPS SHALL BE INSPECTED WEEKLY AND AFTER EACH RAINFALL EVENT GREATER THAN 1/2-INCH.
2. REMOVE SEDIMENT AND RESTORE TRAP TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE TRAP.
3. PLACE THE SEDIMENT THAT IS REMOVED IN A DESIGNATED DISPOSAL AREA AND REPLACE THE CONTAMINATED PART OF THE GRAVEL FACING. DISPLACED RIP-RAP SHALL BE REPLACED IMMEDIATELY.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ACCESS WITHIN LIMITS OF DISTURBED AREA TO ALL SEDIMENT TRAPS FOR MAINTENANCE DURING CONSTRUCTION AND REMOVAL UPON PROJECT COMPLETION.

NOTE:

1. SEE BAFFLE DETAIL FOR BAFFLE INSTALLATION PROCEDURE AND SPACING.

TEMPORARY SEDIMENT TRAP



NOTES:

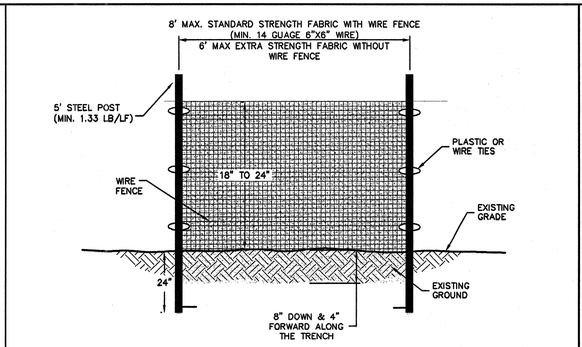
1. La IS THE LENGTH OF THE RIPRAP APRON.
2. d= 1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 18".
3. IN A WELL-DEFINED CHANNEL EXTEND THE APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUM TAILWATER DEPTH OR TO THE TOP OF THE BANK, WHICHEVER IS LESS.
4. MIRIFI 140N, OR APPROVED EQUAL, SHALL BE INSTALLED BETWEEN THE RIPRAP AND SOIL FOUNDATION.

RIPRAP APRON SIZING (PER FIG. 8.06a)

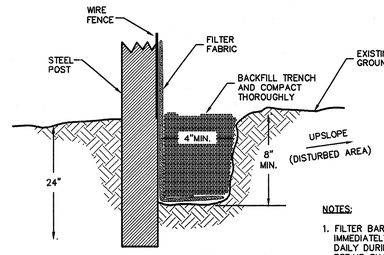
OUTLET No.	PIPE DIAMETER (Do)	3 x Do	APRON LENGTH (La)	RIPRAP SIZE d_{50}
P1/P2	54"/18"	14'	30'	9"
P3	12"	3'	14'	9"
P4	12"	3'	14'	9"
P5	24"	6'	35'	14"
P6/P6A	30"/15"	8'	30'	14"
P9	30"	8'	20'	9"
P10	18"	5'	20'	9"
P11	24"	6'	30'	14"
P12	24"	6'	30'	9"
P13	18"	5'	30'	9"
P14	30"	8'	30'	14"
P15/P16	24"/36"	9'	30'	9"

OUTLET PROTECTION

NOT TO SCALE



SECTION VIEW



NOTES:

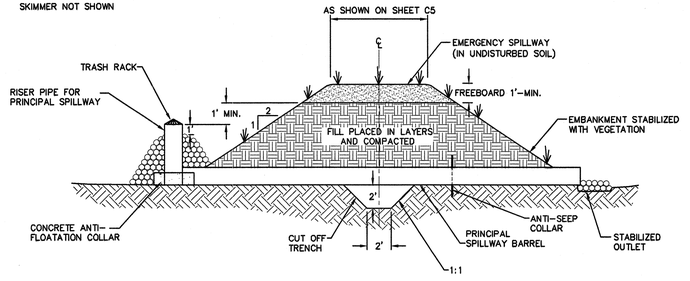
1. FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND DAILY DURING PROLONGED RAINFALL. REPAIR SHALL BE MADE AS NECESSARY.
2. FABRIC SHALL BE REPLACED PROMPTLY IF FOUND TO BE IN DISREPAIR.
3. SEDIMENT DEPOSITS SHALL BE REMOVED AFTER EACH STORM EVENT AND WHEN DEPOSITS REACH APPROXIMATELY 1/3 HEIGHT OF BARRIER.
4. REFERENCE NCDENR LAND QUALITY SECTION DESIGN MANUAL: 6.62.

SLOPE	SLOPE LENGTH(FT)	MAXIMUM AREA(SQFT)
<2%	100	10,000
2 TO 5%	75	7,500
5 TO 10%	50	5,000
10 TO 20%	25	2,500
>20%	15	1,500

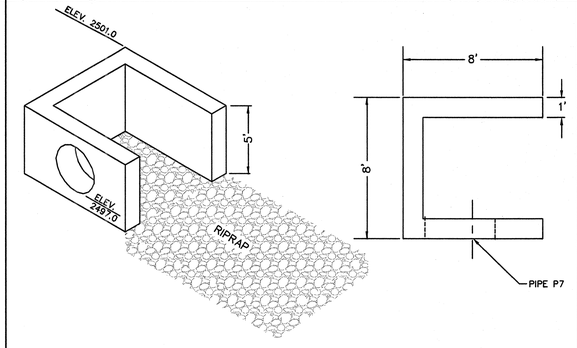
SEDIMENTATION/SILT FENCE

REVISION DATE - NOVEMBER 3, 2008

NOTE:
SKIMMER NOT SHOWN



SEDIMENT BASIN WITH RISER



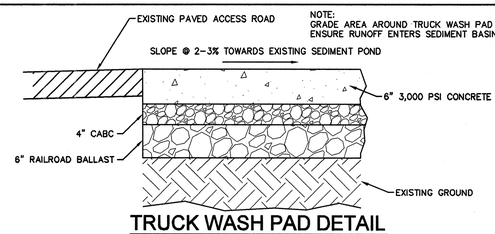
U-SHAPED ENDWALL #2

NTS

SEDIMENT BASIN AND SEDIMENT TRAP EROSION CONTROL SCHEDULE

BASIN #	TOP BERM ELEV. (ft)	EMERGENCY SPILLWAY ELEV. (ft)	TOP OF RISER (ft)	EMERGENCY SPILLWAY	WEIR DIMENSION	SPILLWAY CHANNEL LINING	BERM WIDTH (FT)	BARREL INV. IN ELEV. (ft)	BARREL INV. OUT ELEV. (ft)	RISER SIZE (inches)	BARREL SIZE (inches)	BARREL LENGTH @ SLOPE	FLOTATION BLOCK DIMENSIONS (FT)	SKIMMER ORIFICE SIZE (IN)	SKIMMER INVERT ELEV. (FT)
TEMPORARY SEDIMENT TRAP															
2	2539.0	2538.0	NONE	NA	1'X12'		10	NA	NA	NA		NA	NA	NONE	NONE
PROPOSED SEDIMENT BASIN															
**4	2507.0	2505.0	2503.0	1'X10'		20" CLASS "B" RIP RAP	20	2496.0	2489.0	48"	30"	108' @6.5%	5'X5'X1'	4"	2495.5
5	2456.5	2455.0	2453.0	1'X15'		20" CLASS "B" RIP RAP	10	2447.0	2443.0	36"	24"	80' @5.0%	4'X4'X1'	4"	2449
6	2525.5	NONE	2521.0	NONE		-----	10	2514.0	2480.0	48"	30"	200' @17%	5'X5'X1'	2"	2519
7	2451.0	NA	2448.0	1'X12'		20" CLASS "B" RIP RAP	10	2442.0	2428.0	36"	24"	88' @17.5%	4'X4'X1'	2"	2445
PROPOSED TEMPORARY SEDIMENT TRAP / BASIN															
1	2492.0	2490	2488.5	2'X10'	NA		10	2482.0*	2481.0*	24"*		60' @1.6%	4'X4'X1'*	4"	2483.0

* CONTRACTOR MAY FORGO RISER/BARREL PIPE AND PUMP SEDIMENT LADEN WATER TO EXISTING SEDIMENT BASIN #1
** INSTALL GRASS-LINED EMERGENCY SPILLWAY, CONNECT TO DITCH D11



TRUCK WASH PAD DETAIL

NTS

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

McGill ASSOCIATES
ENGINEERING-PLANNING-FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

PROFESSIONAL ENGINEER SEAL 23574 JAMES H. KELLY NORTH CAROLINA REGISTERED

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
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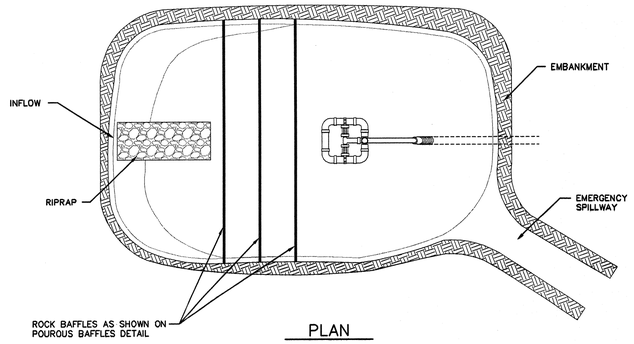
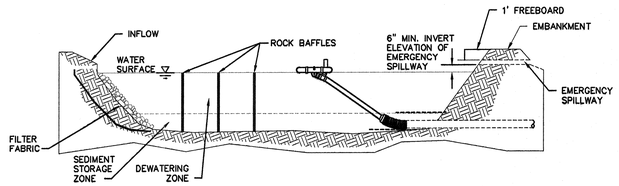
FILE NAME: 07518-Miscellaneous-Details.dwg

MISCELLANEOUS DETAILS

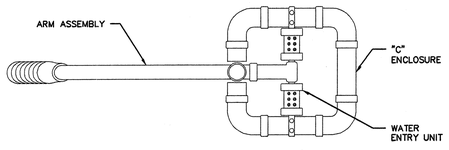
SHEET
D9



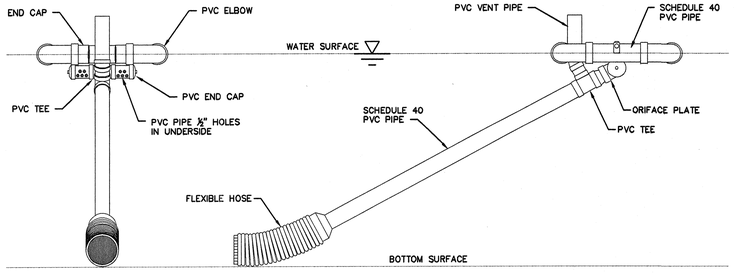
PLAN



SECTION



TOP VIEW

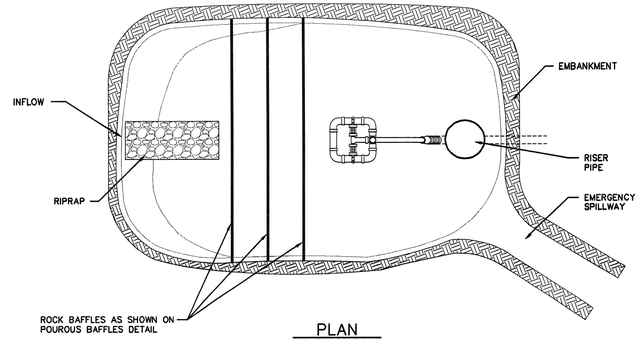


END VIEW FRONT VIEW

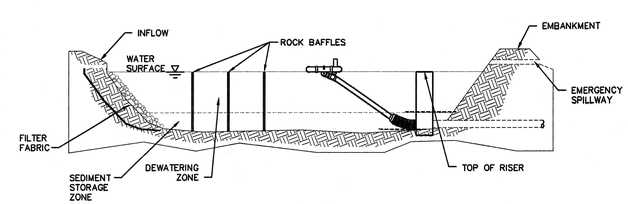
NOTE:

1. ALL SLOPE SIDES AND WEIRS WILL BE SEEDED AND MATTED (NAG S75 OR APPROVED EQUAL)AT THE CONCLUSION OF CONSTRUCTION.
2. SEE SHEET C5 FOR TEMPORARY SEDIMENT TRAPS REQUIRING SKIMMER.

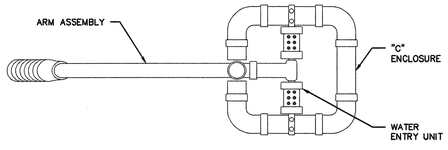
TEMPORARY SEDIMENT TRAP WITH SKIMMER



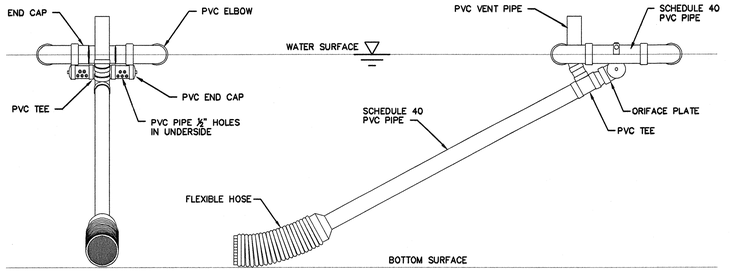
PLAN



SECTION



TOP VIEW

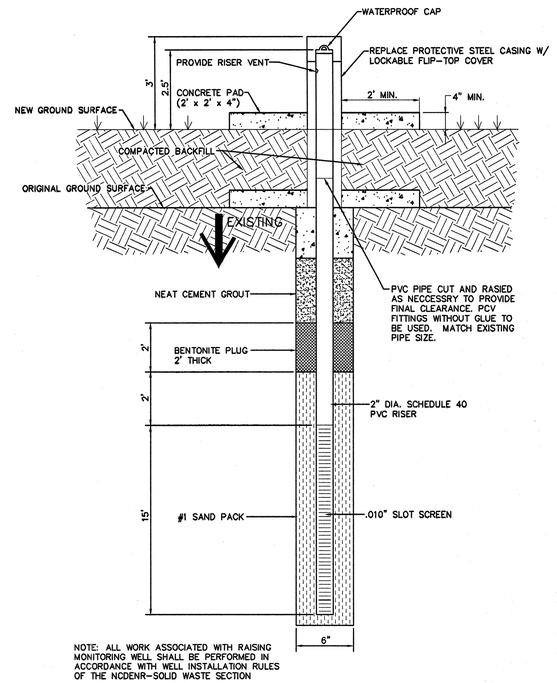


END VIEW FRONT VIEW

NOTE:

ALL SLOPE SIDES AND WEIRS WILL BE SEEDED AND MATTED (NAG S75 OR APPROVED EQUAL)AT THE CONCLUSION OF CONSTRUCTION.

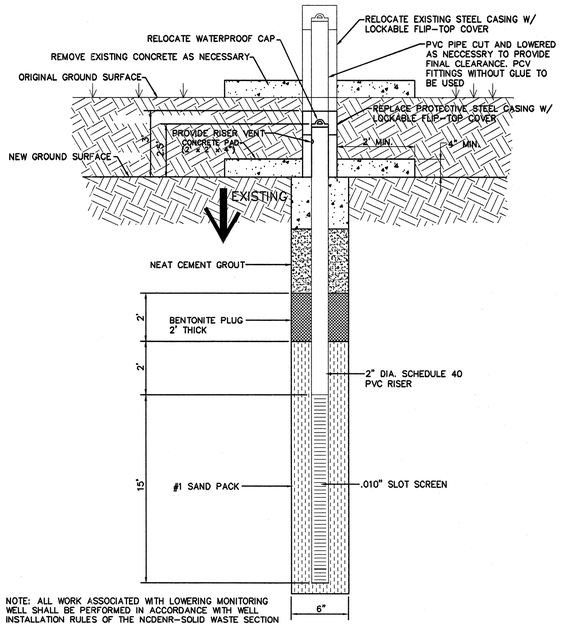
BASIN DETAIL WITH SKIMMER



NOTE: ALL WORK ASSOCIATED WITH RAISING MONITORING WELL SHALL BE PERFORMED IN ACCORDANCE WITH WELL INSTALLATION RULES OF THE NCDENR-SOLID WASTE SECTION

MONITORING WELL RAISING DETAIL

N.T.S.



NOTE: ALL WORK ASSOCIATED WITH LOWERING MONITORING WELL SHALL BE PERFORMED IN ACCORDANCE WITH WELL INSTALLATION RULES OF THE NCDENR-SOLID WASTE SECTION

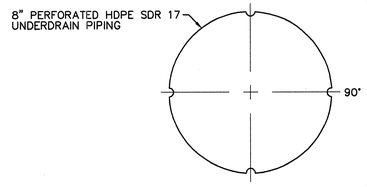
MONITORING WELL LOWERING DETAIL

N.T.S.

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

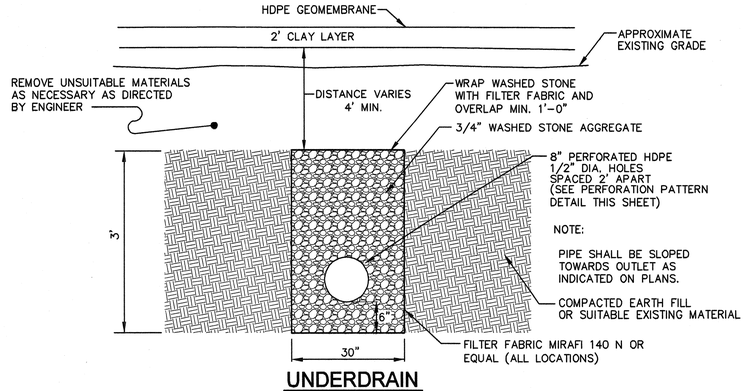


NOTE: 0'

1. FOUR 1/2" DIAMETER PERFORATIONS, 2' O.C.

UNDERDRAIN PERFORATION PATTERN DETAIL

N.T.S.



UNDERDRAIN

N.T.S.

McGill ASSOCIATES
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MISCELLANEOUS DETAILS

SHEET

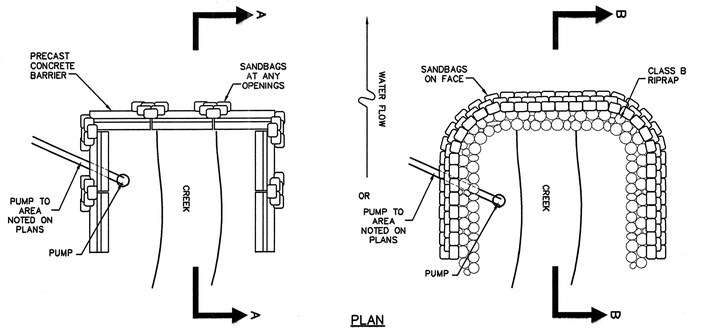
D10

PIPE TABLE SCHEDULE

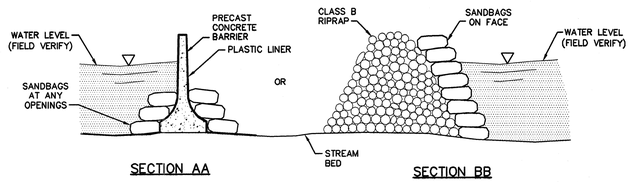
PIPE	FROM STRUCTURE	TO STRUCTURE	SIZE	LENGTH	SLOPE	START INV.	END INV.
P1			54" CMP	55-LF	17.6%	2420.5	2410.8
P2			18" HDPE	80-LF	14.1%	2425.8	2414.5
P3			12" CMP	47-LF	7.4%	2454.0	2450.5
P4			12" CMP	63-LF	6.3%	2461.0	2457.0
P5	SEE SEDIMENT BASIN # 5 SCHEDULE						
P6			30" CMP	36-LF	1.4%	2453.5	2453.0
P6A			15" CMP	41-LF	3.0%	2455.5	2454.3
P7			30" CMP	132-LF	32.2%	2497.0	2454.5
P8	SEE SEDIMENT BASIN #6 SCHEDULE						
P9			DUAL 30" CMP	63-LF	4.0%	2510.0	2507.5
P10			18" CMP	48-LF	2.0%	2523.0	2522.0
P11	SEE SEDIMENT BASIN #7 SCHEDULE						
P12			DUAL 24" CMP	60-LF	2.5%	2567.5	2566.0
P13			30" CMP	40-LF	15.0%	2546.5	2540.5
P14	SEE SEDIMENT BASIN #4 SCHEDULE						
P15			24" CMP	87-LF	12.6%	2514.0	2503.0
P16			30" CMP	54-LF	1.7%	2512.0	2503.0
**P17			18" CMP	157-LF	30.0%	2548.5	2503.0
**P18			18" CMP	148-LF	30.7%	2548.5	2503.0
***P19			8" PVC	87-LF	38.2%	2515.0	2481.8

** INSTALL BENDS AS NECESSARY

*** PIPE SHALL BE SCHEDULE 80 PVC WITH QUICK COUPLER END TO RECEIVE HOSE FROM STORMWATER PUMP



PLAN



SECTION AA SECTION BB

NOTES:

1. COFFER DAM WILL BE BUILT SO THAT ENTIRE STREAM IS DIVERTED THRU PUMP.
2. MATERIAL FROM THE STREAM BED SHALL NOT BE USED FOR COFFER DAM.
3. NO EARTHEN MATERIAL SHALL BE USED FOR COFFER DAM OR PLACED IN STREAM FOR ANY REASON.
4. ALTERNATIVE COFFER DAM MATERIAL IS ACCEPTABLE BUT SHALL BE APPROVED BY THE ENGINEER.

COFFER DAM

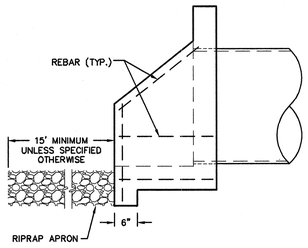
HEADWALL DIMENSIONS (METAL PIPE)

NOTE: USE NEXT LARGEST SIZE FOR CONCRETE PIPE.

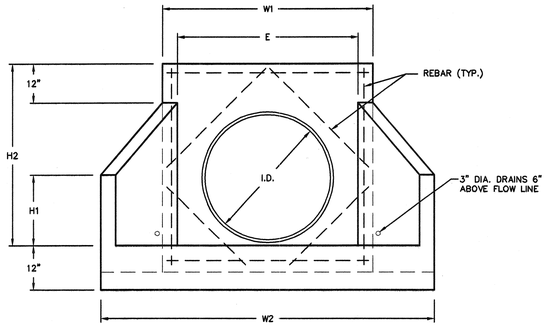
INSIDE DIAMETER OF PIPE	W1	W2	H1	H2	D	E	WEIGHT	SQ. FT. BASE AREA
12"-15"-18"	3'-2"	4'-10"	1'-3"	3'-2"	1'-3"	1'-9"	1,550	7.34
21"-24"	3'-8"	6'-1"	1'-9"	3'-8"	1'-6"	2'-3"	2,100	9.90
30"	4'-2"	7'-2"	2'-0"	4'-2"	1'-10"	2'-9"	2,850	13.50
36"	4'-8"	8'-4"	2'-4"	4'-8"	2'-2"	3'-3"	3,700	17.65
42"-48"	5'-8"	10'-10"	3'-3"	5'-8"	2'-11"	4'-3"	5,600	28.60
54"-60"	6'-10"	11'-9"	3'-6"	6'-8"	3'-4"	5'-2"	7,500	36.27
66"-72"	8'-1"	12'-0"	3'-8"	7'-7"	3'-4"	6'-2"	8,500	40.00
84"-96"	9'-4"	12'-8"	4'-0"	9'-6"	3'-4"	7'-6"	10,000	44.00

NOTE:

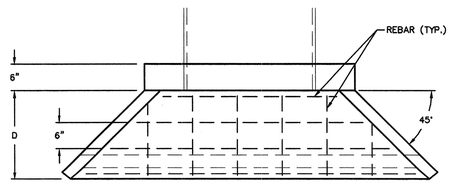
1. 4000 PSI CONCRETE STANDARD



SIDE ELEVATION



FRONT ELEVATION



PLAN

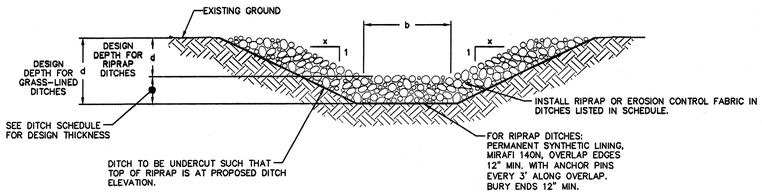
NOTES:

1. CONCRETE HEADWALL REINFORCEMENT PER N.C.D.O.T. STANDARD NO. 838.39 REVISION A.
2. WORK MUST BE ACCOMPLISHED SO THAT WET CONCRETE DOES NOT CONTACT STREAM WATER.

REINFORCED CONCRETE ENDWALL

REVISION DATE - NOVEMBER 3, 2008

ALL MATTING PRODUCTS MAY BE SUBSTITUTED WITH APPROVED EQUAL. INSTALL PER MANUFACTURERS RECOMMENDATION



TYPICAL DITCH DETAIL

DITCH SCHEDULE

CHANNEL#	DITCH SLOPE(%)	BOTTOM WIDTH (FEET)	DEPTH (FEET)	SIDE SLOPES	RIPRAP THICKNESS	CHANNEL LINING SELECTION
D1	6.50	3.00	2.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER S75
D2	9.40	3.00	3.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER S150
D3	9.40	5.00	3.00	2:1	20"	RIPRAP
D4	7.30	*4.00	*3.00	2:1	20"	RIPRAP
D5	36.80	10.00	4.00	2:1	24"	RIPRAP
D6	3.30	*6.00	*4.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER S150
D7	3.40	4.00	3.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER S150
D8	3.40	8.00	3.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER S150
D8A	MATCH EXISTING GRADES	4.00	2.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER S150
D9	12.20	8.00	3.00	2:1	20"	RIPRAP
D10	12.40	4.00	3.00	2:1	—	NORTH AMERICAN GREEN SYNTHETIC LINER C150
D11	12.40	10.00	1.00	2:1	24"	RIPRAP
D12	12.40	10.00	1.00	2:1	24"	RIPRAP

* MINIMUM SIZE-SEE GRADING PLAN FOR ADDITIONAL INFORMATION.

NOTES:

1. NORTH AMERICAN GREEN SYNTHETIC LINER OR APPROVED EQUIVALENT SHALL BE USED WHERE NOTED.
2. RIPRAP SHALL BE D_{50} = 9".
3. ALL RIPRAP DITCHES TO INCLUDE MIRIFI 140N, OR APPROVED EQUAL.

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

CHRISTOPHER D. KELLY SEAL 23574 ENGINEER

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

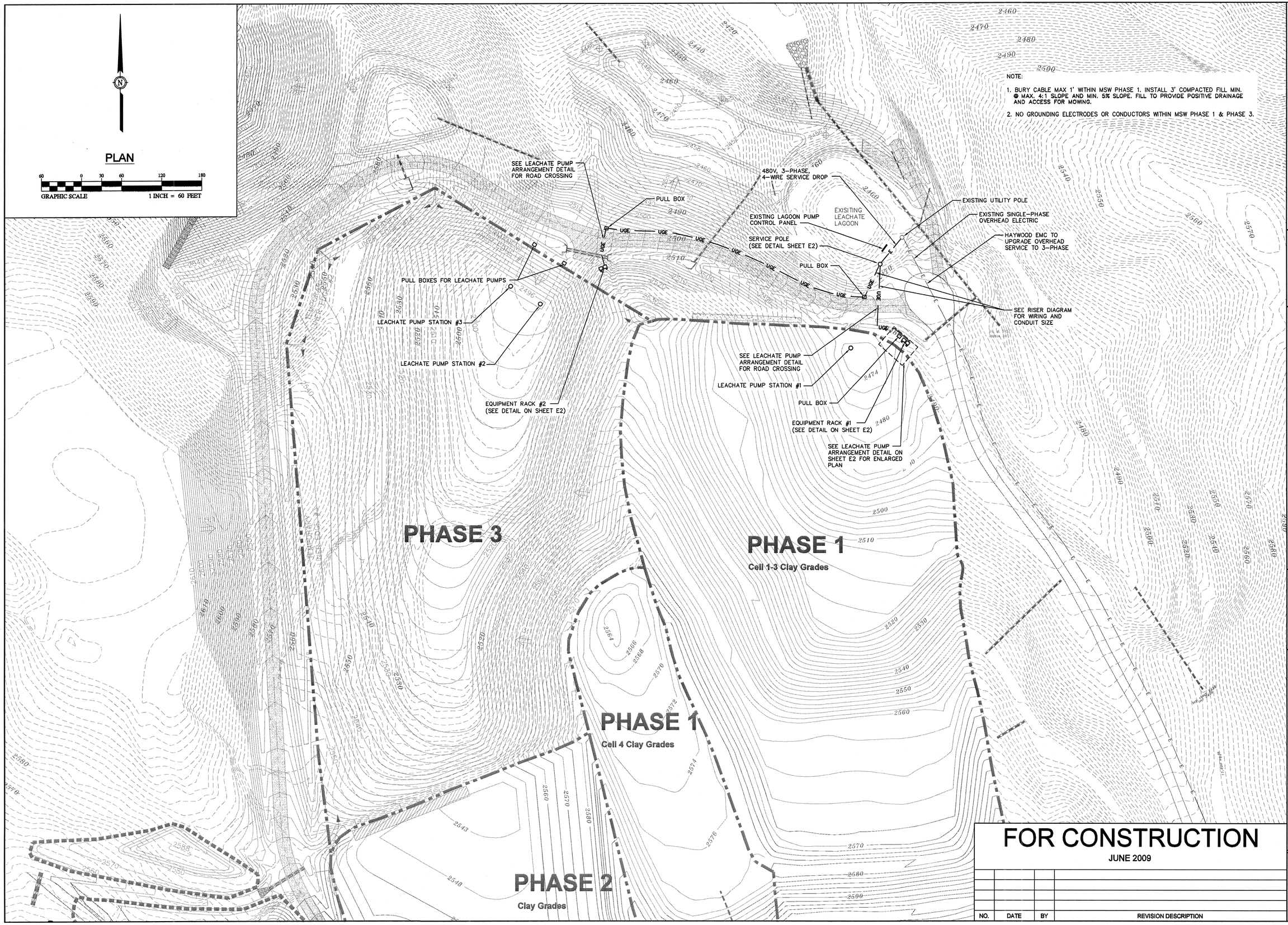
HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: DP, JH, KS
CADD BY: DP, JH, KS
DESIGN REVIEW: ___
CONST. REVIEW: ___
FILE NAME: 07518-Miscellaneous-Details.dwg

MISCELLANEOUS DETAILS

SHEET
D11

Q:\2007\07518\CONSTRUCTION-DWGS\07518-Miscellaneous-Details.dwg 6/9/2009 10:36 AM KELLY



McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK MSW LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: NCH
CADD BY: KFS
DESIGN REVIEW: PAF
CONST. REVIEW: ____
FILE NAME: 07518-E1.dwg

ELECTRICAL SITE PLAN

SHEET
E1

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

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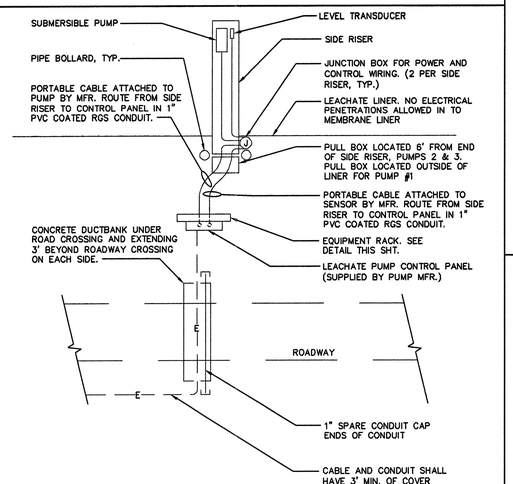
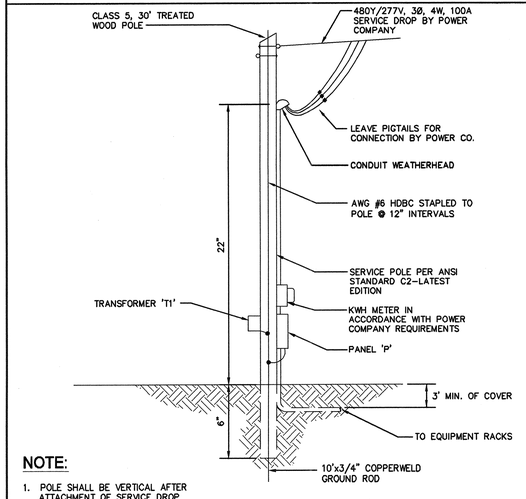


LEACHATE PUMP ARRANGEMENT DETAIL (TYPICAL)

NOT TO SCALE

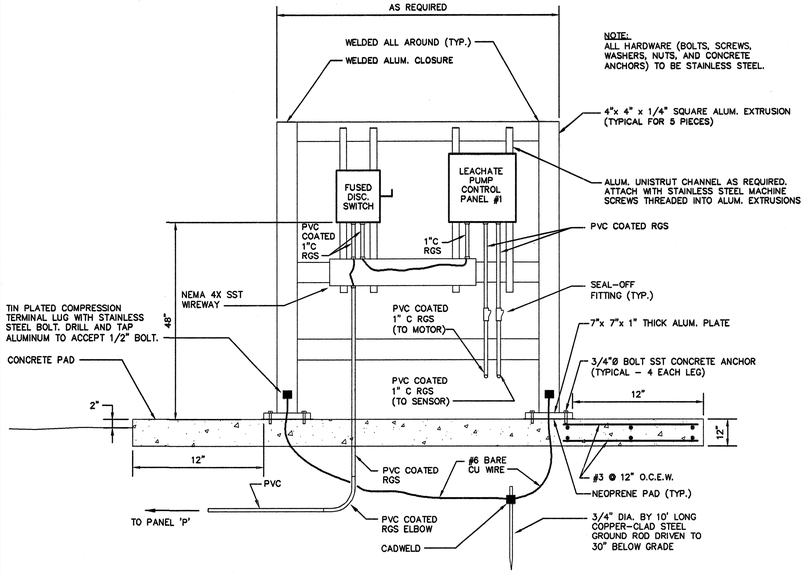


NOTE:

1. POLE SHALL BE VERTICAL AFTER ATTACHMENT OF SERVICE DROP

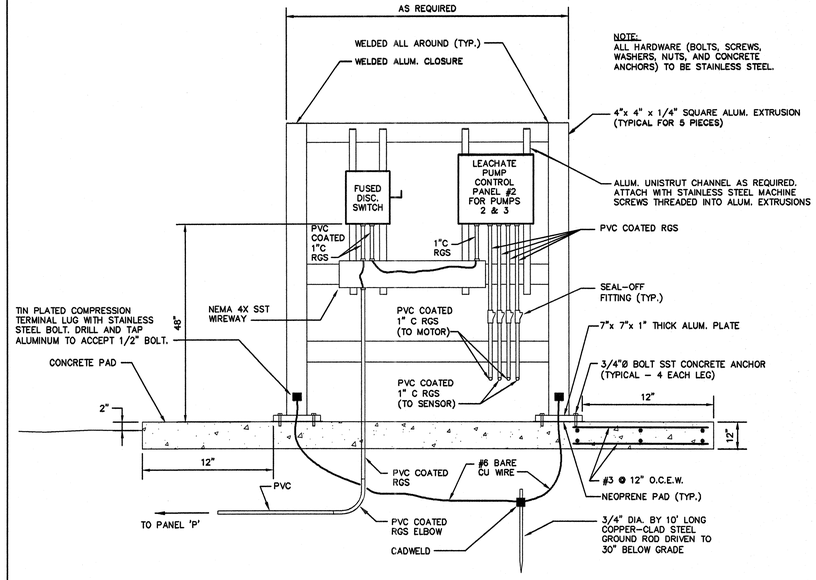
SERVICE POLE DETAIL

NOT TO SCALE



ELECTRICAL EQUIPMENT RACK #1 DETAIL

NOT TO SCALE

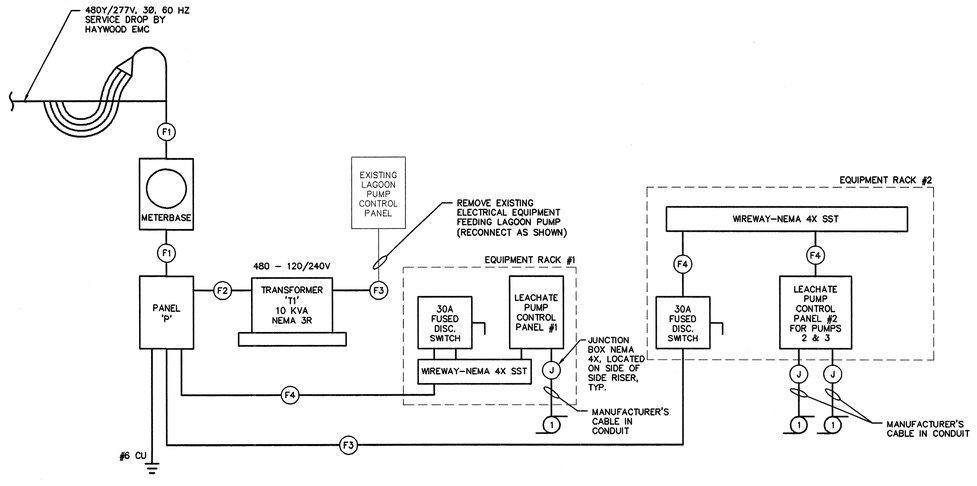


ELECTRICAL EQUIPMENT RACK #2 DETAIL

NOT TO SCALE

FEEDER SCHEDULE

ID	AMPS	NO. OF PARALLEL SETS	PHASE/ NEUTRAL	GROUND	CONDUIT
F1	130	1	4–#1	--	1 1/2"
F2	35	1	4–#10	1–#10	1"
F3	50	1	3–#8	1–#10	1"
F4	35	1	4–#10	1–#10	1"
F5	25	1	4–#12	1–#12	1"



NOTE:

1. THIS DIAGRAM SHOWS POWER WIRING ONLY. CONTROL WIRING IS NOT SHOWN.

ONE-LINE DIAGRAM

NOT TO SCALE

PANEL P

CCT	LOAD	DESCRIPTION	C	G	W	CB	CCT	CCT	CB	W	G	C	DESCRIPTION	LOAD	CCT
1	3360	LAGOON PUMP				3Ø	1	2	3Ø				LEACHATE PUMP #1	582	2
3	3360	–				2P	3	4	3P				–	582	4
5	0	SPACE ONLY	1/2	12	12	20	5	6					–	582	6
7	1164	LEACHATE PUMP #2,#3				3Ø	7	8	20	12	12	1/2	TVSS	0	8
9	1164					3P	9	10	3P				–	0	10
11	1164	–					11	12					–	0	12
13	0	SPARE	1/2	12	12	3Ø	13	14	20	12	12	1/2	SPACE ONLY	0	14
15	0	–				3P	15	16	20	12	12	1/2	SPACE ONLY	0	16
17	0	–					17	18	20	12	12	1/2	SPACE ONLY	0	18
19	0	SPACE ONLY					19	20	20	12	12	1/2	SPACE ONLY	0	20

277 / 480 V, 3 PHASE, 4 WIRE
100 A MINIMUM BUS SIZE
100 A MAIN CIRCUIT BREAKER
14,000 MINIMUM AIC RATING
SURFACEMOUNTING
NEMA 3R ENCLOSURE
GROUND BAR
UL SE LABEL

NOTES:
1. INTEGRAL TVSS.
2.
3.
4.
5.

CONNECTED LOADS	
PH. A:	5.1 KVA
PH. B:	5.1 KVA
PH. C:	1.7 KVA
TOTAL:	12.0 KVA
DEMAND	14.4 A

FOR CONSTRUCTION

JUNE 2009

NO.	DATE	BY	REVISION DESCRIPTION

McGill ASSOCIATES
ENGINEERING-PLANNING-FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

CAROLINA HEIGHTS PHILLIP L. MCGILL SEAL 16884 ENGINEER

WHITE OAK LANDFILL
CONSTRUCTION DRAWINGS
MSW PHASE 3

HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: MARCH 2009
DESIGNED BY: NCH
CADD BY: SAR
DESIGN REVIEW: PAE
CONST. REVIEW: ____
FILE NAME: 07518-E2.dwg

ELECTRICAL DETAILS

SHEET
E2

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Section 5

JOYCE ENGINEERING, INC.

Waste Industry Experts

Joyce Engineering, Inc.
2211 West Meadowview Rd
Suite 101
Greensboro, NC 27407

tel: 336/323-0092
fax: 336/323-0093

www.JoyceEngineering.com

June 16, 2010

Mr. Jeff Bishop, P.E.
McGill Associates
55 Broad Street
Asheville, NC 28801

RE: Construction Quality Assurance Certification Report
White Oak Landfill, Phase 3 Expansion
NC DENR Permit #44-07
Haywood County, North Carolina
JEI Project No. 801.0900.11, Task 01

Dear Jeff:

This letter is to certify that to the best of my knowledge and belief, the Phase 3 Expansion of the Haywood County MSW Landfill has been constructed in conformance with the plans and specifications.

The enclosed revised certification report presents an accumulation of field, laboratory, and other quality assurance data for the construction. It is our understanding that the enclosed construction quality assurance documentation was compiled in accordance with North Carolina Solid Waste Regulations, 15A NCAC 13B and fulfills the submittal requirements in the General Permit Conditions of Permit 44-07, and modification to the Permit to Construct for the MSW landfill unit Phase 3 (October 7, 2009).

The CQA services were conducted in accordance with our agreement with Haywood County, and the CQA report will be part of the final submittal to the North Carolina DENR following the completion of the project. We appreciate the opportunity to work together with McGill Associates on this project. If you have any comments regarding the report, please feel free to contact us.

Sincerely,
JOYCE ENGINEERING, INC.

Evan Andrews, P.E.
Project Manager

Enclosure

Copy: Mr. Stephen King, Director, (Haywood County),

P:\Haywood White Oak LF\Phase 3\CQA Rpt\Certification letter.docx

Prepared for:
Haywood County
Department of Solid Waste
278 Recycle Road
Clyde, NC 28721

WHITE OAK LANDFILL
PHASE 3 CONSTRUCTION
NC DENR PERMIT # 44-07

CONSTRUCTION QUALITY ASSURANCE
CERTIFICATION REPORT
May 2010
Revised June 2010

6/15/10

Prepared by:

JOYCE
ENGINEERING, INC.

2211 West Meadowview Road,
Boone Bldg, Suite 101
Greensboro, North Carolina 27407
JEI Project No. 801.0900.11, TASK 01
NC Corporate License: C-0782

TABLE OF CONTENTS

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1.0 INTRODUCTION

This report, prepared by Joyce Engineering, Inc. (JEI) on behalf of Haywood County, NC addresses the quality assurance procedures and activities performed during construction of the Phase 3 lateral expansion at the White Oak Landfill, in Clyde, North Carolina. The documents comprising this report were compiled in accordance with North Carolina Solid Waste Management Regulations, 15A NCAC 13B and the General Permit Conditions of Permit 44-07.

Thalle Construction Co., Inc. of Hillsborough, North Carolina was selected as the General Contractor and performed earthwork in the summer and fall 2009 for the proposed Phase 3 lateral expansion. Earthwork included excavation and general fill placement to prepare subgrade for construction of a composite Sub-title D liner system, stormwater management features, modifications to the leachate lagoon, and site restoration. Other site work associated with the expansion project included installation of a synthetic liner system contiguous with the existing landfill liner system, installation of leachate collection piping, a leachate force main, a leachate gravity drain, and an aggregate/drainage layer/protective cover. Hallaton, Inc. a subcontractor to Thalle installed geosynthetic clay liner (GCL), 60-mil HDPE geomembrane, and geotextile cushion layer on the approximately 9 acres prepared by Thalle. The existing leachate lagoon was rehabilitated by raising the pond berm and relining the entire pond with HDPE membrane liner. General fill, soil liner and protective stone cover field and laboratory testing data are included in Appendix I. Geosynthetic materials manufacturer, conformance and installation data are included in Appendix II: Geosynthetic Clay Liner; Appendix III: Geomembrane; and Appendix IV: Geotextile and Geocomposite

A construction daily log, minutes of construction progress meetings, and a chronological photographic record to depict the sequence and details of the construction are included in Appendix V.

The constructed subgrade, low-permeability soil liner and top of completed protective cover/drainage layer were surveyed on a 50-foot grid system; the survey data and record drawings are presented in Appendix VIII. Record Drawing #5 in Appendix VIII shows all other site work associated with the Phase 3 construction.

2.0 CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

2.1 General

Geotechnics, Inc. provided the onsite Construction Quality Assurance (CQA) activities during the construction project. The following sections describe the specific areas of CQA.

2.2 Soil Subgrade Foundation

The Contractor excavated and filled the proposed Phase 3 area floor and the sump in accordance with the design and the permit conditions. Undercut quantities, a drawing depicting the subgrade preparation, and underdrain pipe testing report are found in Appendix I. The perimeter road on the west side was cut and the north berm filled to achieve the design grades.

Subgrade preconstruction and construction field and laboratory soil testing data are presented in Appendix I. Table 1 at the end of this narrative section presents a summary of preconstruction test results for all soils used in the construction. Underdrain pipe and other Phase 3 construction related work are shown on Drawing #5. Resistant rock was encountered on the west slope of the Phase 3 during excavation. McGill Associates on behalf of the County prepared a request for a drilling and blasting to remove the rock. The Solid Waste Section approved the Rock Delineation and Blasting Plan on September 15, 2009. The Revised Blasting Plan, Blasting Plan Guide, and the Section approval letter are included in Appendix VII – NCDENR Correspondence. Upon completion, a survey verified that the specified design grade elevations had been achieved. Subgrade certification letter was issued on November 19, 2009. The certification letter is included in Appendix VII. The survey data and subgrade drawing are included Appendix VIII.

2.3 Low-permeability Soil Liner

Following the completed subgrade construction, the Contractor proceeded with the low-permeability soil liner construction. A Test pad was constructed in the SW corner of the Phase 3 within the sloped cell floor and was approximately 100 by 150 feet in size. Four lifts of the low-permeability soil from the on-site borrow source were placed to construct the test pad. Each lift, approximately six to eight inches thick were spread with a dozer and compacted with sheep's-foot roller- compactor. After repeated efforts to work the soil with varying moisture levels and efforts of compaction a decision was made that the on-site soils will not meet the permeability requirement 1x10E-07 cm/sec. As a result, McGill Associates negotiated a permit modification for an alternate liner design with the Solid Waste Section. Subsequently, the constructed test pad met the 1x10E-05 cm/sec permeability requirement for the alternate liner system. Table 2 at the end of this narrative section is a summary of the remolded and test pad permeability results. With the changed permit requirement, Thalle continued the soil liner construction with successful laboratory test results of the in-situ permeability testing. The alternate soil liner was constructed with three eight-inch lifts resulting in total liner thickness of 24 inches. The Phase 3 expansion area was divided into nine approximately one-acre size sections on the site plan to track the work progress and CQA testing. The Contractor placed the low-permeability soil one lift at the time over an acre, worked the soil, and the CQA field representative tested the completed work. Thalle worked some areas twice until acceptable permeability test results were achieved. A total of 27 acre-lifts were constructed for the Phase 3 soil liner. The north end, designated as Acre 9, was constructed in two parts to accommodate stormwater drainage, thus the field and laboratory testing resulted in additional set of soil testing data. The low-permeability soil material pre-construction, test pad and the soil liner construction final results are included in Appendix I. Table 3 at the end of this narrative section is a summary of all laboratory testing of the low-permeability soil liner test results. The leachate lagoon berm was constructed with the soil from the same borrow source used for the Phase 3 soil liner. The field and laboratory testing final results are included in Appendix I. The survey data and top of clay liner drawing are included Appendix VIII.

2.4 Geosynthetic Clay Liner (GCL)

Bentomat ST, manufactured by CETCO with Winning Edge Super Grove™ was placed on the entire cell floor in accordance with the approved permit modification for the alternate

liner design. Thalle Construction utilized the GCL matting on the leachate lagoon berm construction for the same reason as in the Phase 3 cell construction to compensate for the soil liner material not meeting the 1.0 x 10E-07 cm/sec permeability requirement.

Cetco manufacturer's quality certifications (MQC) and the Interface Friction Angle test results are included in Appendix II. The conformance samples were shipped on a pallet to the owner for archives. The GCL material arrived to the site in good condition without any damage to the rolls. The Contractor stacked the rolls in the construction materials staging area where the rolls were stored dry on high ground and covered with plastic to prevent the rolls from premature hydration. Installation of adjacent GCL panels overlapped a minimum of six (6) inches, and end-of-rolls were overlapped and shingled by a minimum of twenty-four (24) inches. Hallaton, Inc. applied accessory bentonite between the two-foot end-of-panel overlap as required in the specifications.

2.5 High Density Polyethylene Geomembrane (HDPE)

The primary HDPE geomembrane and GCL liner were installed simultaneously. Each day the GCL was covered with the HDPE membrane panels. The QA/QC data for the geomembrane liner include: quality certificates from the manufacturer (MQC) and laboratory conformance test results (CQA); installation records: the geomembrane panel placement log; field trial seam log; seaming record and non-destructive air pressure test log; seam destructive test log; laboratory peel and shear test results of the seam weld, and repair log. The geomembrane installation records and subgrade acceptance forms are included in Appendix III. The geomembrane rolls arrived to the site in good condition without any damage to the rolls. The Contractor stacked the rolls on a staging area that provided drainage during storage and covered them with plastic sheeting to prevent dust, rain, and sunlight exposure to the rolls.

2.6 Geotextile Cushion

Following geomembrane seaming, field testing, repairs and laboratory peel and shear test results were completed, Hallaton, Inc. deployed geotextile to cover the primary membrane. The geotextile edges were overlapped six inches, smoothed out and heat bonded together. The geotextile rolls arrived to the site in good condition without damage to the rolls. The Contractor stacked the rolls over an area that provided drainage during storage. The rolls were covered with plastic sheeting to prevent dust and rain, and sunlight exposure to the rolls. Manufacturer certificates and material conformance test results are included in Appendix IV.

With the Phase 3 expansion the leachate storage lagoon improvement was included in the project. Geocomposite was placed between the existing HDPE pond liner and a new HDPE liner. Geocomposite conformance test results and manufacturer certificate for the material are included in Appendix IV.

2.7 Aggregate Drainage Layer

A two-foot thick aggregate layer was placed over the completed geomembrane-geotextile composite liner. The drainage layer material was placed starting from the south end of Phase 3

and worked toward the sump and up toward higher elevation on the side slopes. A dozer equipped with GPS guiding system continuously pushed the stone uphill to avoid stress on the soil/synthetic liner interface and potential liner failure. Material pre-construction and construction testing results are in Appendix I.C. The survey data and top of drainage layer drawing are included Appendix VIII.

3.0 SUMMARY OF CQA FIELD DATA

3.1 Earthwork

Thalle excavated, hauled and placed all the soil materials for the Phase 3 lateral expansion subgrade and soil liner construction entirely from the on-site borrow source. Heavy earth moving equipment used for the earthwork included track excavators, dozers, articulated dump trucks, water trucks, sheep's foot compactor and smooth drum compactor. Soil was spread and graded with the dozers, compacted with a roller compactor, and sealed to smooth surface with rubber-tired drum roller. Water was added when soil moisture content was found below the moisture content required for the material to meet the specified compaction for the general fill and 1.0x10E-05 cm/sec permeability for the soil liner. A small track excavator was used to expose existing liner edge and excavate anchor trenches. A front loader was used for the stockpiled drainage layer stone loading the off-road trucks.

Site soil used for the Phase 3 construction ranged from was silty sand (SM) to elastic silt (MH) and fat clay (CH). A summary, Table 1, of the laboratory testing of materials used for the project is included in the end of this narrative.

Soil construction CQA field testing included in-place wet density, moisture content, calculated dry density and percent compaction with a Troxler model 3440 portable nuclear gauge. A density drive sampler with 4-inch thin-walled tube was used to verify the nuclear gauge test results for each acre lift. If the nuclear gauge moisture readings were found to deviate significantly from the moisture percentage by direct heating method, the dry density and in-place compaction percentage were re-calculated to verify compaction of the soil. If the placed soils were found not to meet the specification in a given area, the Contractor was informed of the test results and asked to re-work the soil. Following the soil re-work, the area was subjected to CQA testing verification. The test pad and soil liner CQA testing data are presented in tabular format at the end of this narrative section; Table 2 - Remolded and Test Pad Permeability Results, and Table - 3 Soil Liner Construction Testing Results. Complete set of all soil testing data for general fill, test pad, soil liner construction and leachate lagoon rehabilitation field and laboratory test results are included in Appendix I.

3.2 Geosynthetics Installation

Geosynthetic materials CQA documentation included friction angle testing, conformance testing for the proposed materials, and their installation. The CQA documents for the installation include (Appendix II and III) roll counts, geomembrane panel deployment, field trial weld log, geomembrane seaming and non-destructive testing log, geomembrane seam destructive test log, and repair log. A Record Drawing #4 of the membrane liner installation is included with Record

Documents in Appendix VIII. The membrane liner record drawing shows the entire Phase 3 area panel placement and their numbering, all welded seams, locations of destructive test and repairs. The west and north side perimeter line corresponds with the constructed anchor trench. The leachate lagoon membrane liner drawing is included on the Record Drawing #4.

Prior to deployment of the GCL the liner Contractor inspected the subsurface condition. The liner installer's Certificates for Subgrade Acceptance are included in Appendix III.

Hallaton, Inc. deployed 200 rolls of Bentomat ST equaling 450,000 SF, or 10.3 acres. The 60-mil textured HDPE synthetic membrane construction utilized 48 rolls of material equaling 452,640 SF, or 10.4 acres. The Phase 3 panel placement log records 113 panels and equals 417,302 SF, or a total of 9.6 acres. The difference of the total amount liner material ordered for the cell construction and the installed lined area results from material placement in the anchor trench, cutting and fitting the panels and material for repairs. Seven rolls of HDPE were ordered for the leachate lagoon improvements. The lagoon liner was constructed in radial pattern with most seams running down slope. Hallaton placed 19 panels totaling 26,255 sf or 0.6 acres.

Field seam testing was conducted on each day the Contractor welded panels and repairs. Each welder and his welding machine must qualify before proceeding with seam welding. The trial weld testing was conducted twice a day, each morning and after lunch-break, as required in the specifications. Samples were cut from a trial test seam and subjected to peel and shear tests. The minimum acceptable peel and shear strength values of fusion welded seams for the 60-mil textured HDPE in accordance with GRI GM19 are 91 ppi and 120 ppi respectively, and for extrusion welded seams were 78 ppi and 120 ppi respectively. The field conducted seam strength test results are included in Appendix III.

The Geomembrane seaming and non-destructive test logs were recorded for each day's progress. A total of 21,308 feet of seam welding was conducted to weld all 113 panels to a one contiguous membrane liner. Destructive samples of the welded seams were cut at an average frequency of 507 feet for a total of 42 destructive samples. The destructive seam samples were shipped to Geotechnics Laboratories in Pittsburg, Pennsylvania for peel and shear testing. DT-11, DT-12, DT-22, and DT-25 had partial seam failures (adhesion break of either inside or outside track). The destructive sample pass/fail criteria in the project specifications states that the peel criteria apply to both tracks of double track seams. Four out of five specimens from a destructive seam sample must meet the peel requirements and five out of five specimens must meet the shear requirements to be acceptable. The adhesion failures were traced both directions from the failed sample locations until acceptable quality weld was found. New samples were cut from the seam and shipped to laboratory peel/shear testing. Each of the four samples re-tested had satisfactory results from the laboratory testing. The in-field destructive seam test log and laboratory test results are included in Appendix III.

The Phase 3 repair log tallies a total of 220 repair locations. The geomembrane repairs consist of non-destructive seam air-test locations, destructive seam tests locations, panel junctions, welder burnouts, or blemishes found in the membrane panels. All repairs were extrusion welded. Prior to beginning repair work, the welding technician welded a sample seam

that was subjected to in-field peel and shear testing that monitors the weld quality. Vacuum-box testing provided quality control of the extrusion welded seam quality. The repair log is included in the Appendix III.

Leachate lagoon rehabilitation included a new liner over the raised berm, repair of any problems within the existing pond liner, double-sided geocomposite and a new 60-mil liner across the entire basin. Three destructive seam test samples were obtained and submitted to laboratory testing from the lagoon construction. The laboratory test results were satisfactory and they are included among the other destructive test results in Appendix III. The lagoon liner construction logs are included at the end of the Hallaton's installation submittal.

Geotextile and geocomposite Manufacturer's certifications and laboratory conformance sampling test results are included in Appendix IV.

The daily installation records track how many rolls of material were deployed each day and the installed quantity in square feet. Geomembrane panel numbers describe the work progress each day. Liner detail work, welding, testing and repairing are performed every day and these activities are recorded in their respective logs. Hallaton, Inc. began deploying GCL and 60-mil HDPE on November 7, 2009 on the south end of the Phase 3 by placing the materials from the Phase 1 tie-in across cell floor to the anchor trench on the west side. The installation progressed north toward the Phase 3 sump, alternating from one side to another and tying in the middle. By November 25, 2009, Hallaton had covered the entire Phase 3 with the geomembrane taking 18 days to construct the synthetic liner. Secondary geomembrane was installed in the sump area in accordance with the design. Repairs were all completed by December 7, 2009. The general construction daily log describing daily construction activities is in Appendix V.A. Photographic log of construction activities in included in Appendix V.B. Construction progress meetings were held once a month, and their minutes are included in Appendix V.C.

Written warranties from the geomembrane manufacturer, Agru, and installer, Hallaton, Inc. are included in Appendix VI.

3.3 Aggregate Drainage Layer

A two foot thick layer of #57 stone was placed over the entire lined area covering the geomembrane liner from anchor trenches to the Phase 1 and 2 tie-in. Preconstruction testing of the stone included a quarry certificate, grain size distribution, permeability, and Calcium Carbonate content. These tests were conducted one per source. Construction testing of the stone included grain size distribution at frequency of every 1,500 CY delivered, and permeability testing at frequency of every 6,000 CY delivered. The stone was delivered to the site and stockpiled and/or directly delivered to the working face. A total of 30,000 CY of stone was delivered for the Phase 3. Preconstruction quarry certificate and laboratory test results, and construction testing results and summary are included in Appendix I.C.

4.0 DEVIATIONS FROM THE CONTRACT DOCUMENTS

4.1 General

The purpose of this section is to identify any deviation from the contract documents, which occurred during construction. Correspondence with NCDENR regarding modifications to the Phase 3 design is included in Appendix VII.

4.2 Modified Permit Approval for the addition of a GCL alternative base-liner system

Pre-construction testing of the site soils for the construction of the base-liner did not yield acceptable laboratory test results for the undisturbed or remolded samples. As a result of the failing tests and the site soils not meeting the permitted soil liner permeability requirement, the County and Engineer agreed to approach the Solid Waste Section to apply for a modification to the Permit to Construct. On October 7, 2009 the Section approved a modification to the permit with the addition of a GCL alternative base-liner. The permit modification is included in Appendix VII – NCDENR Correspondence.

4.3 Anchor Trench and Liner Tie-in with Existing Phases

Thalle Construction suggested a change to the anchor trench and liner tie-in design in the interest to avoid excavating the existing anchor trench and placing low-permeability soil below the anchor trench as shown in the construction Drawing Detail Sheet 4 D. McGill Associates agreed to the suggested change and provided a revision to the anchor trench detail (Appendix III C). A condition to the design change called for subsoil permeability testing below the anchor trench at an interval not exceeding 250 feet. Permeability testing of the below anchor trench soil was conducted in four locations along the Phase 1 and 2 anchor trenches, labeled S-1 thru S-4. Test sample S-2 failed the permeability requirement. Re-sampling the Phase 2 anchor trench was retrieved 100 feet to the west which subsequently met the permeability requirement. The re-sampled S-2A laboratory Sample Number is PH2B. Anchor trench soil test results and location map are included in Appendix I.B - Construction Testing. As a result of the failing subsoil permeability test, McGill Associates required the Contractor to place additional GCL and HDPE membrane over the section of anchor trench that has soils not meeting the permeability requirement. A drawing depicting the geosynthetic installation along Phase 2 tie-in and the revised anchor trench detail are included in Appendix III C.

Rain during the winter months had washed soil from the Phase 2 slope and the fine material was deposited at the toe of the slope within the drainage layer stone. The Contractor removed the drainage layer stone to open the area along Phase 2 needing the additional GCL/HDPE. Hallaton placed one roll (150 feet) of Bentomat DN and covered it with textured 60-mil HDPE. The dimensions of the modified tie-in area were 203 feet long and 22 feet wide. A drawing is included in Appendix III.C – Installation to show the area along Phase 2 where the additional GCL and HDPE were installed and in relation to the anchor trench subsoil permeability test locations S-2 and S-2A. The geomembrane was covered with geotextile and

the stone was replaced. The soil contamination of the drainage layer stone was minimal and concentrated only along the tie-in section where the modification work was conducted.

4.4 HDPE Seam Destructive Testing

Membrane liner (HDPE) welded seam integrity testing is conducted by peel and shear testing of the weld. The seam strength testing is monitored in the field (CQC) and in the laboratory (CQA) testing. The CQA representative observes the liner installation and collects the installation data for each day's activities. As the work progresses, completed seams and the adjoining panel numbers are recorded. The seam lengths are measured in the field using a measuring wheel with accuracy to +/- 1.0 foot. Specification Section 02620 states that the laboratory destructive testing is defined as samples cut on 500 foot centers of the welded seam. At the completion of the project all field data has been collected and quantities verified. For the Phase 3 a total of 21,308 feet of seam welding was recorded to weld all 113 panels to one contiguous membrane liner. Destructive seam samples were marked approximately every 500 feet by measuring with the wheel. 42 seam samples were cut and shipped to the CQA laboratory for a destructive peel and shear testing. The slight variation between the field measured frequency and the mathematical frequency of 507 ft per destructive sample are a result of inaccuracies in field measurements due to human error crew judgment in marking and cutting destructive sample locations. The variation represents a 1.4% measurement error for the entire process which we feel is acceptable.

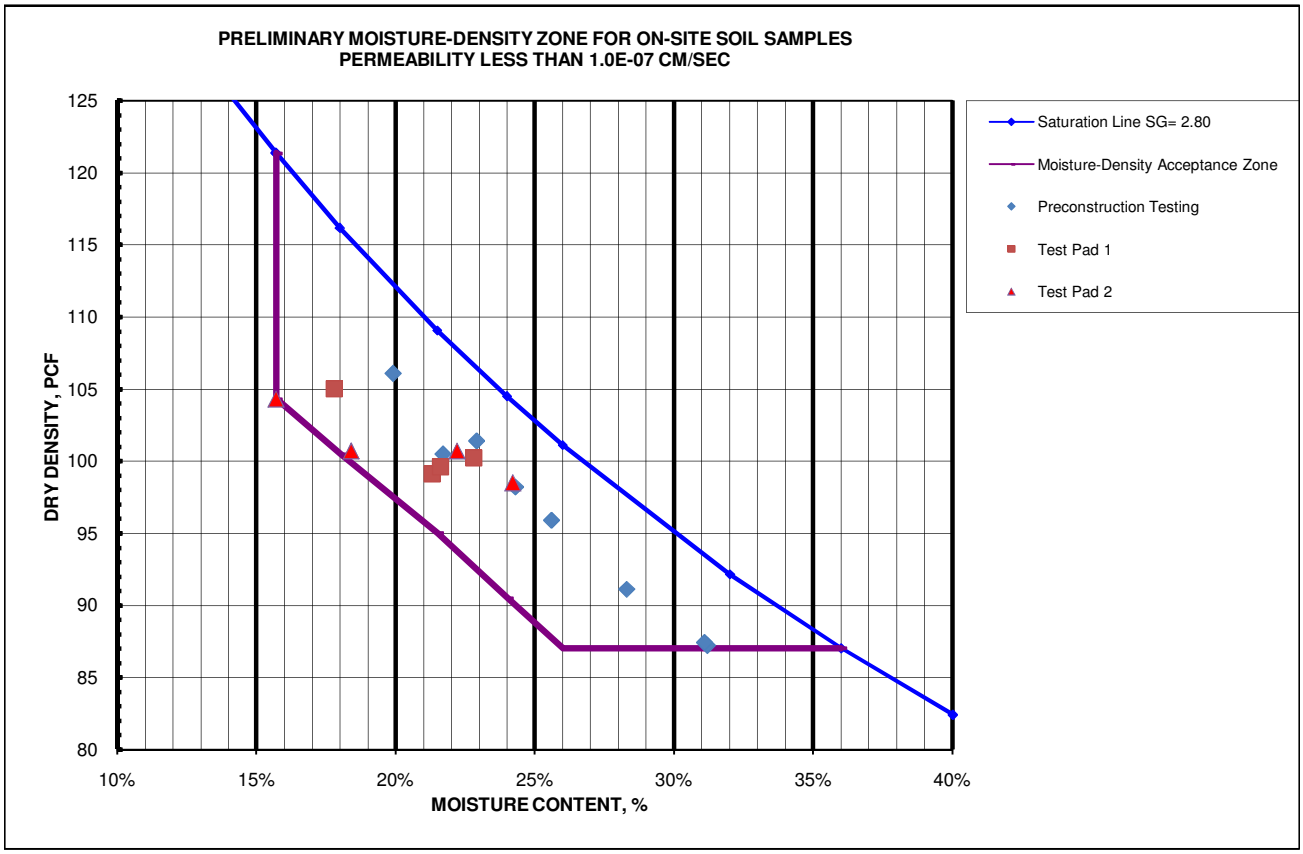
END

TABLE 1.
SUMMARY OF SOIL MATERIALS
White Oak Landfill - Phase 3
Haywood County, NC

Pre-Construction Testing Fill Material						Sieve	Atterberg Limits		
Sample ID	Soli Description	USCS	OMC	MDD	Water content %	%Fines	LL	PL	PI
SF-01	Brown Silt	ML	20.0	101.0	22.5				
SF-02	Red-brn fat Clay	CH	23.8	93.6	24.0				
SF-03	Red-brn fat Clay	CH	23.7	91.0	29.3				
SF-04	Red-brn elastic Silt	MH	27.0	91.0	29.1				
SF-05	Red-brn fat Clay	CH	23.4	87.8	30.5				
SF-06	Brown fat Clay	CH	16.4	104.8	14.0				
SF-07	Brown lean Clay	CL	16.2	107.0	15.2				
SF-08	Brown fat Clay	CH	19.4	102.7	17.2				
SF-09	Brown fat Clay	CH	18.0	103.3	16.8				
SF-10	Brown fat Clay	CH	17.8	102.5	16.1				
SF-11	Red-brn fat Clay	CH	23.9	96.9	5.4				

Pre-Construction Testing Low-Permeability Soil Liner						Sieve	Atterberg Limits		
Sample ID	Soli Description	USCS	OMC	MDD	K cm/sec	%Fines	LL	PL	PI
CCL1	Red-brn elastic Silt	MH	27.5%	89.7	3.4E-07	69.2%	50	30	20
CCL2	Brown fat Clay	CH	18.5%	103.5	6.3E-07	50.4%	51	27	24
CCL3	Brown Silt	ML	19.0%	104.1	5.0E-07	49.8%	39	31	8
CCL4	Brown lean Clay	CL	16.0%	109.8	3.8E-07	57.1%	40	21	19
CCL5	Brown fat Clay	CH	26.0%	94.2	2.6E-07	74.1%	56	29	27
CCL6	Red-brn fat Clay	CH	22.0%	98.8	7.4E-07	68.7%	50	27	23
CCL7	Red-brn Silt	ML	21.3%	100.5	2.9E-06	55.9%	44	36	8
CCL8	Red-brn elastic Silt	MH	28.6%	89.5	4.0E-07	79.7%	70	39	31
CCL9	Brn sandy elastic Silt	MH	18.8%	106.4					

TABLE 2
REMOLDED AND TEST PAD PERMEABILITY RESULTS



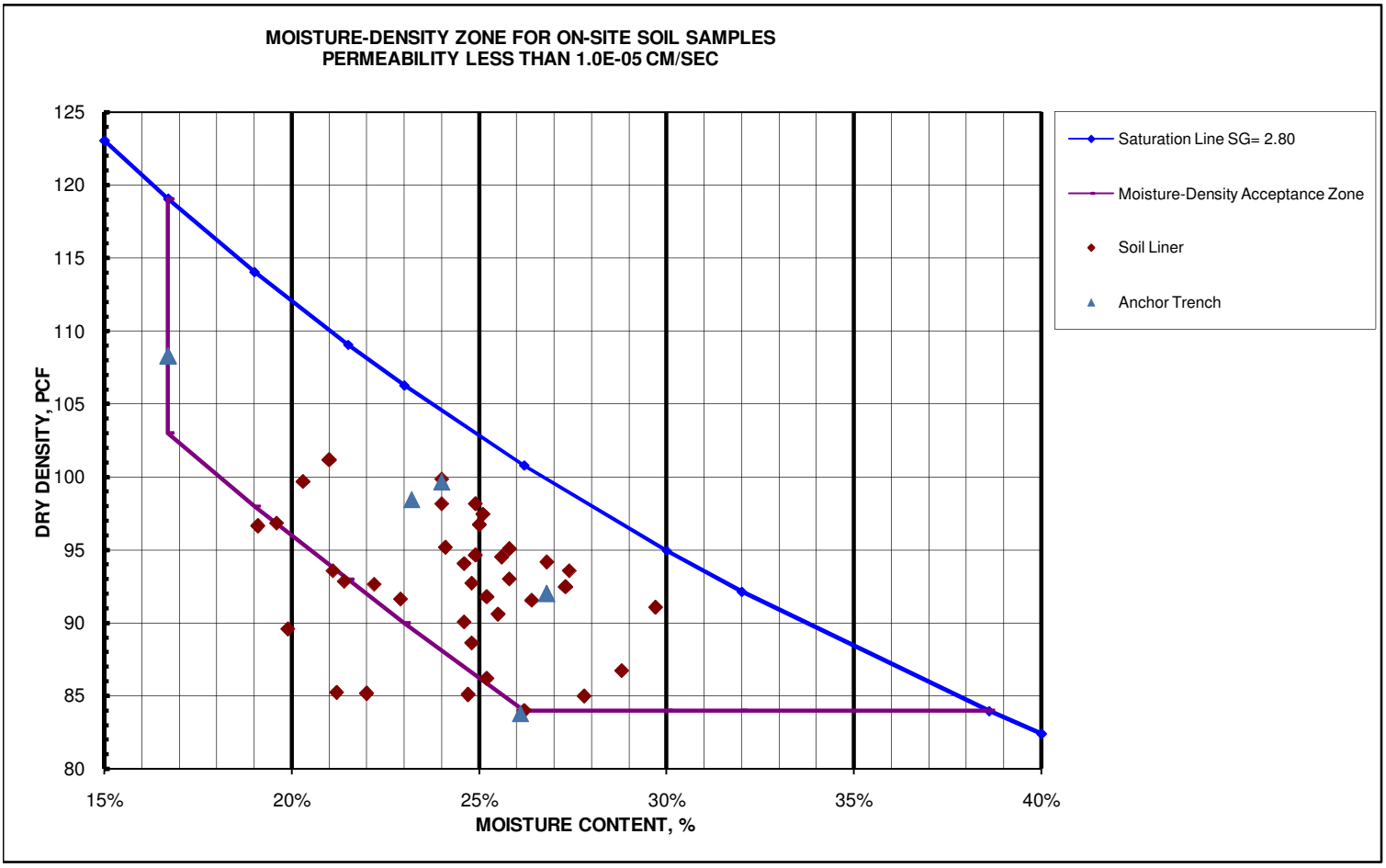
PRE-CONSTRUCTION REMOLDED CQA TESTING

Perm	Sample	Remold			Standard Proctor		Remolded Lab Samples				Perm
No.	I.D.		Sample Description	USCS	OMC	MDD	MC	OMC-MC	DD	DD/MDD	(cm/sec)
	CCL1	Remold	Red-brn elastic Silt	MH	27.5%	89.7	31.2%	3.7%	87.2	97.2%	3.4E-07
	CCL2	Remold	Brown fat Clay	CH	18.5%	103.5	21.7%	3.2%	100.5	97.1%	6.3E-07
	CCL3	Remold	Brown Silt	ML	19.0%	104.1	22.9%	3.9%	101.4	97.4%	5.0E-07
	CCL4	Remold	Brown lean Clay	CL	16.0%	109.8	19.9%	3.9%	106.1	96.6%	3.8E-07
	CCL5	Remold	Brown fat Clay	CH	26.0%	94.2	28.3%	2.3%	91.1	96.7%	2.6E-07
	CCL6	Remold	Red-brn fat Clay	CH	22.0%	98.8	25.6%	3.6%	95.9	97.1%	7.4E-07
	CCL7	Remold	Red-brn Silt	ML	21.3%	100.5	24.3%	3.0%	98.2	97.7%	2.9E-06
	CCL8	Remold	Red-brn elastic Silt	MH	28.6%	89.5	31.1%	2.5%	87.4	97.7%	4.0E-07
	CCL9	Remold	Brn sandy elastic Silt	MH	18.8%	106.4					

TEST PAD Constructed on September 1, 2009

Lab ID	Test Pad	LIFT	ST	Standard Proctor		Undisturbed Shelby Tube				Perm
2009-666-05-02	TP-1	LIFT 1	ST1	16.0%	109.8	17.8%	1.8%	105.0	95.6%	2.30E-07
2009-666-05-04	TP-1	LIFT 2	ST3	21.3%	100.5	21.3%	0.0%	99.1	98.6%	4.40E-07
2009-666-05-06	TP-1	LIFT 3	ST5	21.3%	100.5	22.8%	1.5%	100.2	99.7%	3.00E-07
2009-666-05-08	TP-1	LIFT 4	ST7	21.3%	100.5	21.6%	0.3%	99.6	99.1%	3.10E-07
2009-666-05-03	TP-2	LIFT 1	ST2	18.5%	103.5	18.4%	-0.1%	100.7	97.3%	3.40E-07
2009-666-05-05	TP-2	LIFT 2	ST4	22.0%	98.8	24.2%	2.2%	98.5	99.7%	2.30E-07
2009-666-05-07	TP-2	LIFT 3	ST6	18.5%	103.5	22.2%	3.7%	100.7	97.3%	5.20E-07
2009-666-05-09	TP-2	LIFT 4	ST8	16.0%	109.8	15.7%	-0.3%	104.3	95.0%	6.30E-07

TABLE 3
SOIL LINER CONSTRUCTION TESTING RESULTS



		SOIL LINER Construction started on September 11, 2009												
Lab ID	Tube	ACRE	LIFT	WD	MC	DD	K cm/sec	LL	PL	PI	USCS	Gravel	Sand	Silt/Clay
No.	No.	Ref.		pcf	%	pcf						%	%	%
666-06-01	ST-9	A1	L1	119.9	20.3%	99.7	1.7E-07	45	31	14	ML	5.15	33.21	61.64
666-06-02	ST-10	A1	L2	122.4	21.0%	101.2	4.5E-07	47	34	13	ML	2.93	41.66	55.41
666-07-05	ST-15	A1	L3	118.1	24.1%	95.2	5.7E-07	40	35	5	ML	3.49	47.20	49.31
666-07-01	ST-11	A2	L1	115.8	19.6%	96.8	1.4E-06	43	35	8	ML	3.54	46.65	49.81
666-07-03	ST-13	A2	L2	118.1	29.7%	91.1	1.7E-07	49	38	11	ML	1.01	36.45	62.54
666-07-06	ST-16	A2	L3	118.7	25.6%	94.5	3.4E-07	46	34	12	ML	0.92	47.58	51.50
666-08-01	ST-18	A3	L1	121.9	25.1%	97.4	3.4E-07	50	41	9	MH	3.37	41.10	55.53
666-08-02	ST-19	A3	L2	120.9	25.0%	96.7	1.8E-07	48	35	13	ML	4.78	39.32	55.90
666-09-01	ST-20	A3	L3	123.8	24.0%	99.8	3.0E-07	45	37	8	ML	5.46	43.97	50.57
666-10-06	ST-32	A4	L1	112.2	24.6%	90.0	4.2E-06	48	38	10	ML	0.58	34.32	65.10
666-09-07	ST-33	A4	L2	113.2	22.2%	92.6	7.2E-06	47	39	8	ML	0.08	40.02	59.90
666-12-03	ST-34	A4	L3	117.2	24.6%	94.1	4.7E-06	45	39	6	ML	0.27	41.94	57.79
666-09-05	ST-24	A5	L1	119.2	27.4%	93.6	4.3E-07	45	35	10	ML	0.53	36.36	63.11
666-09-10	ST-29	A5	L2	110.6	24.8%	88.6	2.7E-06	48	42	6	ML	1.03	35.81	63.16
666-10-05	ST-30	A5	L3	113.3	21.1%	93.6	9.5E-06	44	39	5	ML	0.24	38.41	61.35

Lab ID No.	Tube No.	ACRE Ref.	LIFT	WD pcf	MC %	DD pcf	K cm/sec	LL	PL	PI	USCS	Gravel %	Sand %	Silt/Clay %
666-09-02	ST-21	A6	L1	121.7	24.0%	98.1	1.8E-07	55	33	22	MH	0.45	37.06	62.49
666-09-03	ST-22	A6	L2	112.7	21.4%	92.8	2.4E-05	37	32	5	ML	3.38	42.02	54.60
666-09-03	ST-22B	A6	L2B	115.1	19.1%	96.6	3.9E-05	37	32	5	ML	3.38	42.02	54.60
666-10-03	ST-22A	A6	L2R	115.7	24.8%	92.7	2.3E-06	49	41	8	ML	0.45	38.94	60.61
666-09-04	ST-23	A6	L3	111.7	28.8%	86.72	5.7E-06	45	38	7	ML	0.50	38.85	60.65
666-11-01	ST-23A	A6	L3R	108.6	27.8%	85.0	2.8E-06	45	38	7	ML	0.15	36.03	63.82
666-09-06	ST-25	A7	L1	115.7	26.4%	91.5	1.4E-06	47	39	8	ML	2.16	43.03	54.81
666-09-08	ST-27	A7	L2	103.9	22.0%	85.2	1.5E-05	47	43	4	ML	0.22	38.28	61.50
666-10-04	ST-27A	A7	L2	119.4	26.8%	94.2	1.3E-06	44	38	6	ML	0.79	53.63	45.58
666-12-04	ST-35	A7	L3	106.1	24.7%	85.1	3.2E-05	47	39	8	ML	3.87	40.50	55.63
666-14-01	ST-35A	A7	L3R	107.4	19.9%	89.6	5.6E-06	49	41	8	ML	6.3	34.36	59.34
666-09-07	ST-26	A8	L1	117.7	27.3%	92.5	1.4E-06	43	34	9	ML	1.65	36.33	62.02
666-09-09	ST-28	A8	L2	103.3	21.2%	85.2	8.8E-05	45	40	5	ML	0.56	44.67	54.77
666-12-02	ST-28A	A8	L2R	117.0	25.8%	93.0	4.9E-06	47	37	10	ML	1.58	36.19	62.23
666-12-01	ST-31	A8	L3	106.0	26.2%	84.0	3.7E-06	47	39	8	ML	0.13	41.27	58.60
666-07-02	ST-12	A9A	L1	119.6	25.8%	95.1	8.0E-07	47	36	11	ML	5.26	44.17	50.57
666-07-04	ST-14	A9A	L2	113.7	25.5%	90.6	2.1E-06	46	36	10	ML	3.12	44.41	52.47
666-07-07	ST-17	A9A	L3	122.6	24.9%	98.2	1.1E-07	49	33	16	ML	1.67	39.61	58.72
666-13-01	ST-36	A9B	L1	114.9	25.2%	91.8	3.3E-05	46	36	10	ML	0.17	43.19	56.64
666-13-01	ST-36A	A9BR	L1	112.6	22.9%	91.6	8.0E-06	50	36	14	MH	4.21	43.69	52.10
666-13-02	ST-37	A9B	L2	107.9	25.2%	86.2	9.9E-06	51	43	8	MH	0.53	43.87	55.60
666-13-03	ST-38	A9B	L3	118.2	24.9%	94.6	2.8E-06	51	43	8	MH	0.99	38.1	60.91
PERIMETER ANCHOR TRENCH														
666-10-01	ST-1	PH1 CCH3		121.3	23.2%	98.5	5.3E-07	45	33	12	ML	0.39	42.53	57.08
666-10-02	ST-2	PH2		105.7	26.1%	83.8	1.0E-04	37	35	2	ML	0	46.81	53.19
666-10-02	ST-2R	PH2 B		116.7	26.8%	92.0	9.3E-05	37	35	2	ML	0	46.81	53.19
666-13-04	ST-3	PH1		126.4	16.7%	108.3	4.0E-07	49	31	18	ML	5.78	57.89	36.33
666-13-05	ST-4	PH1		123.6	24.0%	99.7	1.0E-05	43	32	11	ML	8.22	68.68	23.10

Notes:
ST = Shelby Tube
A = Acre designation
L = Lift designation
L2B = Lift 2 backup sample
L2R = Lift 2 reworked and resampled
9A = Acre 9 berm construction
9B = Acre 9 sump and floor constrcution
Moisture-Density Acceptance Zone defined to include most passing results.

ALOIS CALLEMYN, PLS
PROFESSIONAL LAND SURVEYOR #L-2544
3500 JUSTAMERE FARM RD.
HILLSBOROUGH, NC 27278

April 30, 2010

Chris Haverstrom
Thalle Construction Co.
900 Hwy 86 north
Hillsborough, NC 27278

RE: Survey – White Oak MSW Landfill, Phase 3

Dear Chris:

Attached to this cover letter is a spreadsheet showing the different elevations at each grid point taken at each stage of this job. The three stages are; subgrade, clay liner and protective cover. The exact location of each grid point is shown with the north and east coordinates and is plotted on three plats by me entitled "White Oak MSW Landfill, Phase 3".

The columns labeled "PT #" are the point numbers for each grid location measurement. The column labeled "SEPARATION" is the separation in feet of each stage.

Furthermore:

ALL COORDINATE DATA AND ELEVATIONS SHOWN ON THE ATTACHED SPREADSHEETS ARE TIED TO NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NAD 1983 (HORIZONTAL) AND NAVD-88 (VERTICAL).

AND

I, ALOIS CALLEMYN, PLS, CERTIFY THAT THE ATTACHED INFORMATION WAS COMPUTED UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS INFORMATION WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA, AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS DAY OF JANUARY, 2010.

(SIGN AND SEAL)

ALOIS CALLEMYN,
PLS LICENSE NO. L-2544

WHITE OAK LANDFILL
HAYWOOD COUNTY NC

THALLE CONSTRUCTION CO, INC.

GRID COMPARISON

Thalle Grid Pt. Number & Coordinates			Cohesive Soil Liner DESIGN	SUBGRADE		CLAY LINER				PROTECTIVE COVER		
PT. #	NORTH	EAST	ELEV	ELEV	Separation	PT. #	ELEV.	Dev. from Design	SEP.	PT#	ELEV.	SEP.
1000	721842.98	811439.89	2530.05	2528.0	2.1	1000	2530.05	0.0	2.1	1000	2532.24	2.2
1001	721846.81	811489.54	2522.42	2520.4	2.0	1001	2522.33	-0.1	1.9	1001	2524.35	2.02
1002	721785.42	811343.83	2539.56	2537.5	2.1	1002	2539.65	0.1	2.2	1002	2541.69	2.04
1003	721789.27	811393.68	2530.59	2528.5	2.1	1003	2530.60	0.0	2.1	1003	2532.65	2.05
1004	721793.11	811443.53	2519.14	2517.1	2.0	1004	2519.10	0.0	2.0	1004	2521.24	2.14
1005	721796.96	811493.39	2508.45	2506.4	2.0	1005	2508.45	0.0	2.0	1005	2510.45	2.00
1006	721800.80	811543.24	2510.51	2508.3	2.2	1006	2510.50	0.0	2.2	1006	2512.63	2.13
1007	721731.72	811297.82	2536.00	2534.0	2.0	1007	2536.02	0.0	2.1	1007	2538.05	2.03
1008	721735.55	811347.63	2533.20	2531.3	1.9	1008	2533.22	0.0	1.9	1008	2535.24	2.02
1009	721739.43	811397.51	2526.54	2524.6	1.9	1009	2526.60	0.1	2.0	1009	2528.63	2.03
1010	721743.26	811447.37	2515.27	2513.3	1.9	1010	2515.35	0.1	2.0	1010	2517.40	2.05
1011	721747.19	811497.19	2505.04	2503.0	2.0	1011	2505.04	0.0	2.0	1011	2507.04	2.00
1012	721750.95	811547.08	2498.81	2496.8	2.0	1012	2498.90	0.1	2.1	1012	2500.94	2.04
1013	721754.79	811596.93	2506.24	2504.2	2.0	1013	2506.26	0.0	2.1	1013	2508.30	2.04
1014	721681.86	811301.65	2536.76	2534.7	2.1	1014	2536.82	0.1	2.1	1014	2538.82	2.00
1015	721685.72	811351.52	2533.36	2531.4	2.0	1015	2533.31	-0.1	2.0	1015	2535.45	2.14
1016	721689.57	811401.37	2524.29	2522.2	2.1	1016	2524.36	0.1	2.1	1016	2526.36	2.00
1017	721693.48	811451.18	2514.95	2512.9	2.0	1017	2515.01	0.1	2.1	1017	2517.02	2.01
1018	721697.25	811501.07	2505.56	2503.5	2.1	1018	2505.66	0.1	2.2	1018	2507.68	2.02
1019	721701.10	811550.93	2498.61	2493.6	5.0	1019	2498.61	0.0	5.0	1019	2500.62	2.01
1020	721704.94	811600.78	2496.00	2494.0	2.0	1020	2496.00	0.0	2.0	1020	2498.14	2.10
1021	721708.79	811650.63	2502.68	2500.6	2.1	1021	2502.64	0.0	2.1	1021	2504.85	2.21
1022	721712.63	811700.48	2515.91	2513.9	2.1	1022	2515.99	0.1	2.1	1022	2518.10	2.11
1023	721628.15	811255.76	2540.00	2538.2	1.8	1023	2540.09	0.1	1.9	1023	2542.14	2.05
1024	721632.00	811305.55	2537.71	2535.7	2.0	1024	2537.75	0.0	2.1	1024	2539.78	2.03
1025	721635.85	811355.36	2531.38	2529.3	2.1	1025	2531.44	0.1	2.2	1025	2533.46	2.02
1026	721639.67	811405.18	2524.22	2522.3	2.0	1026	2524.29	0.1	2.0	1026	2526.32	2.03
1027	721643.55	811455.07	2514.36	2512.4	2.0	1027	2514.41	0.0	2.0	1027	2516.45	2.04
1028	721647.39	811504.88	2505.48	2503.6	1.9	1028	2505.50	0.0	1.9	1028	2507.56	2.06
1029	721651.25	811554.77	2498.93	2496.9	2.0	1029	2498.99	0.1	2.1	1029	2501.03	2.04
1030	721655.09	811604.63	2497.39	2495.3	2.1	1030	2497.44	0.1	2.1	1030	2499.46	2.02
1031	721658.97	811654.62	2498.99	2496.9	2.1	1031	2499.00	0.0	2.1	1031	2501.08	2.08
1032	721662.84	811704.21	2513.48	2511.4	2.1	1032	2513.50	0.0	2.2	1032	2515.52	2.02
1033	721666.63	811754.18	2528.90	2526.9	2.0	1033	2528.85	-0.1	1.9	1033	2530.99	2.14
1034	721578.31	811259.52	2540.45	2538.5	1.9	1034	2540.50	0.1	2.0	1034	2542.51	2.01
1035	721582.16	811309.33	2538.42	2536.4	2.0	1035	2538.44	0.0	2.0	1035	2540.46	2.02

GRID COMPARISON

Thalle Grid Pt. Number & Coordinates			Cohesive Soil Liner DESIGN	SUBGRADE		CLAY LINER				PROTECTIVE COVER		
PT. #	NORTH	EAST	ELEV	ELEV	Separation	PT. #	ELEV.	Dev. from Design	SEP.	PT#	ELEV.	SEP.
1036	721586.01	811359.22	2532.25	2530.2	2.0	1036	2532.25	0.0	2.0	1036	2534.31	2.06
1037	721589.85	811409.04	2523.88	2521.9	2.0	1037	2523.89	0.0	2.0	1037	2525.93	2.04
1038	721593.72	811458.90	2513.80	2511.8	2.0	1038	2513.85	0.0	2.1	1038	2515.89	2.04
1039	721597.48	811508.78	2505.58	2503.6	2.0	1039	2505.60	0.0	2.0	1039	2507.65	2.05
1040	721601.41	811558.61	2500.09	2498.2	1.9	1040	2500.12	0.0	1.9	1040	2502.17	2.05
1041	721605.24	811608.47	2499.45	2497.5	2.0	1041	2499.51	0.1	2.0	1041	2501.54	2.03
1042	721609.09	811658.31	2506.60	2504.4	2.2	1042	2506.65	0.1	2.2	1042	2508.74	2.09
1043	721612.77	811707.72	2521.24	2519.1	2.2	1043	2521.25	0.0	2.2	1043	2523.26	2.01
1044	721616.77	811758.03	2534.29	2532.2	2.1	1044	2534.33	0.0	2.1	1044	2536.37	2.04
1045	721528.47	811263.35	2542.10	2540.2	1.9	1045	2542.08	0.0	1.9	1045	2544.18	2.10
1046	721532.33	811313.16	2539.27	2537.3	2.0	1046	2539.33	0.1	2.0	1046	2541.35	2.02
1047	721536.16	811363.06	2532.89	2530.9	2.0	1047	2532.89	0.0	2.0	1047	2534.90	2.01
1048	721540.03	811412.91	2523.09	2521.1	2.0	1048	2523.15	0.1	2.1	1048	2525.17	2.02
1049	721543.83	811462.76	2513.20	2511.2	2.0	1049	2513.25	0.1	2.1	1049	2515.27	2.02
1051	721547.70	811512.61	2505.85	2503.9	2.0	1051	2505.91	0.1	2.0	1051	2507.91	2.00
1052	721551.52	811562.49	2502.05	2500.1	1.9	1052	2502.08	0.0	1.9	1052	2504.13	2.05
1053	721555.39	811612.32	2501.81	2499.9	2.0	1053	2501.87	0.1	2.0	1053	2503.88	2.01
1054	721559.30	811662.31	2514.43	2512.2	2.2	1054	2514.49	0.1	2.3	1054	2516.56	2.07
1055	721562.97	811712.04	2529.16	2527.0	2.2	1055	2529.20	0.0	2.2	1055	2531.22	2.02
1056	721566.99	811761.93	2540.80	2538.1	2.7	1056	2540.21	-0.6	2.1	1056	2542.32	2.11
1057	721478.62	811267.20	2543.16	2541.1	2.1	1057	2543.10	-0.1	2.0	1057	2545.25	2.15
1058	721482.46	811317.05	2540.25	2538.2	2.1	1058	2540.25	0.0	2.1	1058	2542.30	2.05
1059	721486.31	811366.90	2532.01	2530.0	2.0	1059	2531.98	0.0	2.0	1059	2534.09	2.11
1060	721490.15	811416.75	2522.29	2520.2	2.1	1060	2522.33	0.0	2.1	1060	2524.38	2.05
1061	721494.00	811466.61	2512.48	2510.0	2.5	1061	2512.54	0.1	2.5	1061	2514.54	2.00
1062	721497.89	811516.47	2506.50	2504.5	2.0	1062	2506.50	0.0	2.0	1062	2508.52	2.02
1063	721501.71	811566.32	2504.05	2502.1	1.9	1063	2504.08	0.0	1.9	1063	2506.09	2.01
1064	721505.50	811616.23	2506.02	2503.8	2.2	1064	2506.10	0.1	2.3	1064	2508.10	2.00
1065	721509.33	811666.03	2521.29	2519.1	2.2	1065	2521.29	0.0	2.2	1065	2523.33	2.04
1066	721513.17	811715.85	2536.91	2534.7	2.2	1066	2536.93	0.0	2.2	1066	2539.09	2.16
1067	721428.77	811271.04	2544.24	2542.2	2.0	1067	2544.20	0.0	2.0	1067	2546.24	2.04
1068	721432.61	811320.89	2540.02	2538.0	2.0	1068	2540.10	0.1	2.1	1068	2542.14	2.04
1069	721436.46	811370.75	2530.94	2528.9	2.0	1069	2530.99	0.0	2.1	1069	2533.02	2.03
1070	721440.30	811420.60	2521.40	2519.4	2.0	1070	2521.44	0.0	2.0	1070	2523.47	2.03
1071	721444.15	811470.45	2512.33	2510.3	2.0	1071	2512.36	0.0	2.1	1071	2514.39	2.03
1072	721447.99	811520.30	2507.41	2505.5	1.9	1072	2507.50	0.1	2.0	1072	2509.52	2.02
1073	721451.85	811570.14	2506.44	2504.6	1.9	1073	2506.50	0.1	1.9	1073	2508.50	2.00
1074	721455.70	811619.96	2510.78	2508.6	2.2	1074	2510.80	0.0	2.3	1074	2512.85	2.05
1075	721459.52	811669.85	2526.69	2524.5	2.2	1075	2526.72	0.0	2.2	1075	2528.80	2.08
1076	721463.19	811719.83	2542.48	2540.1	2.4	1076	2542.50	0.0	2.4	1076	2544.51	2.01
1077	721378.91	811274.89	2544.47	2542.4	2.1	1077	2544.49	0.0	2.1	1077	2546.51	2.02

GRID COMPARISON

Thalle Grid Pt. Number & Coordinates			Cohesive Soil Liner DESIGN	SUBGRADE		CLAY LINER				PROTECTIVE COVER		
PT. #	NORTH	EAST	ELEV	ELEV	Separation	PT. #	ELEV.	Dev. from Design	SEP.	PT#	ELEV.	SEP.
1078	721382.76	811324.74	2539.54	2537.5	2.0	1078	2539.55	0.0	2.1	1078	2541.57	2.02
1079	721386.60	811374.59	2530.15	2528.1	2.1	1079	2530.15	0.0	2.1	1079	2532.21	2.06
1080	721390.45	811424.44	2520.83	2518.8	2.0	1080	2520.85	0.0	2.0	1080	2522.86	2.01
1081	721394.30	811474.30	2512.46	2510.4	2.1	1081	2512.48	0.0	2.1	1081	2514.50	2.02
1082	721398.15	811524.15	2509.31	2507.3	2.0	1082	2509.31	0.0	2.0	1082	2511.39	2.08
1083	721402.00	811573.94	2509.44	2507.5	1.9	1083	2509.50	0.1	2.0	1083	2511.53	2.03
1084	721405.57	811623.79	2516.59	2514.5	2.1	1084	2516.68	0.1	2.1	1084	2518.69	2.01
1085	721409.66	811673.71	2530.96	2528.5	2.4	1085	2530.99	0.0	2.5	1085	2533.00	2.01
1086	721413.20	811723.44	2547.25	2544.7	2.5	1086	2547.31	0.1	2.6	1086	2549.41	2.10
1087	721329.06	811278.73	2545.05	2543.0	2.1	1087	2545.06	0.0	2.1	1087	2547.14	2.08
1088	721332.91	811328.59	2539.04	2537.0	2.0	1088	2539.08	0.0	2.1	1088	2541.10	2.02
1089	721336.75	811378.44	2529.74	2527.7	2.0	1089	2529.72	0.0	2.0	1089	2531.80	2.08
1090	721340.60	811428.29	2520.28	2518.2	2.1	1090	2520.26	0.0	2.1	1090	2522.29	2.03
1091	721344.44	811478.14	2514.00	2512.0	2.0	1091	2514.00	0.0	2.0	1091	2516.02	2.02
1092	721348.26	811528.03	2512.48	2510.5	2.0	1092	2512.55	0.1	2.0	1092	2514.59	2.04
1093	721352.52	811577.52	2518.34	2516.2	2.2	1093	2518.36	0.0	2.2	1093	2520.46	2.10
1094	721356.03	811627.74	2529.35	2527.3	2.1	1094	2529.40	0.1	2.2	1094	2531.41	2.01
1095	721359.62	811677.89	2538.77	2536.7	2.1	1095	2538.82	0.1	2.1	1095	2540.87	2.05
1096	721363.66	811727.36	2551.10	2548.9	2.2	1096	2551.13	0.0	2.2	1096	2553.19	2.06
1097	721279.25	811282.72	2545.89	2544.3	1.6	1097	2545.82	-0.1	1.6	1097	2547.84	2.02
1098	721283.11	811332.42	2538.55	2536.5	2.1	1098	2538.57	0.0	2.1	1098	2540.61	2.04
1099	721286.84	811382.18	2529.75	2527.7	2.1	1099	2529.70	-0.1	2.0	1099	2531.74	2.04
1100	721290.79	811432.15	2520.37	2518.9	1.5	1100	2520.43	0.1	1.5	1100	2522.44	2.01
1101	721294.52	811481.99	2517.11	2514.8	2.3	1101	2517.15	0.0	2.4	1101	2519.15	2.00
1102	721298.43	811531.99	2517.19	2515.4	1.8	1102	2517.22	0.0	1.8	1102	2519.24	2.02
1103	721302.26	811581.75	2529.35	2527.2	2.2	1103	2529.43	0.1	2.3	1103	2531.43	2.00
1104	721306.08	811631.67	2541.76	2539.6	2.2	1104	2541.81	0.0	2.2	1104	2543.85	2.04
1105	721309.96	811681.42	2552.80	2550.8	2.0	1105	2552.86	0.1	2.1	1105	2554.97	2.11
1106	721313.91	811731.30	2561.39	2559.0	2.4	1106	2561.39	0.0	2.4	1106	2563.43	2.04
1107	721317.69	811781.03	2567.11	2565.1	2.0	1107	2567.02	-0.1	1.9	1107	2569.06	2.04
1108	721229.22	811287.33	2546.73	2544.7	2.0	1108	2546.75	0.0	2.1	1108	2548.75	2.00
1109	721233.22	811336.18	2538.48	2536.5	2.0	1109	2538.55	0.1	2.1	1109	2540.59	2.04
1110	721236.80	811386.04	2530.03	2527.8	2.2	1110	2530.10	0.1	2.3	1110	2532.13	2.03
1111	721240.83	811436.10	2521.68	2520.0	1.7	1111	2521.68	0.0	1.7	1111	2523.74	2.06
1112	721244.84	811485.78	2519.17	2517.0	2.2	1112	2519.18	0.0	2.2	1112	2521.25	2.07
1113	721248.61	811535.65	2523.99	2521.6	2.4	1113	2524.05	0.1	2.5	1113	2526.11	2.06
1114	721252.44	811585.62	2538.44	2536.4	2.1	1114	2538.47	0.0	2.1	1114	2540.54	2.07
1115	721256.77	811635.03	2552.45	2550.2	2.3	1115	2552.50	0.1	2.3	1115	2554.55	2.05
1116	721260.20	811685.24	2565.33	2563.2	2.1	1116	2565.51	0.2	2.3	1116	2567.52	2.01
1117	721179.73	811290.49	2547.57	2545.5	2.1	1117	2547.60	0.0	2.1	1117	2549.62	2.02
1118	721183.37	811340.25	2538.32	2536.3	2.0	1118	2538.32	0.0	2.0	1118	2540.36	2.04

GRID COMPARISON

Thalle Grid Pt. Number & Coordinates			Cohesive Soil Liner DESIGN	SUBGRADE		CLAY LINER				PROTECTIVE COVER		
PT. #	NORTH	EAST	ELEV	ELEV	Separation	PT. #	ELEV.	Dev. from Design	SEP.	PT#	ELEV.	SEP.
1119	721187.15	811389.96	2530.61	2528.6	2.0	1119	2530.56	-0.1	2.0	1119	2532.61	2.05
1120	721191.20	811439.91	2524.29	2522.2	2.1	1120	2524.36	0.1	2.1	1120	2526.38	2.02
1121	721194.89	811489.68	2521.86	2519.8	2.1	1121	2521.88	0.0	2.1	1121	2523.92	2.04
1122	721198.71	811539.60	2529.74	2527.6	2.2	1122	2529.87	0.1	2.3	1122	2531.88	2.01
1123	721202.53	811589.32	2545.68	2543.4	2.3	1123	2545.70	0.0	2.3	1123	2547.74	2.04
1124	721206.39	811639.14	2561.16	2559.0	2.2	1124	2561.21	0.1	2.2	1124	2563.25	2.04
1125	721129.65	811294.11	2548.78	2546.8	2.0	1125	2548.68	-0.1	1.9	1125	2550.78	2.10
1126	721133.44	811343.92	2538.94	2536.7	2.3	1126	2539.02	0.1	2.4	1126	2541.03	2.01
1127	721137.38	811393.83	2531.72	2529.9	1.8	1127	2531.79	0.1	1.9	1127	2533.84	2.05
1128	721141.23	811443.52	2525.97	2524.1	1.9	1128	2526.06	0.1	2.0	1128	2528.15	2.09
1129	721145.04	811493.52	2524.55	2522.5	2.1	1129	2524.61	0.1	2.1	1129	2526.62	2.01
1130	721148.96	811543.46	2531.14	2529.0	2.2	1130	2531.23	0.1	2.3	1130	2533.29	2.06
1131	721152.86	811593.29	2547.83	2545.7	2.2	1131	2547.85	0.0	2.2	1131	2549.93	2.08
1132	721156.54	811643.29	2564.62	2562.6	2.0	1132	2564.63	0.0	2.1	1132	2566.72	2.09
1133	721079.80	811297.96	2550.34	2548.3	2.0	1133	2550.33	0.0	2.0	1133	2552.39	2.06
1134	721083.58	811347.74	2540.80	2539.1	1.8	1134	2540.79	0.0	1.7	1134	2542.81	2.02
1135	721087.50	811397.61	2533.64	2531.4	2.2	1135	2533.63	0.0	2.2	1135	2535.66	2.03
1136	721091.46	811447.47	2528.57	2526.9	1.7	1136	2528.49	-0.1	1.6	1136	2530.52	2.03
1137	721095.18	811497.37	2527.33	2525.4	1.9	1137	2527.36	0.0	1.9	1137	2529.39	2.03
1138	721099.03	811547.22	2530.90	2529.0	2.0	1138	2530.95	0.0	2.0	1138	2532.95	2.00
1139	721102.87	811597.07	2547.62	2545.4	2.2	1139	2547.72	0.1	2.3	1139	2549.77	2.05
1140	721106.68	811646.91	2564.45	2562.5	1.9	1140	2564.51	0.1	2.0	1140	2566.56	2.05
1141	721029.95	811301.80	2551.83	2549.8	2.0	1141	2551.84	0.0	2.1	1141	2553.87	2.03
1142	721033.63	811351.70	2543.28	2541.6	1.7	1142	2543.36	0.1	1.8	1142	2545.38	2.02
1143	721037.83	811401.39	2536.23	2534.1	2.1	1143	2536.33	0.1	2.2	1143	2538.33	2.00
1144	721041.47	811451.33	2531.71	2529.9	1.8	1144	2531.76	0.1	1.9	1144	2533.78	2.02
1145	721045.34	811501.21	2529.91	2527.8	2.1	1145	2529.96	0.1	2.2	1145	2531.97	2.01
1146	721049.18	811551.05	2533.35	2531.1	2.2	1146	2533.40	0.1	2.3	1146	2535.41	2.01
1147	721053.01	811600.91	2548.53	2546.3	2.3	1147	2548.62	0.1	2.4	1147	2550.64	2.02
1148	721056.89	811650.76	2564.53	2562.5	2.1	1148	2564.52	0.0	2.1	1148	2566.69	2.17
1149	721060.71	811700.62	2579.16	2577.1	2.1	1149	2579.10	-0.1	2.0	1149	2581.14	2.04
1150	720983.97	811355.51	2546.51	2544.6	1.9	1150	2546.54	0.0	2.0	1150	2548.55	2.01
1151	720987.79	811405.33	2540.51	2538.3	2.2	1151	2540.66	0.1	2.3	1151	2542.68	2.02
1152	720991.61	811455.24	2538.08	2536.0	2.1	1152	2538.10	0.0	2.1	1152	2540.56	2.46
1153	720995.48	811505.06	2539.51	2537.5	2.0	1153	2539.55	0.0	2.1	1153	2541.59	2.04
1154	720999.33	811554.91	2544.22	2542.2	2.0	1154	2544.23	0.0	2.0	1154	2546.25	2.02
1155	721003.17	811604.76	2554.40	2552.4	2.0	1155	2553.56	-0.8	1.2	1155	2555.73	2.17
1156	720934.02	811359.42	2552.46	2550.5	2.0	1156	2552.51	0.1	2.0	1156	2554.64	2.13
1157	720937.93	811409.18	2551.13	2549.3	1.9	1157	2551.21	0.1	1.9	1157	2553.21	2.00

GRID COMPARISON

Thalle Grid Pt. Number & Coordinates			Cohesive Soil Liner DESIGN	SUBGRADE		CLAY LINER				PROTECTIVE COVER		
PT. #	NORTH	EAST	ELEV	ELEV	Separation	PT. #	ELEV.	Dev. from Design	SEP.	PT#	ELEV.	SEP.
Break Points												
31	721680	811273	2537.91	2536.0	2.0	31	2537.95	0.0	2.0	31	2539.99	2.0
32	721700	811531	2500.00	2498.0	2.0	32	2500.05	0.1	2.1	32	2502.14	2.1
33	721706	811617	2496.00	2494.0	2.0	33	2496.05	0.1	2.1	33	2498.20	2.1
34	721714	811718	2520.84	2518.8	2.0	34	2520.82	0.0	2.0	34	2522.81	2.0
35	721634	811336	2536.00	2534.0	2.0	35	2536.08	0.1	2.1	35	2538.16	2.1
36	721650	811539	2500.00	2498.0	2.0	36	2500.08	0.1	2.1	36	2502.06	2.0
37	721669	811790	2537.79	2535.7	2.1	37	2539.82	2.0	4.1	37	2541.87	2.1
38	721583	811316	2538.00	2536.0	2.0	38	2538.03	0.0	2.0	38	2540.01	2.0
39	721607	811634	2500.00	2498.1	1.9	39	2500.08	0.1	2.0	39	2502.06	2.0
40	721618	811771	2536.59	2534.5	2.1	40	2536.67	0.1	2.2	40	2538.72	2.0
41	721549	811527	2504.10	2502.2	1.9	41	2504.11	0.0	1.9	41	2506.24	2.1
42	721566	811750	2540.00	2538.0	2.0	42	2539.98	0.0	2.0	42	2542.03	2.0
43	721495	811480	2510.01	2508.0	2.0	43	2510.33	0.3	2.3	43	2512.44	2.1
44	721516	811747	2544.15	2542.1	2.1	44	2544.24	0.1	2.1	44	2546.30	2.1
45	721516	811757	2545.88	2543.8	2.1	45	2545.98	0.1	2.2	45	2548.00	2.0
46	721445	811482	2510.00	2508.0	2.0	46	2510.07	0.1	2.1	46	2512.13	2.1
47	721455	811608	2508.41	2506.5	1.9	47	2508.45	0.0	2.0	47	2510.65	2.2
48	721466	811757	2551.10	2549.1	2.0	48	2551.23	0.1	2.1	48	2553.36	2.1
49	721403	811592	2510.08	2508.2	1.9	49	2510.15	0.1	1.9	49	2512.23	2.1
50	721416	811762	2556.63	2554.6	2.0	50	2556.71	0.1	2.1	50	2558.80	2.1
51	721351	811559	2514.14	2511.8	2.3	51	2514.20	0.1	2.4	51	2516.32	2.1
52	721366	811761	2560.10	2558.1	2.0	52	2560.21	0.1	2.1	52	2562.36	2.1
53	721367	811771	2562.03	2560.0	2.0	53	2562.07	0.0	2.1	53	2564.16	2.1
54	721316	811759	2565.25	2563.2	2.1	54	2565.30	0.1	2.1	54	2567.39	2.1
55	721248	811522	2520.00	2518.0	2.1	55	2522.24	2.2	4.3	55	2524.39	2.2
56	721262	811704	2569.60	2567.6	2.0	56	2569.69	0.1	2.1	56	2571.74	2.0
57	721263	811722	2567.70	2565.7	2.0	57	2567.96	0.3	2.3	57	2569.95	2.0
58	721197	811522	2524.81	2522.5	2.3	58	2524.80	0.0	2.3	58	2526.93	2.1
59	721209	811677	2571.22	2569.2	2.0	59	2571.42	0.2	2.2	59	2573.60	2.2
60	721210	811688	2571.38	2569.3	2.1	60	2571.50	0.1	2.2	60	2573.67	2.2
61	721147	811524	2526.16	2524.0	2.1	61	2526.18	0.0	2.2	61	2528.24	2.1
62	721158	811665	2571.48	2571.5	0.0	62	2573.68	2.2	2.2	62	2575.71	2.0
63	721159	811679	2572.17	2570.1	2.1	63	2572.25	0.1	2.1	63	2574.49	2.2
64	721090	811427	2529.95	2528.3	1.7	64	2529.90	0.0	1.6	64	2532.02	2.1
65	721109	811682	2574.45	2572.4	2.0	65	2574.62	0.2	2.2	65	2576.78	2.2
66	721110	811692	2575.15	2573.1	2.1	66	2575.20	0.0	2.1	66	2577.32	2.1
67	721060	811692	2579.01	2577.0	2.0	67	2578.88	-0.1	1.9	67	2580.92	2.0
68	721039	811702	2577.99	2575.9	2.1	68	2576.10	-1.9	0.2	68	2578.09	2.0
69	721026	811653	2567.75	2565.7	2.1	69	2567.89	0.1	2.2	69	2569.91	2.0
70	720980	811307	2552.96	2550.9	2.1	70	2553.24	0.3	2.4	70	2555.25	2.0

GRID COMPARISON

Thalle Grid Pt. Number & Coordinates			Cohesive Soil Liner DESIGN	SUBGRADE		CLAY LINER				PROTECTIVE COVER		
PT. #	NORTH	EAST	ELEV	ELEV	Separation	PT. #	ELEV.	Dev. from Design	SEP.	PT#	ELEV.	SEP.
71	721008	811604	2554.75	2552.7	2.1	71	2554.61	-0.1	1.9	71	2556.60	2.0
72	721005	811623	2558.84	2553.8	5.0	72	2558.81	0.0	5.0	72	2560.87	2.1

I, ALOIS CALLEMYN, PLS, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA, AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 5 DAY OF JANUARY, 2010.

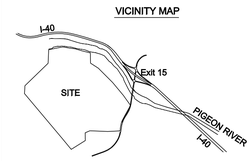
ALOIS CALLEMYN, PLS LICENSE NO. L-2544

NORTH CAROLINA PROFESSIONAL SEAL L-2544 LAND SURVEYOR ALOIS CALLEMYN

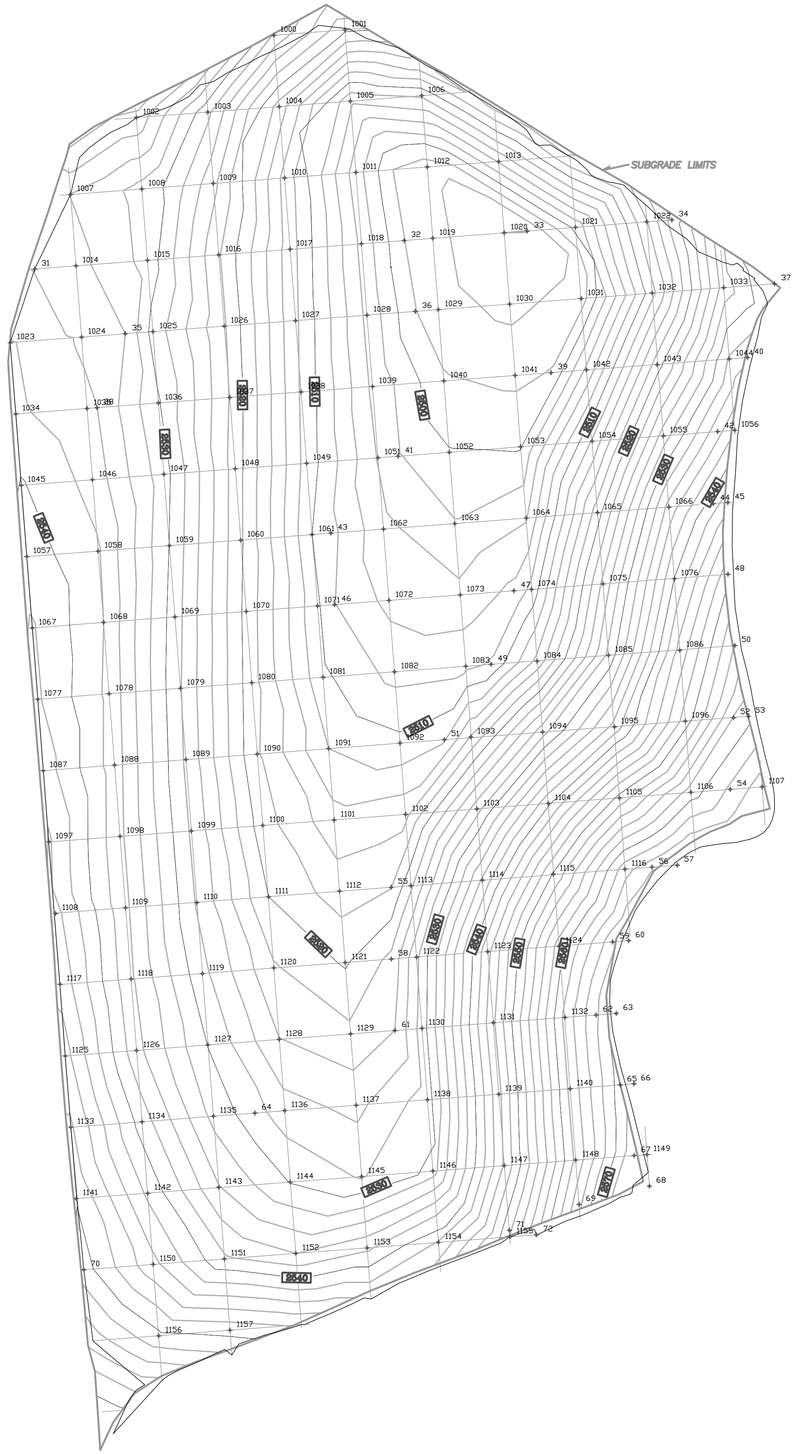
NOTE:
EXISTING TOPOGRAPHICAL INFORMATION AND CONTROL DATA INFORMATION TAKEN FROM PLANS ENTITLED "WHITE OAK MSW LANDFILL CONSTRUCTION DRAWINGS, MSW PHASE 3", DATED MARCH, 2009 BY MCGILL ASSOCIATES.

ALL NEW DATA AND ASBUILT CONTOUR LINES SHOWN ON THIS SURVEY ARE TIED TO NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NAD 1983 (HORIZONTAL) AND NAVD-88 (VERTICAL).

VICINITY MAP



NOT TO SCALE



NAD 83

ASBUILT FOR CELL SUBGRADE

WHITE OAK MSW LANDFILL, PHASE 3"

HAYWOOD COUNTY, NORTH CAROLINA
FIELD WORK PERFORMED NOVEMBER, 2009
NAME OF CLIENT
THALLE CONSTRUCTION CO.

SCALE 1" = 50'
50 0 50 100

LEGEND:
- ○ IRON PIN SET
- ◎ EXISTING IRON/NAIL/ROCK
- □ CONC. MONUMENT SET
- ■ EXISTING CONC. MON.
- △ MATHEMATICAL POINT

ALOIS CALLEMYN
PROFESSIONAL LAND SURVEYOR

3500 JUSTAMERE FARM ROAD
HILLSBOROUGH, NC 27278
919-732-3354
ALOIS@CALLEMYN.COM

I, ALOIS CALLEMYN, PLS, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA, AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 5 DAY OF JANUARY, 2010

.

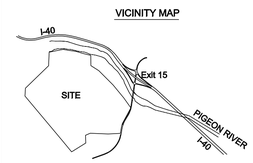
ALOIS CALLEMYN, PLS LICENSE NO. L-2544

NORTH CAROLINA PROFESSIONAL SEAL L-2544 LAND SURVEYOR ALOIS CALLEMYN

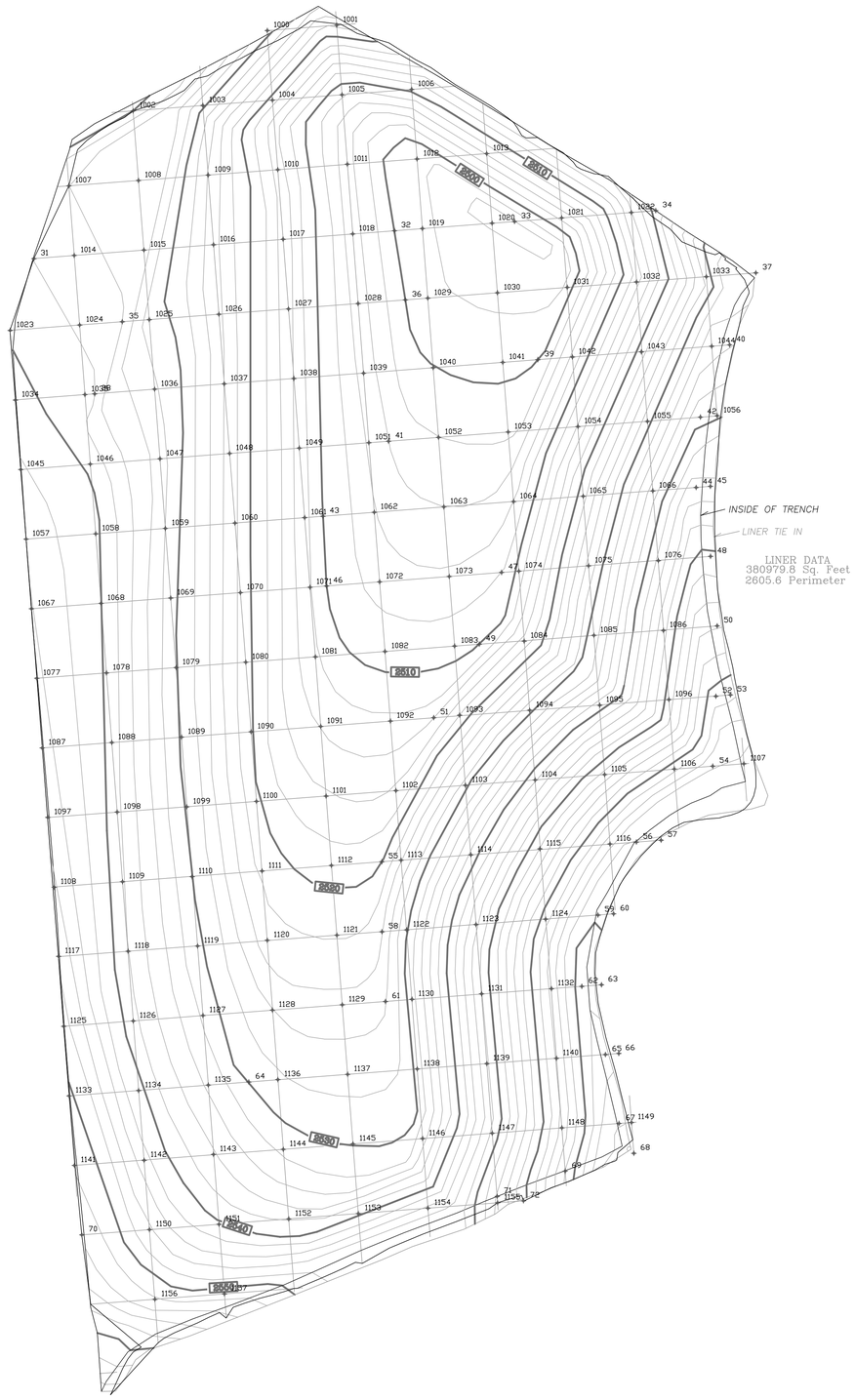
NOTE:
EXISTING TOPOGRAPHICAL INFORMATION AND CONTROL DATA INFORMATION TAKEN FROM PLANS ENTITLED "WHITE OAK MSW LANDFILL CONSTRUCTION DRAWINGS, MSW PHASE 3", DATED MARCH, 2009 BY MCGILL ASSOCIATES.

ALL NEW DATA AND ASBUILT CONTOUR LINES SHOWN ON THIS SURVEY ARE TIED TO NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NAD 1983 (HORIZONTAL) AND NAVD-88 (VERTICAL).

VICINITY MAP



NOT TO SCALE



NAD 83

ASBUILT FOR CELL CLAY LINER

WHITE OAK MSW LANDFILL, PHASE 3"

HAYWOOD COUNTY, NORTH CAROLINA
FIELD WORK PERFORMED DECEMBER, 2009
NAME OF CLIENT
THALLE CONSTRUCTION CO.

SCALE 1" = 50'
50 0 50 100

LEGEND:
- IRON PIN SET
- EXISTING IRON/NAIL/ROCK
- CONC. MONUMENT SET
- EXISTING CONC. MON.
- MATHEMATICAL POINT

ALOIS CALLEMYN
PROFESSIONAL LAND SURVEYOR

3500 JUSTAMERE FARM ROAD
HILLSBOROUGH, NC 27278
919-732-3354
ALOIS@CALLEMYN.COM

I, ALOIS CALLEMYN, PLS, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA, AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 25 DAY OF APRIL, 2010

.

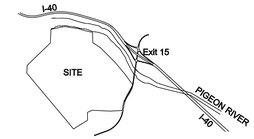
ALOIS CALLEMYN, PLS LICENSE NO. L-2544

NORTH CAROLINA PROFESSIONAL SEAL L-2544 LAND SURVEYOR ALOIS CALLEMYN

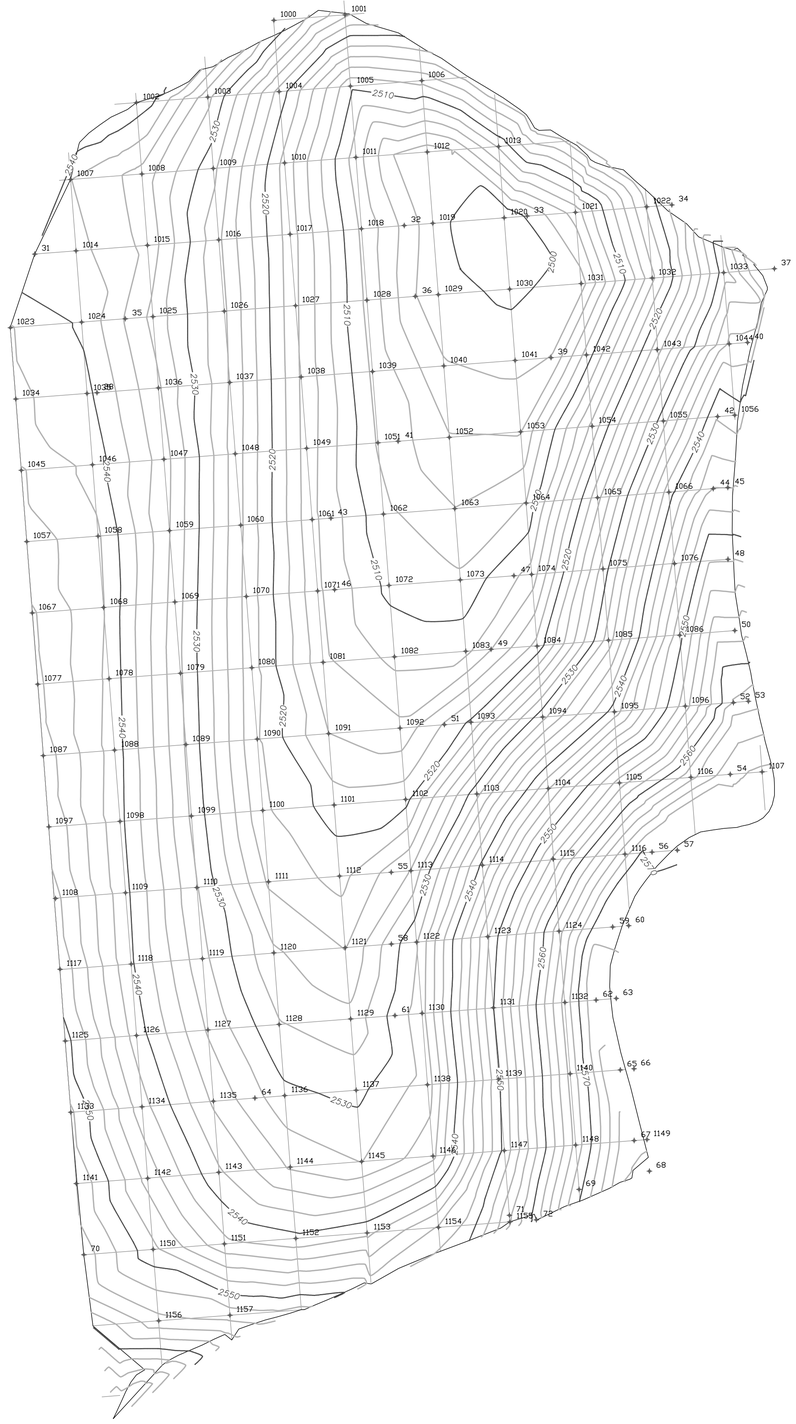
NOTE:
EXISTING TOPOGRAPHICAL INFORMATION AND CONTROL DATA INFORMATION TAKEN FROM PLANS ENTITLED "WHITE OAK MSW LANDFILL CONSTRUCTION DRAWINGS, MSW PHASE 3", DATED MARCH, 2009 BY MCGILL ASSOCIATES.

ALL NEW DATA AND ASBUILT CONTOUR LINES SHOWN ON THIS SURVEY ARE TIED TO NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NAD 1983 (HORIZONTAL) AND NAVD-88 (VERTICAL).

VICINITY MAP



NOT TO SCALE



NAD 83

ASBUILT FOR CELL PROTECTIVE COVER

WHITE OAK MSW LANDFILL, PHASE 3"

HAYWOOD COUNTY, NORTH CAROLINA
FIELD WORK PERFORMED APRIL, 2010
NAME OF CLIENT
THALLE CONSTRUCTION CO.

SCALE 1" = 50'
50 0 50 100

LEGEND:
- ○ IRON PIN SET
- ◎ EXISTING IRON/NAIL/ROCK
- □ CONC. MONUMENT SET
- ■ EXISTING CONC. MON.
- △ MATHEMATICAL POINT

ALOIS CALLEMYN
PROFESSIONAL LAND SURVEYOR

3500 JUSTAMERE FARM ROAD
HILLSBOROUGH, NC 27278
919-732-3354
ALOIS@CALLEMYN.COM

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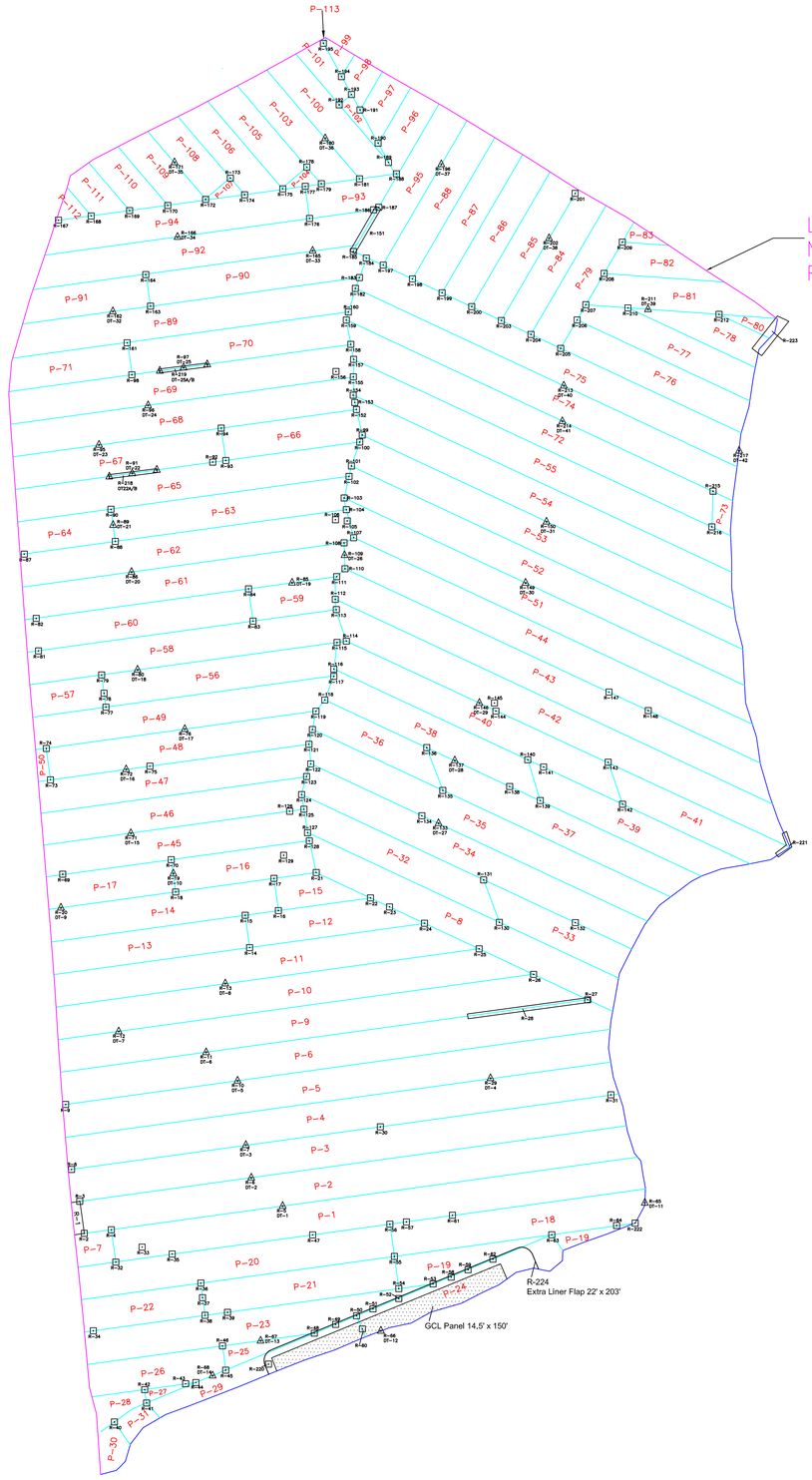
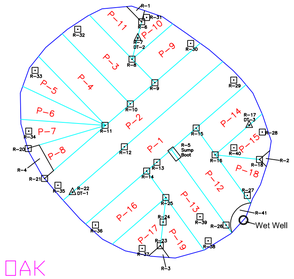




= Limit of Liner
= Liner Panel Seams
P-00 = Liner Panel Numbers
= Destructive Test Location
= Liner Repair Location

*Record Drawing Surveyed & Prepared by Hallaton, Inc. via Trimble GeoXH Datalogger

50 0 50 100 200
Graphic Scale in Feet
1" = 50'

REVISIONS			
NO.	Date.	By.	Description.
A	1/5/10	KHG	Corrections made to repair locations
B	6/8/10	KHG	Corrections to Limits of Liner (N & W Boundries)

WHITE OAK MSW LANDFILL PHASE 3 CONSTRUCTOIN
HAYWOOD COUNTY, NC

Geomembrane Record Drawing

Hallaton, Inc.
Containment Linings
1206 Sparks Road - Sparks, MD 21152
(410) 583-7700 - (410) 583-7720 Fax

Drawn by:	KHG
Date:	12/15/09
Scale:	1" = 50'
Job Number:	0932-8009
Drawing Number:	002B

I, ALOIS CALLEMYN, PLS, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA, AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 25 DAY OF APRIL, 2010

.

ALOIS CALLEMYN, PLS LICENSE NO. L-2544

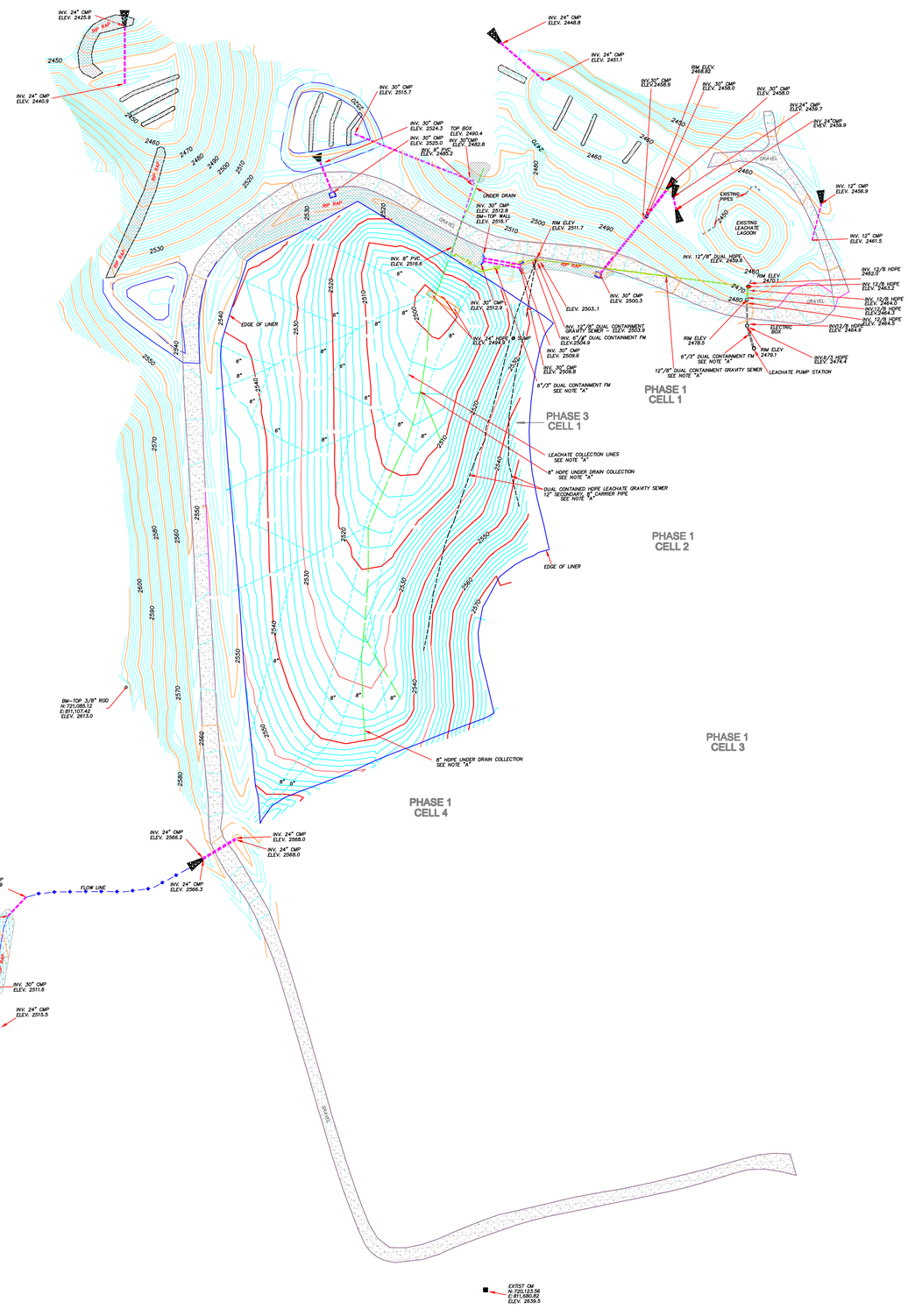
THE UNDERSIGNED HEREBY CERTIFIES THAT HE/SHE IS A PROFESSIONAL ENGINEER/PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF NORTH CAROLINA AND THAT HE/SHE HAS BEEN EMPLOYED BY THALLE CONSTRUCTION CO. TO DESIGN _____
IN ACCORDANCE WITH SPECIFICATION SECTION _____
FOR THE "WHITE OAK MSW LANDFILL, PHASE 3". THE UNDERSIGNED FURTHER CERTIFIES THAT HE/SHE HAS PERFORMED THE DESIGN OF THE _____
_____, THAT SAID DESIGN IS IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL CODES, RULES AND REGULATIONS, AND THAT HIS/HER SIGNATURE AND P.E/P.L.S STAMP HAS BEEN AFFIXED TO ALL CALCULATIONS AND DRAWINGS USED IN, AND RESULTING FROM, THE DESIGN.

THE UNDERSIGNED HEREBY AGREES TO MAKE ALL ORIGINAL DESIGN DRAWINGS AND CALCULATIONS AVAILABLE TO HAYWOOD COUNTY OR OWNER'S REPRESENTATIVE WITHIN FIVE WORKING DAYS FOLLOWING WRITTEN REQUEST THEREFOR BY THE OWNER.

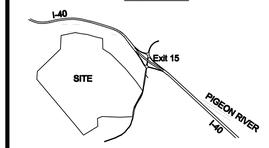
ALOIS CALLEMYN, PLS
3500 JUSTAMERE FARM ROAD, HILLSBOROUGH, NC 27278

NORTH CAROLINA PROFESSIONAL SEAL L-2544 LAND SURVEYOR ALOIS CALLEMYN

NAD 83



VICINITY MAP



NOT TO SCALE

NOTE:
EXISTING TOPOGRAPHICAL INFORMATION AND CONTROL DATA INFORMATION TAKEN FROM PLANS ENTITLED "WHITE OAK MSW LANDFILL CONSTRUCTION DRAWINGS, MSW PHASE 3", DATED MARCH, 2009 BY MCGILL ASSOCIATES.

ALL NEW DATA AND ASBUILT CONTOUR LINES SHOWN ON THIS SURVEY ARE TIED TO NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NAD 1983 (HORIZONTAL) AND NAVD-88 (VERTICAL).

NOTE "A"
THE LOCATION OF UNDERGROUND UTILITIES AS SHOWN ARE BASED ON VISIBLE EVIDENCE AND DRAWINGS PROVIDED TO THIS SURVEYOR. ALL DASHED LINES SHOWN HEREON WERE DRAWN FROM DATA SUPPLIED BY THALLE SURVEY DEPARTMENT.

NOTE "B"
ALL DISTANCES ARE HORIZONTAL GROUND, EXCEPT THOSE SHOWN AS GRID AND AREA IS BY COORDINATE COMPUTATIONS.

NOTE "C"
ALL FIELD DATA AND CADD FILES WERE REVIEWED AND APPROVED AS CORRECTLY SHOWING THE EXISTING CONDITIONS BY BOB WEISSE AND EVAN MONROE OF THALLE SURVEY DEPARTMENT.

RECORD DRAWING FOR

WHITE OAK MSW LANDFILL, PHASE 3"

HAYWOOD COUNTY, NORTH CAROLINA
APRIL, 2010
THALLE CONSTRUCTION CO.

SCALE 1" = 100'
100' 0 100' 200'

ALOIS CALLEMYN
PROFESSIONAL LAND SURVEYOR

3500 JUSTAMERE FARM ROAD
HILLSBOROUGH, NC 27278
919-732-3354
ALOIS@CALLEMYN.COM

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

REPORT OF WELL ABANDONMENT FOR THE PHASE 3 & 4 EXPANSION

WHITE OAK LANDFILL

HAYWOOD COUNTY, NORTH CAROLINA

PERMIT NUMBER 44-07

PREPARED FOR:

HAYWOOD COUNTY SOLID WASTE MANAGEMENT DEPARTMENT

CLYDE, NORTH CAROLINA

NORTH CAROLINA LICENSED SEAL 2134 GEOLOGIST BENJAMIN PAUL NISBETH

PREPARED BY:

BUNNELL-LAMMONS ENGINEERING, INC.

GREENVILLE, SOUTH CAROLINA

ASHEVILLE, NORTH CAROLINA

NORTH CAROLINA LICENSED SEAL 1475 GEOLOGIST ANDREW W. ALEXANDER

JULY 9, 2009

BLE PROJECT NUMBER J09-1957-07

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

July 9, 2009

Haywood County Solid Waste Management
278 Recycle Road
Clyde, NC 28721

Attention: Mr. Stephen King
Director of Solid Waste

Subject: **Report of Well Abandonment for the Phase 3 & 4 Expansion**
White Oak Landfill
Haywood County, North Carolina
BLE Project Number J09-1957-07
Permit Number 44-07

Dear Mr. King:

As authorized by Haywood County's acceptance of our Contract Number P09-0077 (R3) dated February 23, 2009, Bunnell-Lammons Engineering, Inc. (BLE) has performed required well abandonment services at the subject site. The purpose of the work was to abandon the wells as part of the landfill expansion in the Phase 3 & 4 areas. The enclosed report describes the work performed and presents the results obtained.

Twenty-three (23) piezometers/monitoring wells (BLE-1, BLE-2, BLE-3, BLE-5, BLE-6, BLE-7S, BLE-7D, BLE-9, BLE-10, BLE-11, BLE-12, BLE-13, BLE-14, BLE-15, BLE-16, BLE-17, P-4, P-6, MW-5A, MW-5D, MW-12, MW-13S, MW-13D) were permanently abandoned at the subject site from June 2 through 18, 2009. A site location map (Figure 1) and a well abandonment plan (Figure 2) are attached.

Piezometer P-5 was not abandoned because the well could not be located by the landfill staff and was presumed to be destroyed by grading activities. The P-5 piezometer was located outside and north of the proposed Phase 4 boundary. Landfill gas well (LFG-6) was not abandoned by BLE but was completely removed by the landfill staff by excavation via trackhoe. The well was observed to be less than 3 feet deep. We understand that the former LFG-6 location will be undercut as part of the landfill cell construction.

Well abandonments were performed by North Carolina-licensed drillers retained by Bunnell-Lammons Engineering, Inc. of Greenville, South Carolina (North Carolina Registrations #3362-A and #3290-A) in accordance with North Carolina Well Construction Standards Rule 15A NCAC 2C, .0113 pertaining to Abandonment of Wells.

As part of the well abandonment procedures, the polyvinyl chloride (PVC) casings and screens of the wells were drilled-out from the ground surface using hollow-stem augers. The resulting borehole at each former well location was then tremie grouted to the ground surface with a cement or cement-bentonite mixture. At well locations which were to be undercut, the resulting boreholes were grouted to the proposed subgrade and then filled to the ground surface with bentonite chips per DWM

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29615
PHONE (864) 288-1265
FAX (864) 288-4430

requirements. Specific abandonment procedures for each well are documented on the abandonment records (Appendix A).

We appreciate the opportunity to serve as your environmental consultant on this project. Please contact us at (864) 288-1265 if you have any questions or comments regarding this report.

Sincerely,
BUNNELL-LAMMONS ENGINEERING, INC.

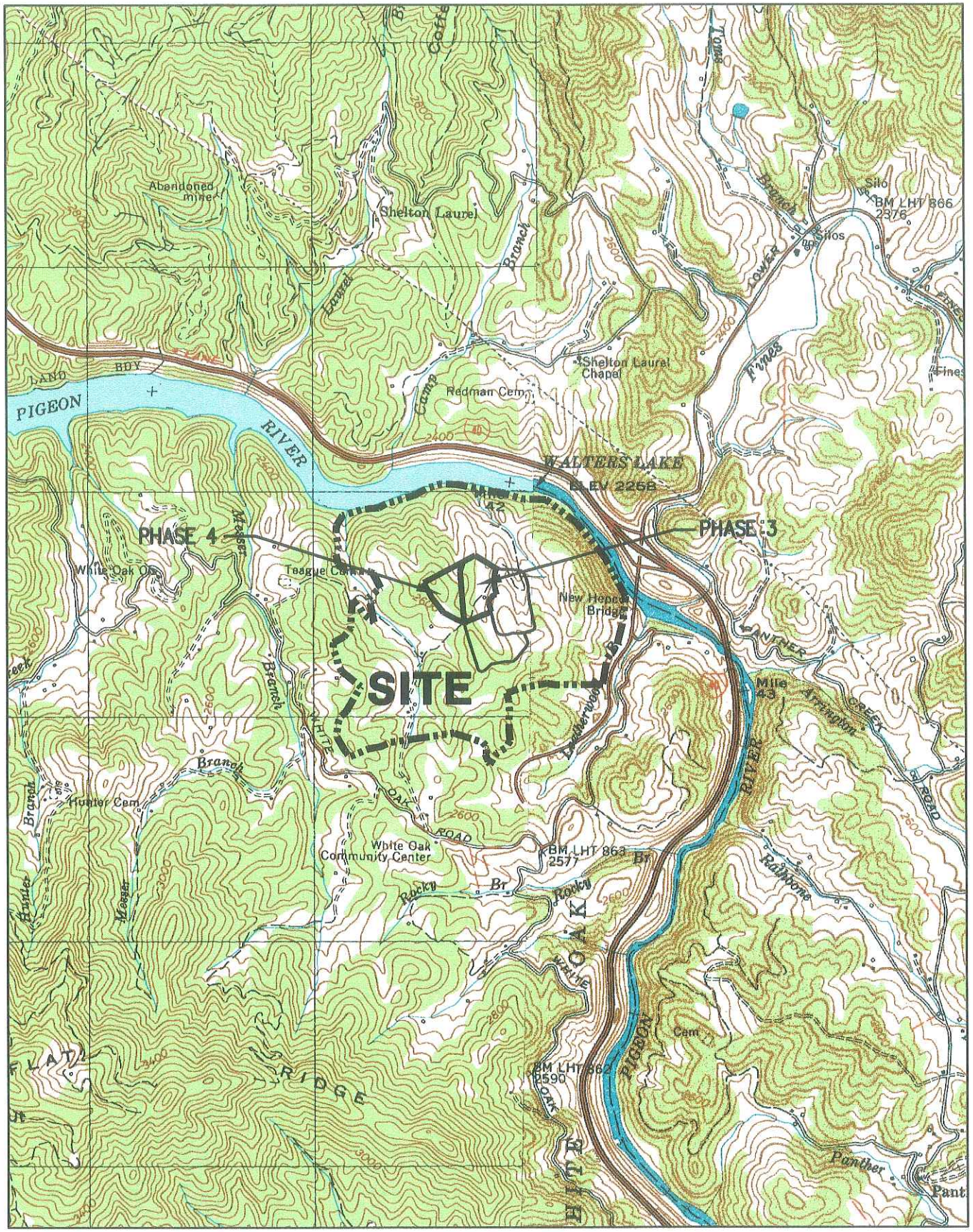
Benjamin P. Nisbeth, P.G.
Staff Geologist
Registered, North Carolina #2134

Andrew W. Alexander, P.G.
Senior Hydrogeologist
Registered, North Carolina #1475

cc: Mr. Jeff Bishop – McGill Associates

c:\awa\active projects\mcgill\haywood county lf\1957-07 wolf well abandonment\white oak landfill well abandonment 1957-07 final.doc

FIGURES



REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES,
COVE CREEK GAP AND FINES CREEK, N.C. QUADRANGLES, 1967.

DRAWN: ACE	DATE: 07-02-09	BLE inc. BUNNELL-LAMMONS ENGINEERING, INC. 6004 PONDERS COURT GREENVILLE, SOUTH CAROLINA 29615 PHONE: (864)288-1265 FAX: (864)288-4430	FIGURE 1
CHECKED: AWA	CAD: HCWOLF-07 SLM		
APPROVED:	JOB NO: J09-1957-07		

SITE LOCATION MAP
WHITE OAK LANDFILL
HAYWOOD COUNTY, NORTH CAROLINA

LEGEND

- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER – APPROXIMATE LOCATIONS FROM PREVIOUS SITE PLANS
- EXISTING PIEZOMETER – SURVEYED BY McGILL ASSOCIATES IN 2007
- EXISTING PIEZOMETER AND OR BORING INSTALLED BY BUNNELL-LAMMONS ENGINEERING IN 2007
- CONTROL POINT
- EXISTING LANDFILL GAS MONITORING PROBE
- SURFACE WATER SAMPLING LOCATION
- WELL ABANDONED
- WELL EXCAVATED
- WELL NOT LOCATED

DRAWING TITLED "CONCEPTUAL SITE PLAN, OPTION 1 & 2" BY McGILL ASSOCIATES DATED JUNE 2007.

REVISIONS		
No.	DESCRIPTION	BY
1	ADDED EXISTING SED POND LABEL -- FEBRUARY 2009	AWA

DRAWN:	ACE
CHECKED:	AWA
APPROVED:	

DATE:	07-02-09
CAD FILE:	HCWOLF-07 ABN
JOB NO:	J09-1957-07

BLE INC.
BUNNELL-LAMMONS ENGINEERING, INC.
6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29615
PHONE: (864)288-1265 FAX: (864)288-5430

WELL ABANDONMENT SITE PLAN

WHITE OAK LANDFILL
HAYWOOD COUNTY, NORTH CAROLINA

FIGURE NO. 2

APPENDIX A

ABANDONMENT RECORDS

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name:

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe Ga 30655
City or Town State Zip Code

(770) - 207 9782
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-1

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation
Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 39.90'
LONGITUDE 83° 00.20'
May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY. The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID # (if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721
City or Town State Zip Code

(828) - 627-8042
Area code - Phone number

6. WELL DETAILS:

a. Total Depth: 65.0 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING:	Length	Diameter
a. Casing Depth (if known):	ft.	in.
b. Casing Removed:	ft.	in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 1786 lb.
Water 76 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite 50 lb. - 3-Bags
Type: Slurry Pellets
Water 15 gal.

Other
Type material 50/50 Portland
Amount 90 LBS / 50 gallons mix

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure grout / Tremie pipe
To 8.23 ft / Bent To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-3-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-3-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. WELL CONTRACTOR:

Burnson & King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd
Lexington SC 29072
City or Town State Zip Code

(803) - 348 - 8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-2

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Cap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.94'
LONGITUDE 83° 00.16'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 39 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	39 ft.	2 in.
b. Casing Removed:	39 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 282 lb.
Water 31 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 20 lb.
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other
Type material
Amount

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
Overdrilled to 39 ft + tremie grouted to surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-17-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Burnson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1523 Hwy 138

Monroe Ga 30655
City or Town State Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 3

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 39.97'
LONGITUDE 83° 00.15'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID # (if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde NC 28721
City or Town State Zip Code

(828) - 627-8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 48.0 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	____ ft.	____ in.
b. Casing Removed:	____ ft.	____ in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 1922 lb.
Water 5.2 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 50 lb. - 3 - Bags
Type: Slurry ____ Pellets ____
Water 15 gal.

Other
Type material 58 Bentonite
Amount 61 LBS / 28 gallon water

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

pressure grout / Tremie side
To 8.77 Feet Bgs / Bent To Surf.

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G. Smith 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G. Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362 - A

1. WELL CONTRACTOR:
Joseph G Smith
Well Contractor (Individual) Name
Landprobe LLC
Well Contractor Company Name
STREET ADDRESS 1528 Hwy 138
Monroe GA 30655
City or Town State Zip Code
(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:
SITE WELL ID # (if applicable) BLE - 5
STATE WELL PERMIT # (if applicable)
COUNTY WELL PERMIT # (if applicable)
DWQ or OTHER PERMIT # (if applicable)
WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation
Other (list use)

3. WELL LOCATION:
COUNTY Haywood QUADRANGLE NAME Cove Creek Gap
NEAREST TOWN: Clyde, NC
(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)
LATITUDE 35° 40.01'
LONGITUDE 83° 00.15'
May be in degrees, minutes, seconds, or in a decimal format
Latitude/longitude source: (GPS) Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY. The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)
FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:
NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721
City or Town State Zip Code
(828) - 627 - 8042
Area code - Phone number

5. WELL DETAILS:
a. Total Depth: 25 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING: Length Diameter
a. Casing Depth (if known): ft. in.
b. Casing Removed: ft. in.

7. DISINFECTION: NA
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 752 lb.
Water 362 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite lb.
Type: Slurry Pellets
Water gal.

Other
Type material SB Bentgel
Amount 36 LBS / 19 gallon water

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
Pressure grout / Tremie Pipe To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)
Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. WELL CONTRACTOR:

Brunson L King
Well Contractor (Individual) Name

King's Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodard Rd

Seamington SC 29072
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-6

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap
NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☒ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 40.02'
LONGITUDE 83° 00.10'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 46 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	46 ft.	2 in.
b. Casing Removed:	46 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 470 lb.
Water 35 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 25 lb.
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other
Type material Ralphlez
Amount 2 bags

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Overdrilled to 46 ft + Trimie grouted 46 to 9 ft Ralphlez 9 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-18-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson L King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Brunson L King
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe GA 30655
City or Town State Zip Code

(770) 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-75

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION:

Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 40.04'

LONGITUDE 83° 00.13'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS ~~Route~~ 278 Recycle Rd

Clyde, NC 28721
City or Town State Zip Code

(828) 627-9042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 25.1 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): _____ ft.

Measuring point is _____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	_____ ft.	_____ in.
b. Casing Removed:	_____ ft.	_____ in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement: Cement 752 lb. Water 36a gal.

Sand Cement: Cement _____ lb. Water _____ gal.

Bentonite: Bentonite 0 lb. Type: Slurry__ Pellets__ Water _____ gal.

Other: Type material 5 lb Bar Grout

Amount 36LBS / 19 gallon totes

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure grout / Tremie Pipe grout To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith — 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362 - A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1523 Hwy 138

Monroe GA 30655
City or Town State Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 7D

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Cap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 40.04'
LONGITUDE 83° 00.13'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40

City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721
City or Town State Zip Code

(828) - 627 - 8042
Area code - Phone number

6. WELL DETAILS:

a. Total Depth: 59.6 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): ft.

Measuring point is ft. above land surface.

6. CASING:	Length	Diameter
a. Casing Depth (if known):	ft.	in.
b. Casing Removed:	32 ft.	in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement	Sand Cement
Cement 1880 lb.	Cement lb.
Water 80 gal.	Water gal.

Bentonite

Bentonite 0 lb.
Type: Slurry Pellets
Water gal.

Other

Type material 5% Bentonite

Amount 94 LBS / 52 gallons mix

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

pressure grout / Remove pipe
grout To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G. Smith — 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290 A

1. WELL CONTRACTOR:

Brunson & King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Lexington SC 29072
City or Town State Zip Code

(803) - 348-8941
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) RLE-9

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap
NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☒ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 40.04
LONGITUDE 83° 00.18

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 470.7 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	470.7 ft.	2 in.
b. Casing Removed:	25 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 282 lb.
Water 21 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 20 lb.
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other
Type material Hole plug
Amount 5 bags

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Tremie grouted from 470.7 to 20 ft
Overdrilled to 25 ft (top of rock)
Holeplugged 20 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-16-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe Ga 30655
City or Town State Zip Code

(770) - 207-9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 10

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope Valley Flat (Ridge) Other
(Circle appropriate setting)

LATITUDE 35° 40.00

LONGITUDE 83° 00.27

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY. The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Landfill

Exit 15 off I-40

City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen Kemp

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721
City or Town State Zip Code

(828) - 627-8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 78.7 ft. Diameter: in.

b. Water Level (Below Measuring Point): ft.

Measuring point is ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	ft.	in.
b. Casing Removed:	ft.	in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement: Cement 155 lb. Water 62 gal.

Sand Cement: Cement lb. Water gal.

Bentonite: Bentonite 50 lb. 9½ Bags Type: Slurry Pellets ✓ Water 50 gal.

Other: Type material 5% Bent grout

Amount 77 LBS / 39 gallons mixed

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure grout / Tremie Pipe

2897 # / Bentonite To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-10-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph Smith 6-10-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:
Joseph G Smith
Well Contractor (Individual) Name
Landrobe LLC
Well Contractor Company Name
STREET ADDRESS 1528 Hwy 138
Monroe Ga 30655
City or Town State Zip Code
(770)- 207-9722
Area code - Phone number

2. WELL INFORMATION:
SITE WELL ID # (if applicable) BLE - 11
STATE WELL PERMIT # (if applicable)
COUNTY WELL PERMIT # (if applicable)
DWQ or OTHER PERMIT # (if applicable)
WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation
Other (list use)

3. WELL LOCATION: Cove Creek
COUNTY Haywood QUADRANGLE NAME Gap
NEAREST TOWN: Clyde, NC
(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
TOPOGRAPHIC / LAND SETTING:
Slope Valley Flat (Ridge) Other
(Circle appropriate setting)
LATITUDE 35° 39.98'
LONGITUDE 83° 00.22'
May be in degrees, minutes, seconds, or in a decimal format
Latitude/longitude source: (GPS) Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)
FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:
NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721
City or Town State Zip Code
(828)- 627-8042
Area code - Phone number

5. WELL DETAILS:
a. Total Depth: 102.6 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING: Length Diameter
a. Casing Depth (if known): ft. in.
b. Casing Removed: ft. in.

7. DISINFECTION: NA
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 1,568 lb.
Water 64 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite 50 lb / 17 Bags
Type: Slurry Pellets
Water 65 gal.

Other
Type material SG BenTgrouT
Amount 78 Lbs / 39 gallons total

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
Pressure grout / Tremie Pipe
52.61 / Bentonite To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-11-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 6-11-09

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)
Joseph Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290 A

1. WELL CONTRACTOR:

Brunson & King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd
Lexington S.C 29072
City or Town State Zip Code

(803) 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-12

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☐ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap
NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☒ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.96'
LONGITUDE 83° 00.28'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY: The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 90 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	80 ft.	2 in.
b. Casing Removed:	80 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement: Cement 376 lb. Water 38 gal.
Sand Cement: Cement ____ lb. Water ____ gal.
Bentonite: Bentonite 25 lb. Type: ☑ Slurry ☐ Pellets Water ____ gal.
Other: Type material Rabeplug Amount 5 bags

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Overdrilled To 90 ft + Trimie
grouted to 25 ft
Rabeplugged 25 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-10-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name

Landprobe
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe Ga 30655
City or Town State Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLF-13

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope Valley Flat (Ridge) Other
(Circle appropriate setting)

LATITUDE 35° 39.96'
LONGITUDE 83° 00.23'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40

City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721
City or Town State Zip Code

(828) 627-8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 81.4 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): ft.

Measuring point is ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	ft.	in.
b. Casing Removed:	ft.	in.

7. DISINFECTION: N/A

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 752 lb.
Water 316 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite 50 lb. - 19-B95
Type: Slurry Pellets
Water 90 gal.

Other
Type material 50 Bentonite
Amount 36.LBS / 19 gallons water

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure Grout - Trimie Pipe
To 57.39 ft / Bent To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-10-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-10-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G Smith
Well Contractor (Individual) Name

Landprobe
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe GA 30655
City or Town State Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 14

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation
Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope Valley Flat (Ridge) Other
(Circle appropriate setting)

LATITUDE 35° 39.95'
LONGITUDE 83° 00.23'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY. The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde NC 28721
City or Town State Zip Code

(828) - 627 - 8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 73 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	ft.	in.
b. Casing Removed:	73 ft.	2 in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 658 lb.
Water 28 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite 50 lb. ~ 17-Bags
Type: Slurry Pellets
Water 85 gal.

Other
Type material 5% BenTgrouT
Amount 32 LBS / 18 gallons wTR

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure grouT - ThrougH TremiE Pipe
52.41+/ BeaT To SurFace

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-9-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-9-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G. Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G Smith
Well Contractor (Individual) Name

Leadprobe LLC
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe Ga 30655
City or Town State Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 15

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Cap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
(Slope) Valley Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 39.89'
LONGITUDE 83° 00.23'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Rd

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721
City or Town State Zip Code

(828) - 627-8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 74.1 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): _____ ft.

Measuring point is _____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	_____ ft.	_____ in.
b. Casing Removed:	_____ ft.	_____ in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 1504 lb.
Water 64 gal.

Sand Cement
Cement _____ lb.
Water _____ gal.

Bentonite
Bentonite 50 lb. - 8 Bags
Type: Slurry__ Pellets__
Water 40 gal.

Other
Type material 50 Bentgel
Amount 75 LBS / 38 gallons

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

pressure grout / Tremmie Pipe
26.11 ft / Bent To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-3-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-3-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G. Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362 - A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 138

Monroe Ga 30655
City or Town State Zip Code

(770) - 207 9702
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 1

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 39.90'
LONGITUDE 83° 00.20'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY. The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721
City or Town State Zip Code

(828) - 627 - 8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 65.0 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	____ ft.	____ in.
b. Casing Removed:	____ ft.	____ in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 1,786 lb.
Water 76 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 50 lb. - 3-Bags
Type: Slurry ___ Pellets ___
Water 75 gal.

Other
Type material 5/8 Bentonite
Amount 90 LBS / 50 gallon mix

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure grout / Tremie Pipe
To 8.23 ft / Bent To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-3-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-3-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. WELL CONTRACTOR:

Burnson & King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd
Lexington SC 29072
City or Town State Zip Code

(803) - 348 - 8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-2

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.94'
LONGITUDE 83° 00.16'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 39 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	39 ft.	2 in.
b. Casing Removed:	39 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 282 lb.
Water 21 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 20 lb.
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other
Type material
Amount

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Overdrilled to 39 ft + tremie grouted to surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-17-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Burnson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1528 Hwy 13B

Monroe | GA | 30655
City or Town | State | Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE - 3

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 39.97'
LONGITUDE 83° 00.15'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY. The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID # (if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town | State | Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde | NC | 28721
City or Town | State | Zip Code
(828) - 627-8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 48.0 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): _____ ft.
Measuring point is _____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	_____ ft.	_____ in.
b. Casing Removed:	_____ ft.	_____ in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 1222 lb.
Water 52 gal.

Sand Cement
Cement _____ lb.
Water _____ gal.

Bentonite
Bentonite 50 lb. - 3 - Bgs
Type: Slurry _____ Pellets _____
Water 15 gal.

Other
Type material 5/8 Bentonite
Amount 61 LBS / 28 gallon water

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

pressure grout / Tremie side
To 8.77 Feet Bgs / Bent To Sur.

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G. Smith — 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G. Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362 - A

1. WELL CONTRACTOR:
Joseph G Smith
Well Contractor (Individual) Name
Landprobe LLC
Well Contractor Company Name
STREET ADDRESS 1528 Hwy 138
Monroe Ga 30655
City or Town State Zip Code
(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:
SITE WELL ID # (if applicable) BLE-5
STATE WELL PERMIT # (if applicable)
COUNTY WELL PERMIT # (if applicable)
DWQ or OTHER PERMIT # (if applicable)
WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation
Other (list use)

3. WELL LOCATION:
COUNTY Haywood QUADRANGLE NAME Cove Creek Gap
NEAREST TOWN: Clyde, NC
(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)
LATITUDE 35° 40.01'
LONGITUDE 83° 00.15'
May be in degrees, minutes, seconds, or in a decimal format
Latitude/longitude source: (GPS) Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)
FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:
NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721
City or Town State Zip Code
(828) - 627 - 8042
Area code - Phone number

5. WELL DETAILS:
a. Total Depth: 25 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING: Length Diameter
a. Casing Depth (if known): ft. in.
b. Casing Removed: ft. in.

7. DISINFECTION: NA
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 752 lb.
Water 362 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite lb.
Type: Slurry Pellets
Water gal.

Other
Type material SB Bentgent
Amount 36 LBS / 19 gallon units

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
Pressure grout / Tremmie Pipe To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)
Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. WELL CONTRACTOR:

Brunson L King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Bennettsville SC 29072
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-6

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential

☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural

☐ Recovery ☐ Injection ☐ Irrigation

☐ Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Cap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☒ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other

(Check appropriate setting)

LATITUDE 35° 40.02'

LONGITUDE 83° 00.10'

May be in degree, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40

City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen Kings

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721

6. WELL DETAILS:

a. Total Depth: 46 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): ____ ft.

Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	46 ft.	2 in.
b. Casing Removed:	46 ft.	2 in.

7. DISINFECTION: Clorox

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement

Cement 470 lb.
Water 35 gal.

Sand Cement

Cement ____ lb.
Water ____ gal.

Bentonite

Bentonite 25 lb.
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other

Type material Baleplug
Amount 2 bags

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Overdrilled to 46 ft + Trimie
grouted 46 to 9 ft
Baleplug 9 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-16-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson L King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Brunson L King
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:

Joseph G. Smith
Well Contractor (Individual) Name

Landprobe LLC
Well Contractor Company Name

STREET ADDRESS 1529 Hwy 138

Monroe GA 30655
City or Town State Zip Code

(770) - 207 9722
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-75

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation

Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
Slope (Valley) Flat Ridge Other
(Circle appropriate setting)

LATITUDE 35° 40.04'

LONGITUDE 83° 00.13'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: (GPS) Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS ~~Estate~~ 278 Reagle Rd

Clyde, NC 28721
City or Town State Zip Code

(828) - 627-8042
Area code - Phone number

5. WELL DETAILS:

a. Total Depth: 25.1 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): _____ ft.

Measuring point is _____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	_____ ft.	_____ in.
b. Casing Removed:	_____ ft.	_____ in.

7. DISINFECTION: NA

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement: Cement 752 lb. Water 36a gal.

Sand Cement: Cement _____ lb. Water _____ gal.

Bentonite: Bentonite 0 lb. Type: Slurry__ Pellets__ Water _____ gal.

Other: Type material 5 lb Bentogrout

Amount 36 LBS / 19 gallon buckets

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Pressure grout / Tremie Pipe grout To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-2-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joseph G Smith 6-2-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joseph G Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290 A

1. WELL CONTRACTOR:

Brunson L King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd
Lexington SC 29072
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) BLE-16

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☑ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap
NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☑ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.97'
LONGITUDE 83° 00.27'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 78.2 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	68.2 ft.	2 in.
b. Casing Removed:	68.2 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 6894 lb.
Water 14 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 25 lb. Used Bentonite grout
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other
Type material Holeplug
Amount 10 bags

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
Overdrilled to 78.2 ft & tremie grouted from 78 to 50.
Holeplugged 50 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-9-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson L King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Brunson L King
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3362-A

1. WELL CONTRACTOR:
Joseph G Smith
Well Contractor (Individual) Name
Landprobe LLC
Well Contractor Company Name
STREET ADDRESS 1523 Hwy 138
Monroe Ga. 30655
City or Town State Zip Code
(770) 207 9722
Area code - Phone number

2. WELL INFORMATION:
SITE WELL ID # (if applicable) BLE - [redacted] 17
STATE WELL PERMIT # (if applicable)
COUNTY WELL PERMIT # (if applicable)
DWQ or OTHER PERMIT # (if applicable)
WELL USE (Circle applicable use): (Monitoring) Residential Municipal/Public Industrial/Commercial Agricultural Recovery Injection Irrigation
Other (list use)

3. WELL LOCATION: Cove Creek
COUNTY Haywood QUADRANGLE NAME Cap
NEAREST TOWN: Clyde, NC
(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
TOPOGRAPHIC / LAND SETTING:
(Slope) Valley Flat Ridge Other
(Circle appropriate setting)
LATITUDE 35° 39.94'
LONGITUDE 83° 00.26'
May be in degrees, minutes, seconds, or in a decimal format
Latitude/longitude source: (GPS) Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)
FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:
NAME Stephen Kring
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721
City or Town State Zip Code
(828) 627-8042
Area code - Phone number

5. WELL DETAILS:
a. Total Depth: 99.7 ft. Diameter: in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING: Length Diameter
a. Casing Depth (if known): ft. in.
b. Casing Removed: ft. in.

7. DISINFECTION: NA
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 2,162 lb.
Water 92 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite 50 lb / 10 1/2 Bags
Type: Slurry Pellets ✓
Water 50 gal.

Other
Type material 5/8 Bentonite
Amount 108.135 / 52 gallons ea

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
pressure grout / Tremmie pipe
30.46' / Bentonite To Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-10-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Joe Smith 6-10-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Joe Smith
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290 A

1. WELL CONTRACTOR:

Brunson L King
Well Contractor (Individual) Name

King Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Lexington SC 29072
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) MW-5A

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential

☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural

☐ Recovery ☐ Injection ☐ Irrigation

☐ Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other

(Check appropriate setting)

LATITUDE 35° 39.98'

LONGITUDE 83° 00.12'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40

City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 19.5 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): 9 ft.

Measuring point is 2 ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	19.5 ft.	2 in.
b. Casing Removed:	19.5 ft.	2 in.

7. DISINFECTION: Clorox

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement		Sand Cement	
Cement	282 lb.	Cement	lb.
Water	21 gal.	Water	gal.

Bentonite

Bentonite 15 lb.

Type: ☑ Slurry ☐ Pellets

Water gal.

Other

Type material

Amount

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Overdrilled to 19.5 ft + Trimie grouted to Surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-11-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson L King — 6-26-09

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE

(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING

PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. WELL CONTRACTOR:

Brunson & King
Well Contractor (Individual) Name

King Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Lexington SC 29072
City or Town State Zip Code

(803) - 348 - 8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) MW-5D

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Cap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.99'
LONGITUDE 83° 00.12'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

5. WELL DETAILS:

a. Total Depth: 35.7 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): 21 ft.
Measuring point is 2 ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	35.7 ft.	2 in.
b. Casing Removed:	20 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 282 lb.
Water 21 gal.

Sand Cement
Cement ____ lb.
Water ____ gal.

Bentonite
Bentonite 20 lb.
Type: ☑ Slurry ☐ Pellets
Water ____ gal.

Other
Type material
Amount

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Tremi grouted 35.7 ft. 20 ft
Overdrilled to 20 ft + tremi
grouted to surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-11-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. WELL CONTRACTOR:

Brunson & King
Well Contractor (Individual) Name

King Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd
Sanford SC 29072
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) MW-12

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap
NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.93'
LONGITUDE 83° 00.14'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Landfill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 23 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): 11 ft.
Measuring point is 2 ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	23 ft.	2 in.
b. Casing Removed:	23 ft.	2 in.

7. DISINFECTION: Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement 282 lb.
Water 21 gal.

Sand Cement
Cement lb.
Water gal.

Bentonite
Bentonite 20 lb.
Type: ☑ Slurry ☐ Pellets
Water gal.

Other
Type material
Amount

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
Overdrilled to 23 ft + Trimi
grouted to surface

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-17-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Brunson & King
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290 A

1. WELL CONTRACTOR:

Brunson & King
Well Contractor (Individual) Name

Runyo Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Swannanoa NC 28778
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) MW-135

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential

☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural

☐ Recovery ☐ Injection ☐ Irrigation

☐ Other (list use)

3. WELL LOCATION: Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other

(Check appropriate setting)

LATITUDE 35° 39.93'

LONGITUDE 83° 00.15'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) White Oak Landfill

NAME OF FACILITY White Oak Road

STREET ADDRESS 44-07

Exit 15 off I-40

City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721

5. WELL DETAILS:

a. Total Depth: 24 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): 14 ft.

Measuring point is 2 ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	24 ft.	2 in.
b. Casing Removed:	24 ft.	2 in.

7. DISINFECTION: Clorox

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement

Cement 282 lb.

Water 21 gal.

Sand Cement

Cement _____ lb.

Water _____ gal.

Bentonite

Bentonite 15 lb.

Type: ☑ Slurry ☐ Pellets

Water _____ gal.

Other

Type material _____

Amount _____

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Overdrilled to 24 ft + tremie grouted 24 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-11-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09

SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE

(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Brunson King

PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290A

1. **WELL CONTRACTOR:**

Brunson & King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Lexington SC 29072
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. **WELL INFORMATION:**

SITE WELL ID # (if applicable) MW-13D

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. **WELL LOCATION:** Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap
NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☒ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE 35° 39.931'
LONGITUDE 83° 00.15'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. **FACILITY**- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07
NAME OF FACILITY White Oak Land Fill
STREET ADDRESS White Oak Road
Exit 15 off I-40
City or Town State Zip Code

4b. **CONTACT PERSON/WELL OWNER:**

NAME Stephen King
STREET ADDRESS 278 Recycle Road
Clyde, NC 28721

6. **WELL DETAILS:**

a. Total Depth: 57 ft. Diameter: 2 in.
b. Water Level (Below Measuring Point): 31 ft.
Measuring point is 2 ft. above land surface.

6. **CASING:**

	Length	Diameter
a. Casing Depth (if known):	57 ft.	2 in.
b. Casing Removed:	24 ft.	2 in.

7. **DISINFECTION:** Clorox
(Amount of 65%-75% calcium hypochlorite used)

8. **SEALING MATERIAL:**

Neat Cement
Cement 376 lb.
Water 28 gal.

Sand Cement
Cement _____ lb.
Water _____ gal.

Bentonite
Bentonite 75 lb.
Type: ☑ Slurry ☐ Pellets
Water _____ gal.

Other
Type material
Amount

9. **EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:**
Temie grouted 57 to 24 + overdrilled to 24 (top of rock) + grouted to surface

10. **WELL DIAGRAM:** Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. **DATE WELL ABANDONED** 6-11-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L KING
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # _____

1. WELL CONTRACTOR:

Brunson & King
Well Contractor (Individual) Name

King Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Bessemer SC 29072
City or Town State Zip Code

(803) 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) P-4

STATE WELL PERMIT # (if applicable) _____

COUNTY WELL PERMIT # (if applicable) _____

DWQ or OTHER PERMIT # (if applicable) _____

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential

☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural

☐ Recovery ☐ Injection ☐ Irrigation

☐ Other (list use) _____

3. WELL LOCATION:

Cove Creek

COUNTY Haywood QUADRANGLE NAME Gap

NEAREST TOWN: Clyde NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☐ Slope ☐ Valley ☐ Flat ☒ Ridge ☐ Other _____

(Check appropriate setting)

LATITUDE 35° 40.06'

LONGITUDE 83 00.16'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721

8. WELL DETAILS:

a. Total Depth: 81 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): _____ ft.

Measuring point is _____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	59 ft.	2 in.
b. Casing Removed:	59 ft.	2 in.

7. DISINFECTION: Clorox

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement

Cement 564 lb.
Water 35 gal.

Sand Cement

Cement _____ lb.
Water _____ gal.

Bentonite

Bentonite 35 lb.
Type: ☑ Slurry ☐ Pellets
Water _____ gal.

Other

Type material Holeplug
Amount 8 bags

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Tremi grouted from 81 to 45 ft
Overdrilled to 59 ft + Tremi
grouted to 45 ft
Holeplugged 45 to 0

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-18-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson & King — 6-26-09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

_____
SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

BRUNSON L King
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3290 A

1. WELL CONTRACTOR:

Brunson L King
Well Contractor (Individual) Name

Kings Drilling
Well Contractor Company Name

STREET ADDRESS 160 Woodside Rd

Bessemer City SC 29022
City or Town State Zip Code

(803) - 348-8741
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) P-6

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☒ Monitoring ☐ Residential ☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐ Irrigation

☐ Other (list use)

3. WELL LOCATION:

COUNTY Haywood QUADRANGLE NAME Cove Creek Gap

NEAREST TOWN: Clyde, NC

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☐ Slope ☐ Valley ☐ Flat ☒ Ridge ☐ Other

(Check appropriate setting)

LATITUDE 35° 39.99'

LONGITUDE 83° 00.20'

May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map

(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY- The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable) 44-07

NAME OF FACILITY White Oak Landfill

STREET ADDRESS White Oak Road

Exit 15 off I-40
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME Stephen King

STREET ADDRESS 278 Recycle Road

Clyde, NC 28721

5. WELL DETAILS:

a. Total Depth: 67.5 ft. Diameter: 2 in.

b. Water Level (Below Measuring Point): ____ ft.

Measuring point is ____ ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	57.5 ft.	2 in.
b. Casing Removed:	57.5 ft.	2 in.

7. DISINFECTION: Clorox

(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement

Cement 94 lb.

Water 7 gal.

Sand Cement

Cement ____ lb.

Water ____ gal.

Bentonite

Bentonite 15 lb.

Type: ☑ Slurry ☐ Pellets

Water ____ gal.

Other

Type material Rolepleg

Amount 10

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

Tremie grouted from 67.5 to 57.5 + overpulled to 57.5 + tremie grouted 57.5 to 50ft Holepleg 50 to 0

(Depth to rock was at 58ft)

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 6-10-09

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Brunson L King — 6-26-09

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE

(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Brunson L King

PRINTED NAME OF PERSON ABANDONING THE WELL

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Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

Roy Alexander

From: David Pasko [dpasko@mcgillengineers.com]
Sent: Monday, October 19, 2009 3:31 PM
To: roy@mcgillengineers.com
Subject: FW: Testing of Dual-Contained Piping

From: David Pasko [mailto:dpasko@mcgillengineers.com]
Sent: Thursday, August 13, 2009 10:38 AM
To: 'chaverstrom@Thalle.com'; 'Sarah McKee'; 'kvess@thalle.com'
Cc: 'Stephen King'; 'Mark Shumpert'; 'Denese Ballew'
Subject: Testing of Dual-Contained Piping

Chris,

We appreciate you all coming to the site yesterday to talk about the project. We felt it was a very productive meeting.

In regards to testing of the dual-contained piping on the project, the County must be able to prove beyond the shadow of a doubt that Thalle installed the pipeline under MSW Phase 3 in such a manner that the pipe does not leak. Therefore, we included in our spec the requirement that both sections of the dual-contained piping be tested. Feel free to perform water testing on each section of pipe individually, or you can use an air and water testing procedure simultaneously. The attached spec is the typical testing procedure that we use for any gravity sewer that we install. See Section 3.02 A 2f of the spec for the air testing requirements if you wish to use this method. Shamrock Environmental recently completed testing of a dual-contained pipe on one of our projects, and the Project Superintendent said it was a relatively straightforward procedure of fusion welding an end plate to both ends, and then tapping the end plates to install the appropriate fittings to do the test. Please let Alan Mackey know when you all are going to do the testing.

Give us a call if you have any questions regarding this procedure.

Dave Pasko
McGill Associates
828/252-0575

McGill Associates P.A.
Post Office Box 2259
Asheville, North Carolina 28802
(828) 252-0575

PROJECT OBSERVATION REPORT

(ALL ENTRIES IN INK)

DATE 8/19/09	DAY OF WEEK S M T (W) T F S	TIME ARRIVED 7:00 AM PM	TIME DEPARTED 12:00 AM PM
WEATHER ☐ CLEAR ☑ OVERCAST ☐ RAIN ☐ SNOW ☐ OTHER	RAIN WITHIN PAST 24 HOURS IN.	HIGH TEMPERATURE 84	LOW TEMPERATURE 64
CONTRACTOR THALLE CONSTRUCTION			
PROJECT FOREMAN KEITH VESS	OPERATOR(S) 16	SKILLED 3	OTHER
EQUIPMENT TRACK EXCAVATOR 3	RUBBER TIRE EXCAVATOR	RUBBER TIRE LOADER 1	
DUMP TRUCK 5	OTHER 2-DOZERS, 2-ROLLERS		
SUBCONTRACTOR	FOREMAN		
SUBCONTRACTOR	FOREMAN		
SUBCONTRACTOR	FOREMAN		
OWNER'S REP			
VISITORS			

☐ WATER LINE	☐ SEWER LINE INSTALLATION	Sta.		to Sta.	
☐ WATER LINE	☑ SEWER LINE TESTING	Sta.	± 13+42 ± 10+06	to Sta.	± 18+27 ± 18+08
☐ ROAD CONSTRUCTION		Sta.		to Sta.	

WORK AREA CLEAN-UP	☐ GOOD	☑ ACCEPTABLE	☐ INADEQUATE	☐ SEE COMMENTS BELOW
EROSION & SEDIMENTATION CONTROL MEASURES IN PLACE	☐ N/A	☑ YES	☐ NO	☐ SEE COMMENTS BELOW
EROSION & SEDIMENTATION CONTROL MEASURES	☑ CLEAN & FUNCTIONAL	☐ REPAIR/MAINTENANCE REQUIRED	☐ SEE COMMENTS BELOW	
TRAFFIC CONTROL	☑ SIGNS	☐ CONES	☐ FLAGMEN	☐ N/A
GRADED AREAS (SLOPES/FILLS)	☐ SEEDED	☐ PROTECTED	☐ OTHER	

LIST PICTURES TAKEN TODAY:		DOES CONTRACTOR HAVE SHOP DRAWINGS FOR THE MATERIALS INSTALLED TODAY?	☑ YES	☐ NO

CONSTRUCTION ISSUES:

Alan Mackey
CFR'S SIGNATURE

8/19/09
DATE

Sewer Line Test Report

PAGE: 1 OF: 1

PROJECT: WHITE OAK LANDFILL
CONTRACTOR: THARLE CONSTRUCTION
OWNER: HAYWOOD CO.
FOREMAN: KEITH VESS
PROJECT No.: 07518
McGILL CFR: ALLAN F. MAGELEY

DATE	PIPE SIZE	PIPE TYPE	Stations From	Stations To	TEST LENGTH	TEST PRESSURE	TEST TIME	PASS/ FAIL	LAMP	95% MANDREL
8/19/09	12"	H.D.P.E	±13+42	±18+27	485'	3.5 lbs	8:54	PASS	—	—
8/19/09	8"	H.D.P.E	±13+42	±18+27	485'	3.5 lbs	5:56	PASS	—	—
8/19/09	12"	H.D.P.E	±10+00	±18+08	808'	3.5 lbs.	14:14	PASS	—	—
8/19/09	8"	H.D.P.E	±10+00	±18+08	808'	3.5 lbs	9:30	PASS	—	—

Minimum Test Time for Pipe

LENGTH TESTED

Pipe Size	4"	6"	8"	10"	12"	15"	21"	24"
25	0:04	0:10	0:17	0:22	0:26	0:31	0:44	0:53
50	0:09	0:20	0:35	0:44	0:53	1:02	1:29	1:47
75	0:13	0:30	0:53	1:06	1:20	1:34	2:14	2:40
100	0:17	0:40	1:11	1:29	1:47	2:05	2:58	3:33
125	0:22	0:50	1:29	1:51	2:13	2:36	3:43	4:27
150	0:26	1:00	1:47	2:13	2:40	3:07	4:27	5:20
175	0:31	1:10	2:04	2:35	3:07	3:39	5:12	6:14
200	0:35	1:20	2:22	2:58	3:33	4:10	5:57	7:07
225	0:40	1:30	2:40	3:20	4:00	4:41	6:41	8:00
250	0:44	1:40	2:58	3:42	4:27	5:13	7:26	8:54
275	0:49	1:50	3:16	4:05	4:53	5:44	8:10	9:47
300	0:53	2:00	3:33	4:27	5:20	6:15	8:55	10:41
325	0:58	2:10	3:51	4:49	5:47	6:47	9:40	11:34
350	1:02	2:20	4:09	5:11	6:14	7:18	10:24	12:28
375	1:06	2:30	4:27	5:34	6:40	7:49	11:09	13:21
400	1:11	2:40	4:45	5:56	7:07	8:21	11:54	14:14
425	1:15	2:50	5:02	6:18	7:34	8:52	12:38	15:08
450	1:20	3:00	5:20	6:40	8:00	9:23	13:23	16:01
475	1:24	3:10	5:38	7:03	8:27	9:54	14:07	16:55
500	1:29	3:20	5:56	7:25	8:54	10:26	14:52	17:48
525	1:33	3:30	6:14	7:47	9:21	10:57	15:37	18:42
550	1:38	3:40	6:31	8:09	9:47	11:28	16:21	19:35
575	1:42	3:50	6:49	8:32	10:14	12:00	17:06	20:28
600	1:47	4:00	7:07	8:54	10:41	12:31	17:51	21:22

Permit No.	Date	Document ID No.
44-07	**August 28, 2009**	**8516**

McGill ASSOCIATES

25th anniversary 1984-2009

August 27, 2009

Mr. Allen Gaither
Regional Engineer
Solid Waste Permitting Section
Division of Waste Management
North Carolina Department of Environment and Natural Resources
2090 U.S. Highway 70
Swannanoa, North Carolina 28778

RE: Request for Blasting – MSW Phase 3
White Oak MSW Landfill Permit # 44-07
Haywood County, North Carolina

Dear Mr. Gaither:

During the construction of the Municipal Solid Waste Landfill (MSW) Phase 3 waste area, the contractor has encountered rock pinnacles that can not be excavated with standard excavation methods. The rock is located within the limits of the Phase 3 waste area and sediment basin #6. The attached drawing shows the approximate location of the rock. Based on a survey of the exposed rock, the rock covers an area of approximately 2 acres. We project from 4' to 15' feet of vertical cut is necessary to reach the proposed grades and to provide the required 4' separation from the base liner system. We estimate approximately 25,000 cubic yards of rock material needs to be removed.

We have calculated approximately 15,000 cubic yards of waste volume would be lost in Phase 3 alone if the rock is not removed. At the current compaction rates, this lost airspace would translate to more than 7,000 tons of waste. In addition, due to the location of the rock, revising the base grades to avoid the rock would also impact the grades and waste airspace for the future Phase 4 waste area. Haywood County can not afford to lose this waste airspace.

We have discussed the situation with the Phase 3 landfill contractor, Thalle Construction. Thalle Construction has experience with rock removal on landfill projects. They have provided the attached Site Specific Blasting Plan for removal of the encountered rock as prepared by National Quarry Service. Based on the attached information, we are confident that we can successfully remove the encountered rock with out detrimental impacts.

McGill Associates, P.A. • P.O. Box 2259, Asheville, NC 28802 • 55 Broad Street, Asheville, NC 28801
828-252-0575 • Fax: 828-252-2518

On behalf of Haywood County, we are requesting approval to remove the encountered rock for the Phase 3 area to the elevations that allow the landfill to be constructed as permitted. Thank you for your attention to this request. Since we are currently under construction, we would like to expedite the review as soon as possible. Please call should you have any questions or need any additional information.

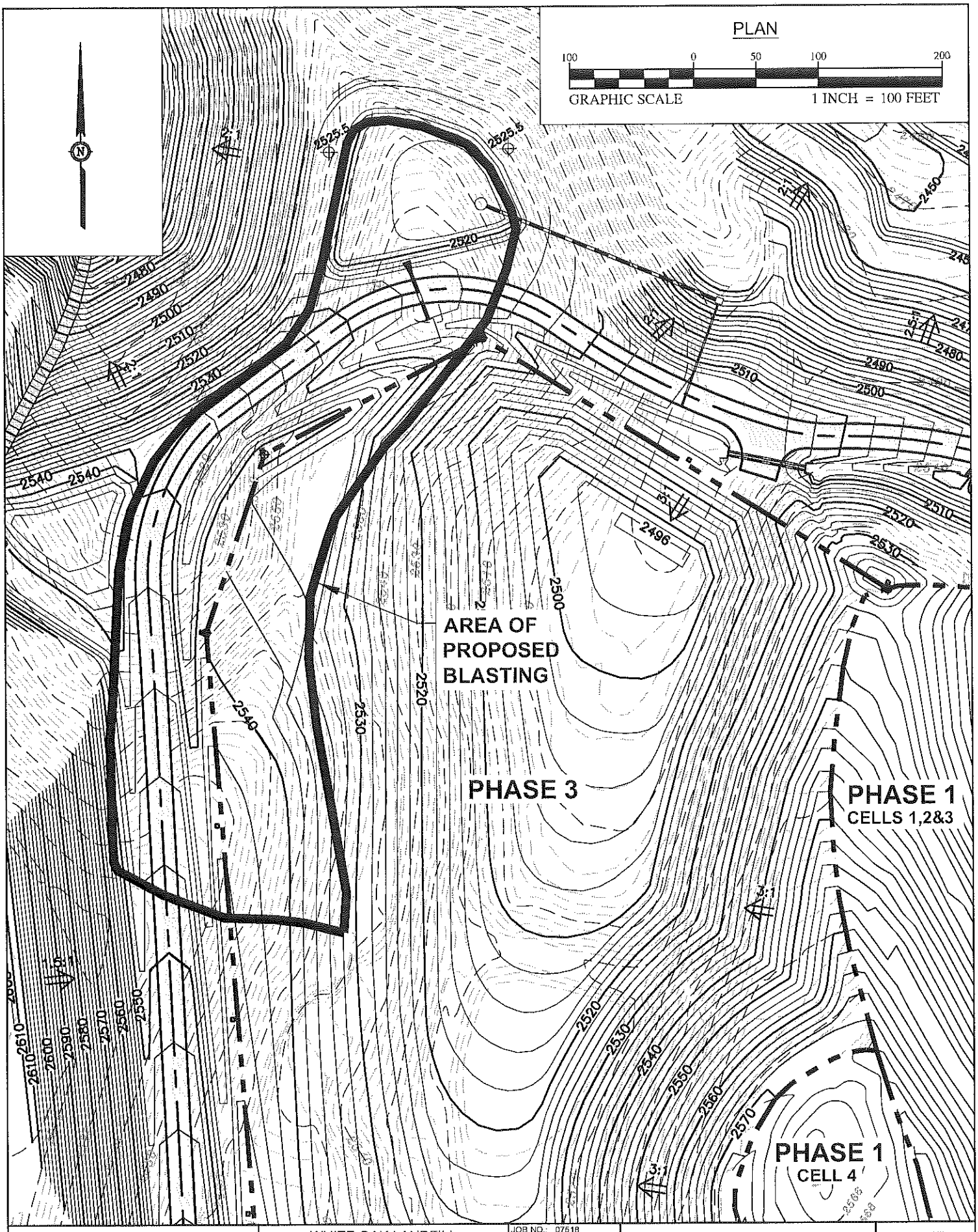
Sincerely,
McGILL ASSOCIATES, P.A.

JEFFREY R. BISHOP, P.E.
Senior Project Manager

Enclosures

cc: Stephen King, Haywood County Solid Waste Director, w/ enc

P:/07518/Letters/ag27aug09-Blasting Request.doc



McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC 28801 PH. (828) 252-0575

WHITE OAK LANDFILL
MSW PHASE 3
HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518
DATE: AUGUST 2009
DESIGNED BY: KS
CADD BY: KS
DESIGN REVIEW: ____
CONST. REVIEW: ____
FILE NAME: 07518-Rock-Worksheet-8-19-09.dwg

AREA OF BLASTING

FIGURE
1

Q:\2007\07518\CONSTRUCTION-DWGS\07518-Rock-Worksheet-8-19-09.dwg 8/27/2009 10:53 AM KELLY

8/24/2009

Sarah R. McKee, E.I.

Thalle Construction Company, Inc.

900 NC Hwy 86 North

Hillsborough, NC 27278

Re: Blasting at Haywood County Sanitary Landfill

Ms. McKee,

At your request, National Quarry Service has prepared a site specific blasting plan for removal of the rock encountered in the proposed phase three of the Haywood County Sanitary Landfill. After visiting the site and speaking with Thalle Construction personnel it is sure that all mechanical means of excavation have been exhausted and drilling and blasting is the last resort for the removal of the rock. We believe that well designed and executed blasting would achieve the intended results without risk of damage to the existing cells, underlying bed rock or hydrology of the site.

The rock to be excavated occurs in various depths between elevation 2510' and elevation 2550'. According to borings done at the site and our experience in this area of North Carolina, we expect to find a medium to hard layer of weathered rock overlying hard granite with layers of gneiss, quartz and feldspar. National Quarry Service intends to use non-electric type blasting caps to initiate high explosive primers approximately 1' above the blast hole bottom. We expect that the area will be free of ground water and will use ammonium nitrate/ fuel oil blasting agent to load the holes to required weight and depth. The holes will then be stemmed to the collar with crushed stone for maximum confinement. Drill pattern and blast hole size will be manipulated so that a powder factor of 1 pound to 1.25 pounds per cubic yard of rock will be maintained with the holes being drilled to a depth 3' below proposed sub-grade. This industry accepted standard for blasting of unconfined mass rock will result in desired fracturization of the rock while

minimizing disturbance outside of the actual blast area. Maximum pounds per delay will be expected to occur in an area of cut between 27' and 29' approximately 450' from existing phase 1. Using the calculated scaled distance of 46.134 and an "H" factor of 160, the maximum peak particle velocity at the nearest corner of the structure is predicted to be less than 0.4 inches per second. In addition, there is an area of excavation to below proposed sub grade separating the blast area from the existing cell which would be expected to reduce the conductivity of ground vibration. We would recommend that a thorough survey be done of the existing conditions of the structures as near prior to blasting as possible. Seismic monitoring will be done at all areas of concern and readings will be reviewed after each blast to assess the effects of the blast and the need for changes to blast designs.

All other procedures as to the general blasting on the site are outlined in the General Blasting Plan for the Haywood County Sanitary Landfill. I hope I have included enough information for you to make a determination in proceeding. If you have any questions, please call myself (336) 624-2190 or Chris (518) 210-3353. Thank you for the opportunity to assist in this and all Thalle Construction projects.

Regards,

Jim Schultz

National Quarry Service

Va. Blaster Cert. #691037525

GENERAL BLASTING PLAN

Haywood County Sanitary Landfill

Haywood County, NC

Table of Contents

GENERAL BLASTING PLAN

1.0 INTRODUCTION

This Blasting plan identifies measures to be taken by National Quarry Service Inc. to ensure that blasting operations are carried out in accordance with federal, state and local regulations and restrictions.
Measures identified in this blasting plan apply to work within the project area as defined as, the right-of-way, access roads, temporary use areas and other areas used during construction of the project.
Contractors sub – contractors and all site personnel are to be thoroughly familiar with this plan.

1.1 Purpose

The project encounters one or more areas of surface and subsurface rock where mechanical equipment will be unable to rip or excavate rock to allow construction. There is estimated to approximately 25,000 cubic yards of this type of rock on this project. In these areas blasting will be used to fracture the rock to allow for grading and excavation.

This plan describes safety standards and practices that will be implemented during construction to minimize health, safety and environmental concerns related to blasting on the project.

2.0 Blasting Procedures

2.1 Notifications

National Quarry Service Inc. will notify all appropriate federal, state and local authorities at least 24 hours prior storing or using explosives on the project. In addition, the following notifications will be needed throughout the project.

Prior to any detonation of explosives in the vicinity of existing facilities (such as pipelines, dwellings, structures, overhead or underground utilities, farm operations, or public crossings), a minimum of 24 hours notice will be given to appropriate authorities, and the owners or operators of any facilities that may be affected by the blasting.

2.2 Blasting Process

Drilling - Scaled Distance formulas will be used as guidelines to determine maximum pounds within any 8ms delay period and appropriate drill hole spacing and diameter will be applied.

Loading - Explosive type will be determined by drilling reports and ground water encountered. Cartridge and or bulk explosives will be primed with an appropriate primer in the bottom of the blast hole. Once loaded to a predetermined depth, all holes will be stemmed with #78 crushed stone. All delay and ignition caps will be non – electric type and will be connected and inspected by a certified blaster. Tail caps of will be of sufficient length that visual inspection after the blast will be possible to insure that all holes have detonated.

Matting/Covering – Whenever necessary blasting mats or earth cover will be used to protect surrounding property from blasting debris.

Warning – The blaster inspects the blast area to ensure that vehicles and personnel have withdrawn to a safe distance. Access to the area is restricted and warning signals are sounded.

Blast – Following the warning signals, the blast will be detonated.

Clearance – National Quarry Service personnel will conduct a thorough post blast inspection of the blast area to ensure that all explosives and blasting caps are detonated prior to any other work proceeding. Once the area is verified clear, the all clear will be sounded.

2.2.1 Misfires/Cut-offs

If during the post blast inspection of any shot it is determined that all of any part of the shot did not detonate, the immediate area of the shot will be secured and will be treated as an area where explosives are being loaded. No additional work, other than that necessary to remove the hazard, shall be performed, and only those persons needed to do such work shall remain at the blast site. As soon as practical, notifications will be given and blasting procedures outlined in section 2.2 will begin.

2.3 Restrictions

Special blasting controls will be required in the vicinity of power lines, telephone lines, fiber optic lines, existing pipeline facilities, structures, water wells, springs, or buildings or where directed by National Quarry Service, Inc. to preclude the possibility of damage due to fly-rock, shock waves, vibrations, or changes to hydraulic conductivity of the

bedrock near important springs and wells. This will be accomplished by a combination of blast design, adequate collaring, and matting. Matting to control fly-rock includes, but is not limited to, fabricated mats, overburden, and sand-pad matting.

3.0 EXPLOSIVES STORAGE & TRANSPORTATION

National Quarry Service inc. will obtain necessary permits and comply with 27 CFR Part 55 & 13 NCAC 07F.0707 regulations and NFPA 495, state and local governments having jurisdiction as to storage and transportation of explosives. National Quarry Service will maintain an inventory and use record for all explosives and detonating caps that will be reconciled at the end of the working day. Inventory and use records will be available on site for inspection by any jurisdictional authorities at all times.

4.0 SAFETY MEASURES

Standard safety measures will be employed during blasting operations to prevent damage to adjacent resources, residences, utilities, and roadways. As discussed above, these measures will include blasting controls to limit fly-rock, air blast, and vibrations near sensitive areas. Warning signals, signage, and procedures to protect human health and safety are discussed below.

4.1 General Safety Measures

National Quarry Service Inc. will at all times protect its workers and the public from any injury or harm from drilling or the use of explosives. Only workers thoroughly experienced in handling explosives will be permitted to supervise, handle, haul, load or fire explosives. In those jurisdictions where the licensing of blasters is mandatory, National Quarry Service, Inc. will provide proof of the necessary certification for every person so required before any crew assignment.

National Quarry Service Inc. will not leave holes loaded overnight, unattended or unprotected. Explosives will be primed immediately before use. Loading and blasting will be conducted only during daylight hours. No explosives will be abandoned on the right of way.

During the blasting procedure, all personnel not involved in the actual detonation will stand back from the time the "blast imminent" signal is given until the "all clear" has been sounded. The Contractor will post flagmen on all roadways passing the blast area to stop all traffic during blasting operations.

The Contractor will ensure that no members of the general public are in the area when a blast occurs.

4.2 Warning Signs and Signals

The Contractor will install "Blast Zone Ahead" signs along roads, public ways, in the vicinity of occupied buildings immediately adjacent to the blast area, and other locations deemed necessary to warn the public of the blasting area. Additional signs warning to turn off electrical devices shall be required if electric blasting caps are used. NQS will install "Leaving Blast Zone "to notify the public that they are leaving blast area.

4.2.2 Blast Signals

National Quarry Service will use an acceptable air horn or siren to give the blasting warning and "All – Clear" signals. The warning system used for blast signals will produce a sound that is distinct from any other signals used on the site. Use of vehicle horns as blast signals will not be permitted. The blast warning signals will be given as follows.

Three minutes prior to blasting - Blast Imminent; the blaster in charge will give three short blasts of an air horn.

One minute prior to blasting – The blaster will give two short blasts of an air horn.

Prior to blasting – the Blaster in Charge will shout "Fire in the Hole" and the explosives will be fired.

If there is any interruption to the blast routine once the "Blast Imminent" signal has been given, the entire procedure will begin again.

All Clear Signal – The blaster will check the blast site to ensure all charges have been detonated and give one long blast of the air horn

Safety Standard Operation Procedures

1. This General Blasting Plan will be made available to all personnel involved in field activities. Prior to the start of field activities, all personnel working on the site will be thoroughly briefed about the type of work to be done, potential hazards, safety equipment to be used and worn, safety precautions, emergency procedures, and procedures for reporting accidents or injuries.

2. A fully stocked first-aid kit will be on site at all times.
   Eye wash kits will be available on-site.
   Drinking water will be available at all times.

3. Personal safety protection will be used in the immediate area of drilling by all personnel including hearing protection, safety glasses and hard hats.

4. No blasting activities will be conducted during thunderstorms or during periods of potential lightning.

5. National Quarry Service Inc. will adhere to all Federal, State and Local restrictions.

6. Emergency response procedures will be understood by all site personnel. Any visitors to the site will be briefed by the project manager.

REVISED
GENERAL BLASTING PLAN

Haywood County Sanitary Landfill

Haywood County, NC

September 3, 2009

Table of Contents

GENERAL BLASTING PLAN

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Drilling - Scaled Distance formulas will be used as guidelines to determine maximum pounds within any 8ms delay period and appropriate drill hole spacing and diameter will be applied.

Loading - The rock to be excavated occurs in various depths between elevation 2510' and elevation 2550' with the average cut expected to be 13'. According to borings done

at the site and our experience in this area of North Carolina, we expect to find a medium to hard layer of weathered rock overlying hard granite with layers of gneiss, quartz and feldspar. National Quarry Service intends to use non-electric type blasting caps to initiate high explosive primers approximately 1' above the blast hole bottom. We expect that the area will be free of ground water and will use ammonium nitrate/ fuel oil blasting agent to load the holes to required weight and depth. Explosive type will be determined by drilling reports and ground water encountered. The holes will then be stemmed to the collar with crushed stone for maximum confinement. Drill pattern and blast hole size will be manipulated so that a powder factor of 1 pound to 1.25 pounds per cubic yard of rock will be maintained with the holes being drilled to a depth 3' below proposed sub-grade. This industry accepted standard for blasting of unconfined mass rock will result in desired fracturization of the rock while minimizing disturbance outside of the actual blast area. Each blast will be fired with an "open face" blast designed so that each hole fires a minimum of 25 milliseconds prior to the adjoining holes effectively "unburdening" each hole sequentially. This ensures that maximum energy is used to fracture the intended rock and not confined so to fracture the underlying mass. Maximum pounds per delay will be expected to occur in an area of cut between 27' and 29' which is approximately 450' from existing phase 1. Using the calculated scaled distance of 46.134 and an "H" factor of 160, the maximum peak particle velocity at the nearest corner of the structure is predicted to be less than 0.4 inches per second. In addition, there is an area of excavation to below proposed sub grade separating the blast area from the existing cell which would be expected to reduce the conductivity of ground vibration. We would recommend that a thorough survey be done of the existing conditions of the structures as near prior to blasting as possible. Seismic monitoring will be done at all areas of concern and readings will be reviewed after each blast to assess the effects of the blast and the need for changes to blast designs.

Cartridge and or bulk explosives will be primed with an appropriate primer in the bottom of the blast hole. Once loaded to a predetermined depth, all holes will be stemmed with #78 crushed stone. All delay and ignition caps will be non – electric type and will be connected and inspected a certified blaster. Tail caps of will be of sufficient length that visual inspection after the blast will be possible to insure that all holes have detonated.

Matting/Covering – Whenever necessary blasting mats or earth cover will be used to protect surrounding property from blasting debris.

Warning – The blaster inspects the blast area to ensure that vehicles and personnel have withdrawn to a safe distance. Access to the area is restricted and warning signals are sounded.

Blast – Following the warning signals, the blast will be detonated.

Clearance – National Quarry Service personnel will conduct a thorough post blast inspection of the blast area to ensure that all explosives and blasting caps are detonated prior to any other work proceeding. Once the area is verified clear, the all clear will be sounded.

2.2.1 Misfires/Cut-offs

If during the post blast inspection of any shot it is determined that all of any part of the shot did not detonate, the immediate area of the shot will be secured and will be treated as an area where explosives are being loaded. No additional work, other than that necessary to remove the hazard, shall be performed, and only those persons needed to do such work shall remain at the blast site. As soon as practical, notifications will be given and blasting procedures outlined in section 2.2 will begin.

2.3 Restrictions

Special blasting controls will be required in the vicinity of power lines, telephone lines, fiber optic lines, existing pipeline facilities, structures, water wells, springs, or buildings or where directed by National Quarry Service, Inc. to preclude the possibility of damage due to fly-rock, shock waves, vibrations, or changes to hydraulic conductivity of the bedrock near important springs and wells. This will be accomplished by a combination of blast design, adequate collaring, and matting. Matting to control fly-rock includes, but is not limited to, fabricated mats, overburden, and sand-pad matting.

3.0 EXPLOSIVES STORAGE & TRANSPORTATION

National Quarry Service inc. will obtain necessary permits and comply with 27 CFR Part 55 & 13 NCAC 07F.0707 regulations and NFPA 495 state and local government having jurisdiction as to storage and transportation of explosives. National Quarry Service will maintain an inventory and use record for all explosives and detonating caps that will be reconciled at the end of the working day. Inventory and use records will be available on site for inspection by any jurisdictional authorities at all times.

4.0 SAFETY MEASURES

Standard safety measures will be employed during blasting operations to prevent damage to adjacent resources, residences, utilities, and roadways. As discussed above, these measures will include blasting controls to limit fly-rock, air blast, and vibrations near sensitive areas. Warning signals, signage, and procedures to protect human health and safety are discussed below.

4.1 General Safety Measures

National Quarry Service Inc. will at all times protect its workers and the public from any injury or harm from drilling or the use of explosives. Only workers thoroughly experienced in handling explosives will be permitted to supervise, handle, haul, load or fire explosives. In those jurisdictions where the licensing of blasters is mandatory, National Quarry Service, Inc. will provide proof of the necessary certification for every person so required before any crew assignment.

National Quarry Service Inc. will not leave holes loaded overnight, unattended or unprotected. Explosives will be primed immediately before use. Loading and blasting will be conducted only during daylight hours. No explosives will be abandoned on the right of way.

During the blasting procedure, all personnel not involved in the actual detonation will stand back from the time the "blast imminent" signal is given until the "all clear" has been sounded. The Contractor will post flagmen on all roadways passing the blast area to stop all traffic during blasting operations.

The Contractor will ensure that no members of the general public are in the area when a blast occurs.

4.2 Warning Signs and Signals

The Contractor will install "Blast Zone Ahead" signs along roads, public ways, in the vicinity of occupied buildings immediately adjacent to the blast area, and other locations deemed necessary to warn the public of the blasting area. Additional signs warning to turn off electrical devices shall be required if electric blasting caps are used. NQS will install "Leaving Blast Zone "to notify everyone that they are leaving blast area.

4.2.2 Blast Signals

National Quarry Service will use an acceptable air horn or siren to give the blasting warning and "All – Clear" signals. The warning system used for blast signals will produce a sound that is distinct from any other signals used on the site. Use of vehicle horns as blast signals will not be permitted.

- Three minutes prior to blasting - Blast Imminent; the blaster in charge will give three short blasts of an air horn.
- One minute prior to blasting – The blaster will give two short blasts of an air horn.
- Prior to blasting – the Blaster in Charge will shout "Fire in the Hole" and the explosives will be fired.
- If there is any interruption to the blast routine once the "Blast Imminent" signal has been given, the entire procedure will begin again.
- All Clear Signal – The blaster will check the blast site to ensure all charges have been detonated and give one long blast of the air horn

5.0 STANDARD SAFETY OPERATING PROCEDURES

1. This General Blasting Plan will be made available to all personnel involved in field activities. Prior to the start of field activities, all personnel working on the site will be thoroughly briefed about the type of work to be done, potential hazards, safety equipment to be used and worn, safety precautions, emergency procedures, and procedures for reporting accidents or injuries.

2. A fully stocked first-aid kit will be on site at all times.
   Eye wash kits will be available on-site.
   Drinking water will be available at all times.

3. No blasting activities will be conducted during thunderstorms or during periods of potential lightning.

4. All blasting operations will be restricted to daylight hours.

5. National Quarry Service Inc. will adhere to all Federal, State and Local restrictions.

6. Emergency response procedures will be understood by all site personnel. Any visitors to the site will be briefed by the project manager.

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Dexter R. Matthews
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

September 15. 2009

Mr. Stephen King
Haywood County Solid Waste Director
278 Recycle Road
Clyde, North Carolina 28721

Re: Authorization Approval for Blasting Plan, Phases 3 & 4 – Rock Delineation and Blasting Plan, White Oak MSW Landfill, Haywood County, North Carolina, Permit No. 44-07, ID No. 8588

Dear Mr. King:

Mr. Jeffrey Bishop, P.E. on behalf of White Oak Landfill, submitted an initial Rock Delineation / Blasting Plan on August 27, 2009, pertaining to the subgrade and construction of Phase 3 and Phase 4. Supplemental documentation was submitted on September 1 & 2, 2009 and a Revised General Blasting Plan (Doc ID 8558) was submitted on September 3, 2009 by Mr. Bill Sperry, P.E. of McGill Associates.

The initial Rock Delineation / Blasting plan addressed removal of unrippable rock identified during construction. The rock is located in the northwest corner of proposed Phase 3, northeast corner of proposed Phase 4, and proposed sediment basin north of Phase 3. This area is about two (2) acres. Intent of removing the rock is to achieve the four (4) feet separation below the designed base liner system. Blasting operations shall comply with all applicable local, state, and federal ordinances, regulations, and laws.

The Revised General Blasting Plan will be included with the list of the approved documents in the permit to operate. Please include the report documenting the approved activity in the final CQA report as well as submitting the blasting report within 30 days of the activity. Please note that further modifications to the construction of these phases may require a permit modification fee. Also, future landfill expansion areas (Phases) to be constructed may require further lithologic investigative characterization (i.e. top of rock / rock borings) at the time of design study phase.

If you have any questions please contact me at (919) 508-8401 or at zinith.barbee@ncdenr.gov.

Sincerely,

Zinith Barbee

Zinith Barbee
Hydrogeologist
Solid Waste Section

cc: Jeffrey R. Bishop, P.E. McGill Associates, P.A. Bill Sperry, P.E. McGilll Associates, P.A.
Allen Gaither Solid Waste Section Andrea Keller Solid Waste Section

DRAFT

ROCK BLASTING
AT LINED LANDFILL UNITS

The Solid Waste Section allows blasting for rock removal only after all other options have been explored, including the viability of adjusting base grades.

Generally, the base grades must be designed to maintain four foot of vertical separation from the top of rock as established by the Design Hydrogeologic Study. This study requires a boring density of about one boring per acre for the area of investigation, which includes the footprint for the planned landfill phase of development and the area around the footprint that will be subject to ground-water monitoring. For the purposes of the Design Study the top of rock is defined by auger refusal or a Standard Penetration Resistance blow count of about 50/.2'. The base grades are then designed to maintain four foot of vertical separation from the top of bedrock datum plane as established in the Design Hydrogeologic Study.

If during excavation of the disposal cell, rock pinnacles are found that are above the top of rock datum plane established in the Design Hydrogeologic Study, then the Solid Waste Section will consider authorizing some rock removal. If blasting is necessary the landfill owner/operator or their consultants should submit a blasting plan. This blasting plan should show the location and size of the rock pinnacles, the elevations of the rock, and an estimate of the volume of rock that needs to be removed. The blasting plan must be designed so as to minimize the impact to underlying rock and nearby structures.

If rock removal is determined to be necessary, the Solid Waste Section may authorize blasting with the following conditions:

- Effort shall be made to minimize the amount of blasting necessary, and to minimize the effects of the blasting that is required.

- Blast monitoring shall be conducted at appropriate locations. Monitoring may be required at the edge of the proposed cell, at the location of monitoring wells, at the edge of clay liner of nearby landfill cells, at the edge of nearby structures, etc. Every effort shall be made to limit the peak particle velocity to 1 inch per second at the blast monitoring locations.

- A full, detailed report of the rock blasting activities shall be submitted to the Solid Waste Section within 30 days of the completion of the rock removal. The Licensed Blaster shall certify that the drill hole pattern, charge weights, and delays were selected in such a manner as to minimize the amount of energy which may impact underlying rock.

- A Professional Engineer shall certify that rock blasting was kept to a minimum and that controlled blasting techniques were used to minimize the effects of blasting to the underlying bedrock.

- The report of blasting activities shall also include a discussion by a Licensed Professional Geologist on the effect of heavy ripping and/or blasting on the ground-water flow regime at the site. Additional subsurface investigation may be required to determine the effect of heavy ripping and/or blasting on the hydrogeology of the area.

- During and after excavation of the area and prior to backfilling with soil, the Licensed Professional Geologist shall evaluate the excavation for any evidence of structural features that could influence ground-water flow (fractures, dikes, pegmatites, etc.) The Solid Waste Section shall be informed of when the excavation will be completed, so a Section Hydrogeologist may schedule a site visit to inspect the area. The report of blasting activities shall include a report by the Licensed Professional Geologist on the evaluation of the excavated area and recommendations of any modifications that may be needed to the ground-water monitoring system based on this evaluation.

- If modifications to the water quality monitoring plan are necessary, based upon the evaluation of the excavation area or additional subsurface investigation, a revised monitoring plan shall be submitted by the Licensed Professional Geologist to the Solid Waste Section for review.

- The Professional Engineer shall include a discussion in the CQA Report of the location and nature of the rock blasting and the backfill of the over-excavation. This shall be included as part of the certification of the subgrade.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

REPORT OF GEOLOGIC OBSERVATION OF ROCK BLASTING IN PHASE 3

WHITE OAK LANDFILL
HAYWOOD COUNTY, NORTH CAROLINA

PERMIT NO. 44-07

PREPARED FOR:

McGill ASSOCIATES

MCGILL ASSOCIATES
ASHEVILLE, NORTH CAROLINA

PREPARED BY:

BUNNELL-LAMMONS ENGINEERING, INC.
GREENVILLE, SOUTH CAROLINA

NOVEMBER 20, 2009

BLE Project Number J09-1957-10

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

November 20, 2009

McGill Associates
55 Broad Street
Asheville, North Carolina 28801

Attention: Mr. Jeff Bishop, P.E.

Subject: **Report of Geologic Observation of Rock Blasting in Phase 3**
White Oak Landfill
Haywood County, North Carolina
Permit No. 44-07
BLE Project Number J09-1957-10

Dear Mr. Bishop,

As authorized, by McGill Associates (McGill) acceptance of our proposal number P09-0658 dated October 7, 2009, Bunnell-Lammons Engineering, Inc. (BLE) performed field geologic observation after blasting activities at the subject site. The purpose of this work was to conduct geologic observations of the areas of the site where rock blasting was performed and to prepare a report of our findings. The enclosed report describes the work performed and presents the results obtained.

1.0 PROJECT INFORMATION

The following project information was obtained from conversations with Mr. Bill Sperry, P.E. of McGill, documents provided by McGill and from site data (in BLE's project records) from our current services contract with Haywood County.

The existing 286-acre White Oak Municipal Solid Waste (MSW) Landfill facility is located in Haywood County, North Carolina, approximately 12 miles north of Waynesville at the Fines Creek Exit (Exit 15) off of Interstate 40 (Figure 1). Haywood County owns and operates the White Oak Landfill which is currently being expanded in the areas designated Phases 3 & 4. McGill has been retained by Haywood County to provide engineering services related to the expansion of the landfill.

We understand that "unrippable" rock was encountered at the site above proposed landfill base grades. McGill submitted a *Rock Delineation and Blasting Plan* for the subject site which was approved by the Solid Waste Section (SWS) of the NCDENR. McGill requested that BLE conduct geologic observations and prepare a report in accordance with the approved blasting plan.

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29615
PHONE (864) 288-1265
FAX (864) 288-4430

2.0 SITE GEOLOGY

The subject site is located within the Blue Ridge Belt. The crystalline rocks of the Blue Ridge occur in generally northeast-southwest trending geologic belts in the Carolinas and Virginia. Precambrian-age (Proterozoic) basement complexes of metamorphosed igneous and sedimentary rocks underlie the region (Hadley and Goldsmith, 1963; Horton and Zullo, 1991). The site is underlain by the Middle to Late Proterozoic-aged Spring Creek Granitoid Gneiss, which are metamorphosed-igneous rocks. The multiple metamorphic deformations of the igneous rocks have resulted in biotite granitic gneiss interlayered with biotite granodiorite gneiss, tonalitic gneiss, quartz monzodiorite gneiss, amphibolite, biotite gneiss, and biotite schist (Carter and Weiner, 1999). Late Proterozoic-aged Great Smoky Group has been mapped southeast of the facility boundary, which are metamorphosed-sedimentary rocks. The multiple metamorphic deformations of the sedimentary rocks have resulted in metagraywache, with lesser amounts of locally interbedded kyanite-garnet-mica schist, garnet-mica schist, and calc-silicate granofels (Carter and Weiner, 1999). In the vicinity of the site, bedding and foliation generally strike northeast-southwest and dips moderately to the southeast. Structurally, the contact between the Spring Creek Granitoid Gneiss and the Great Smoky Graywacke is mapped as a thrust fault in which the Great Smokey formation overlies the Spring Creek formation (Carter and Weiner, 1999).

Holocene and younger age faults were not indicated on site or within 200 feet of the site from the literature review or from the field reconnaissance.

The typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands. Residual soil zones develop by the in situ chemical weathering of bedrock, and are commonly referred to as "saprolite." Saprolite usually consists of silt with lesser amounts of sand, clay, and large rock fragments. The thickness of the saprolite in the Piedmont ranges from a few feet to more than 100 feet. The boundary between soil and rock is not sharply defined.

A transitional zone of partially weathered rock is normally found overlying the parent bedrock. Partially weathered rock is defined, for engineering purposes, as residual material with standard penetration resistance in excess of 100 blows per foot (bpf). Fractures, joints, and the presence of less resistant rock types facilitate weathering. Consequently, the profile of the partially weathered rock and hard rock is quite irregular and erratic, even over short horizontal distances. Also, it is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

3.0 FIELD OBSERVATIONS

Mr. Benjamin P. Nisbeth, P.G. of BLE visited the site on October 23, 2009 and November 4, 2009 after blasting activities were completed. During these visits, the exposed ground surface was observed to identify potential anomalous geologic features not identified during previous geologic investigations. The October site visit was conducted before the blast rock was removed and before rough grading for the subgrade of the Phase 3 area had begun. The November site visit was conducted after the blast zone had been rough graded to the design elevation. Site observations are summarized below and are shown on the attached Photographs 1 through 6.

The blast zone was located in the northern half of Phase 3 along the western limits of the area (Figure 2, Photo No. 4). The blasting reduced the near-surface boulders and bedrock in size to rock fragments that could be removed by conventional excavating equipment (Photos No. 1 and No. 2). Sandy-silt and silty-sand residual soils, partially weathered rock, and fractured rock that could be excavated to achieve the desired grade were encountered below the boulder-rock mass (Photo No. 5).

Several small boulders/pinnacles of bedrock were exposed above the desired grade along the south end of the blast zone (Photos No. 3 and No. 6). In a conversation with the grading contractor, it was indicated that the small boulders/pinnacles of rock were to be removed using conventional excavation equipment (track-hoe mounted hydraulic hammer and excavator). We did not observe attempts to excavate the rock; however, we understand that the rock was successfully removed after our last site visit. Other than the noted rock, no other pertinent geologic features were observed at the site.

The soils and partially weathered bedrock, and rock were observed to be consistent with those found in the borings performed during previous site investigations.

4.0 CONCLUSIONS & RECOMMENDATIONS

Bedrock/boulders were encountered at elevations above the proposed subgrade. A limited amount of rock blasting was performed in the immediate area of the bedrock/boulders and the rock mass was removed. No exposed pertinent geologic features were observed in the Phase 3 area subgrade which were different from that encountered at the site during previous site investigations by BLE.

The rock blasting did not significantly alter the groundwater flow regime since the blasting was restricted to shallow depths below ground surface. The effects of blasting were limited to the immediate vicinity of the rock mass. Therefore, we conclude that modification of the existing *Water Quality Monitoring Plan* is not necessary.

We understand that this report will be submitted as part of the CQA report which will be prepared by others. We also understand that the blast vibration monitoring was completed by others and will also be submitted as part of the CQA report.

5.0 CLOSING

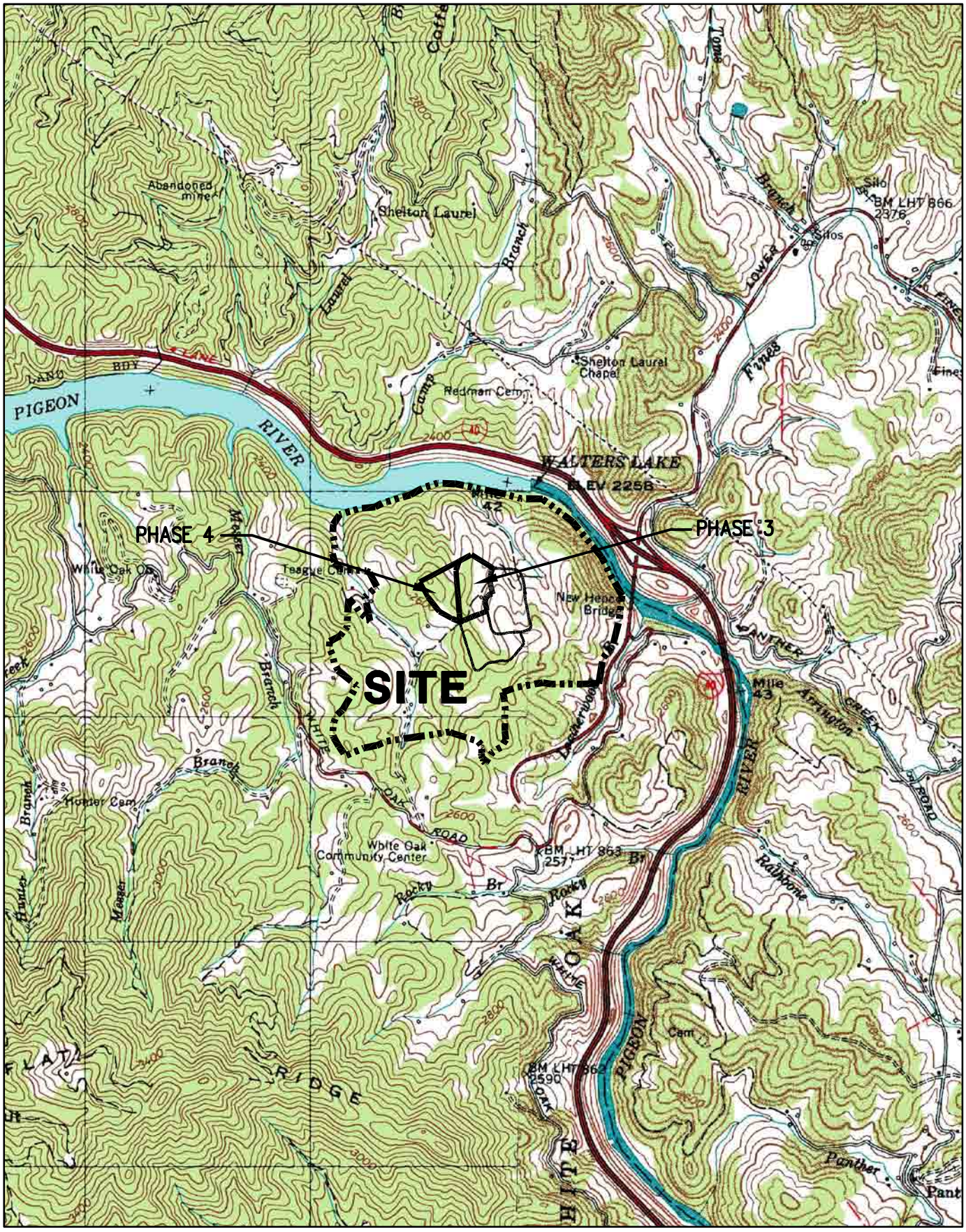
We appreciate the opportunity to serve as your environmental consultant on this project. Please contact us at (864) 288-1265 if you have any questions or comments regarding this report.

Sincerely,
BUNNELL-LAMMONS ENGINEERING, INC.

Benjamin P. Nisbeth, P.G.
Staff Geologist
Registered, North Carolina #2134

Andrew W. Alexander, P.G., RSM
Senior Hydrogeologist
Registered, North Carolina #1475

FIGURES

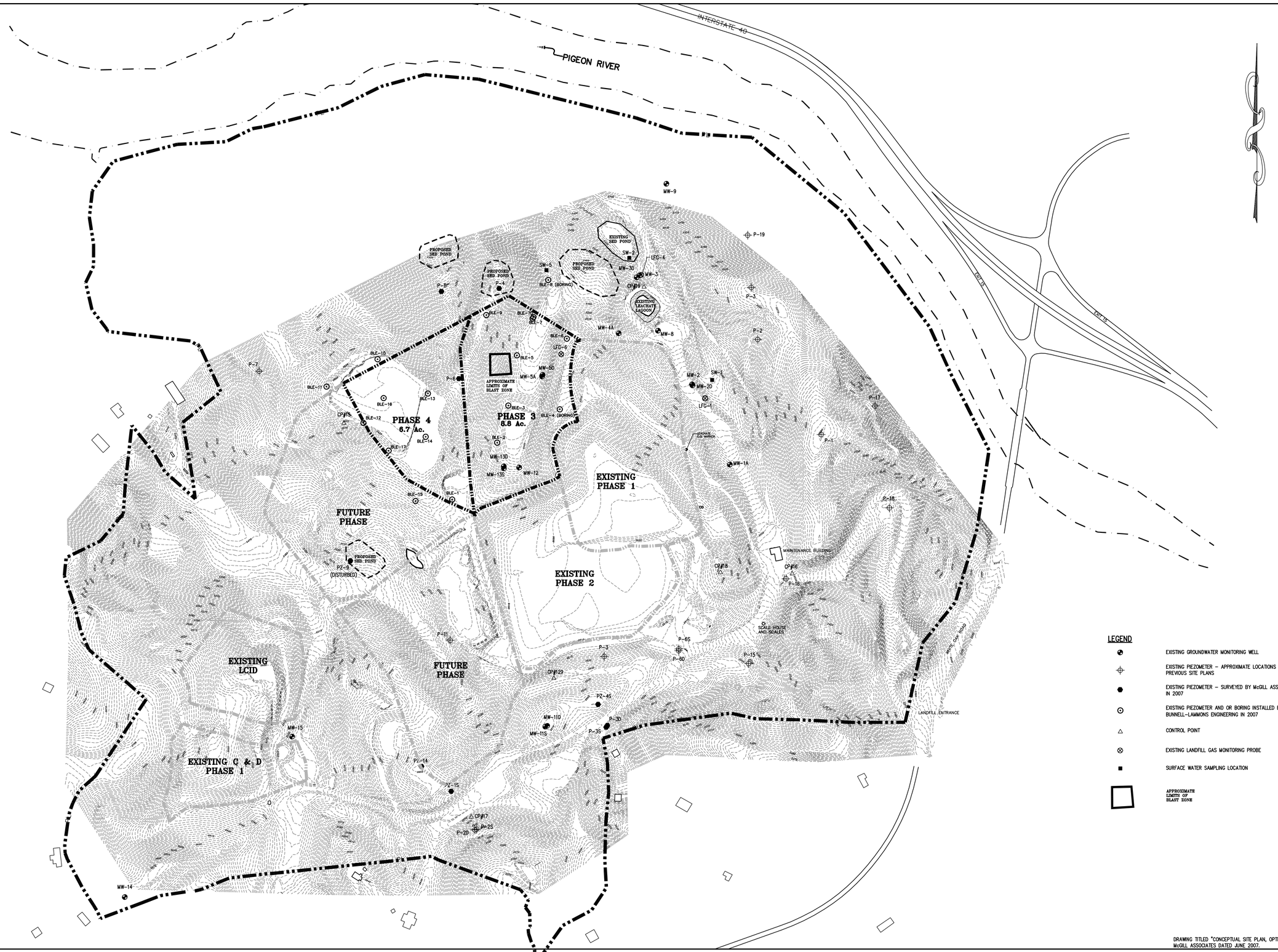


2000 1000 0 2000 4000

APPROXIMATE SCALE IN FEET

REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES,
COVE CREEK GAP AND FINES CREEK, N.C. QUADRANGLES, 1967.

DRAWN: AEH	DATE: 11-19-09	BLE inc. BUNNELL-LAMMONS ENGINEERING, INC. 6004 PONDERS COURT GREENVILLE, SOUTH CAROLINA 29615 PHONE: (864)288-1265 FAX: (864)288-4430	FIGURE
CHECKED: MSP	CAD: HCWOLF-10 SLM	**SITE LOCATION MAP** WHITE OAK LANDFILL HAYWOOD COUNTY, NORTH CAROLINA	1
APPROVED:	JOB NO: J09-1957-10		



DRAWING TITLED "CONCEPTUAL SITE PLAN, OPTION 1 & 2" BY McGILL ASSOCIATES DATED JUNE 2007.

REVISIONS		
No.	DESCRIPTION	BY

DRAWN:	AEH
CHECKED:	AWA
APPROVED:	

DATE:	11-19-09
CAD FILE:	HCWOLF-10 SMBZ
JOB NO:	J09-1957-10

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.
6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29615
PHONE: (864)288-1265 FAX: (864)288-4430

SITE MAP WITH APPROXIMATE BLASTING ZONE LIMITS

WHITE OAK MSW LANDFILL
HAYWOOD COUNTY, NORTH CAROLINA

FIGURE NO. 2

APPENDICES

APPENDIX A

PROJECT PHOTOGRAPHS

Photo No. 1 – Picture of Blast Zone prior to rough grading, looking southwest. Taken on 10/23/2009.

Photo No. 2– Picture of blast rock, looking Northwest from southeast corner of the Blast Zone. Taken on 10/23/2009.

Photo No. 3 – Picture of the south edge of Blast Zone showing exposed rock/boulders above base grades, looking West. Taken on 11/04/09.

Photo No. 4 – Picture of Blast Zone in Phase 3, looking West. Taken on 11/04/09.

Photo No. 5 – Picture of boulders and rock fragments near North edge of Blast Zone, looking Northwest. Taken on 11/04/09.

Photo No. 6 – Picture of exposed boulder/rock pinnacle near south edge of Blast Zone, looking Northeast. Taken on 11/04/09.

Section 9

I, ALOIS CALLEMYN, PLS, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA, AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 25 DAY OF APRIL, 2010

.

ALOIS CALLEMYN, PLS LICENSE NO. L-2544

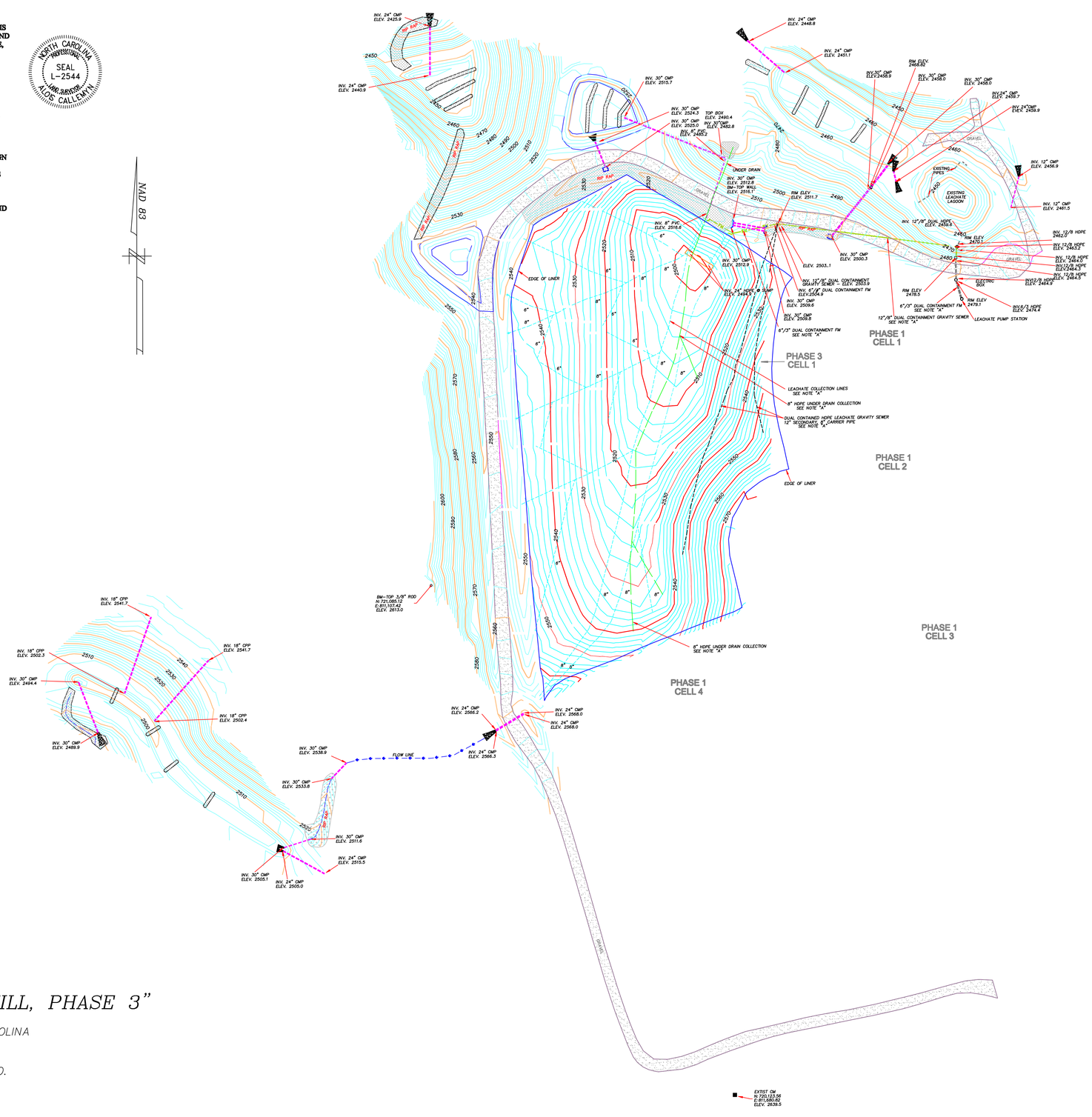
THE UNDERSIGNED HEREBY CERTIFIES THAT HE/SHE IS A PROFESSIONAL ENGINEER/PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF NORTH CAROLINA AND THAT HE/SHE HAS BEEN EMPLOYED BY THALLE CONSTRUCTION CO. TO DESIGN _____
IN ACCORDANCE WITH SPECIFICATION SECTION _____
FOR THE "WHITE OAK MSW LANDFILL, PHASE 3". THE UNDERSIGNED FURTHER CERTIFIES THAT HE/SHE HAS PERFORMED THE DESIGN OF THE _____
_____, THAT SAID DESIGN IS IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL CODES, RULES AND REGULATIONS, AND THAT HIS/HER SIGNATURE AND P.E/P.L.S STAMP HAS BEEN AFFIXED TO ALL CALCULATIONS AND DRAWINGS USED IN, AND RESULTING FROM, THE DESIGN.

THE UNDERSIGNED HEREBY AGREES TO MAKE ALL ORIGINAL DESIGN DRAWINGS AND CALCULATIONS AVAILABLE TO HAYWOOD COUNTY OR OWNER'S REPRESENTATIVE WITHIN FIVE WORKING DAYS FOLLOWING WRITTEN REQUEST THEREFOR BY THE OWNER.

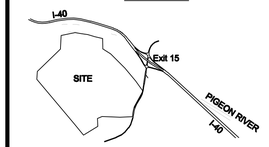
ALOIS CALLEMYN, PLS
3500 JUSTAMERE FARM ROAD, HILLSBOROUGH, NC 27278

NORTH CAROLINA PROFESSIONAL SEAL L-2544 LAND SURVEYOR ALOIS CALLEMYN

NAD 83



VICINITY MAP



NOT TO SCALE

NOTE:
EXISTING TOPOGRAPHICAL INFORMATION AND CONTROL DATA INFORMATION TAKEN FROM PLANS ENTITLED "WHITE OAK MSW LANDFILL CONSTRUCTION DRAWINGS, MSW PHASE 3", DATED MARCH, 2009 BY MCGILL ASSOCIATES.

ALL NEW DATA AND ASBUILT CONTOUR LINES SHOWN ON THIS SURVEY ARE TIED TO NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NAD 1983 (HORIZONTAL) AND NAVD-88 (VERTICAL).

NOTE "A"
THE LOCATION OF UNDERGROUND UTILITIES AS SHOWN ARE BASED ON VISIBLE EVIDENCE AND DRAWINGS PROVIDED TO THIS SURVEYOR. ALL DASHED LINES SHOWN HEREON WERE DRAWN FROM DATA SUPPLIED BY THALLE SURVEY DEPARTMENT.

NOTE "B"
ALL DISTANCES ARE HORIZONTAL GROUND, EXCEPT THOSE SHOWN AS GRID AND AREA IS BY COORDINATE COMPUTATIONS.

NOTE "C"
ALL FIELD DATA AND CADD FILES WERE REVIEWED AND APPROVED AS CORRECTLY SHOWING THE EXISTING CONDITIONS BY BOB WEISSE AND EVAN MONROE OF THALLE SURVEY DEPARTMENT.

RECORD DRAWING FOR

WHITE OAK MSW LANDFILL, PHASE 3"

HAYWOOD COUNTY, NORTH CAROLINA
APRIL, 2010
THALLE CONSTRUCTION CO.

SCALE 1" = 100'
100' 0 100' 200'

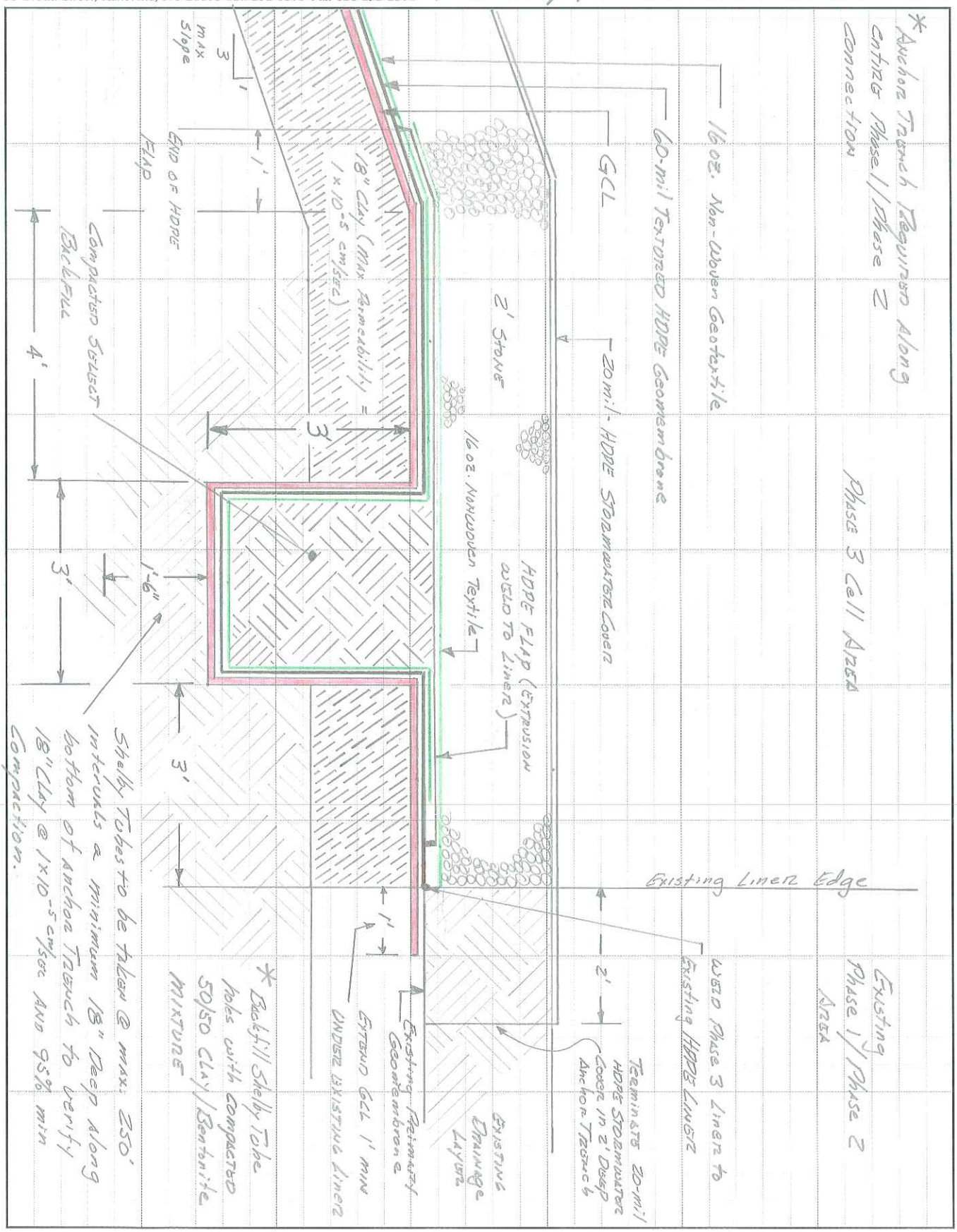
ALOIS CALLEMYN
PROFESSIONAL LAND SURVEYOR

3500 JUSTAMERE FARM ROAD
HILLSBOROUGH, NC 27278
919-732-3354
ALOIS@CALLEMYN.COM

Section 10

McGill ASSOCIATES
Engineering • Planning • Finance
McGill Associates, P.A. P.O. Box 2259, Asheville, NC 28802
55 Broad Street, Asheville, NC 28801 828-252-0575 Fax 828-252-2518

PROJECT: White Oak MSW LANDFILL - Phase 3
PROJECT NO.: 07510
DESCRIPTION: Phase 3/Phase 1-2 Liner Connection
CALCULATED BY: WHS CHECKED BY:
DATE: 11/2/09 SHEET NO. 1 OF 1



Jeff Bishop

From: Jeff Bishop [jbishop@mcgillengineers.com]
Sent: Friday, December 11, 2009 4:18 PM
To: 'Allen Gaither'
Subject: FW: DRAFT pdf's of revisions to PTC to include an additional GCL over the anchor trench adjacent to the MSW Phase 2 sump area
Attachments: 07518-C3A-Phase-3-Subgrade-REV12-11-09.pdf; 07518-Miscellaneous-Details-REV12-11-09.pdf

Allen, if you have a minute, I would like to discuss these drawings with you.

McGill ASSOCIATES

Jeffrey R. Bishop, P.E.
Senior Project Manager
McGill Associates, P.A.
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From: David Pasko [mailto:dpasko@mcgillengineers.com]
Sent: Friday, December 11, 2009 3:04 PM
To: jbishop@mcgillengineers.com
Subject: DRAFT pdf's of revisions to PTC to include an additional GCL over the anchor trench adjacent to the MSW Phase 2 sump area

PHASE 4
PHASE 3
PHASE 2
PHASE 1
PHASE 1
PHASE 1
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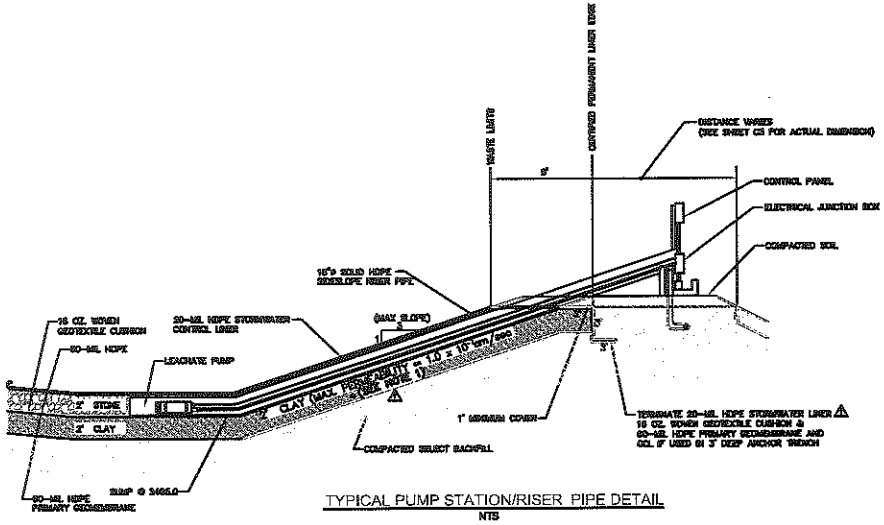
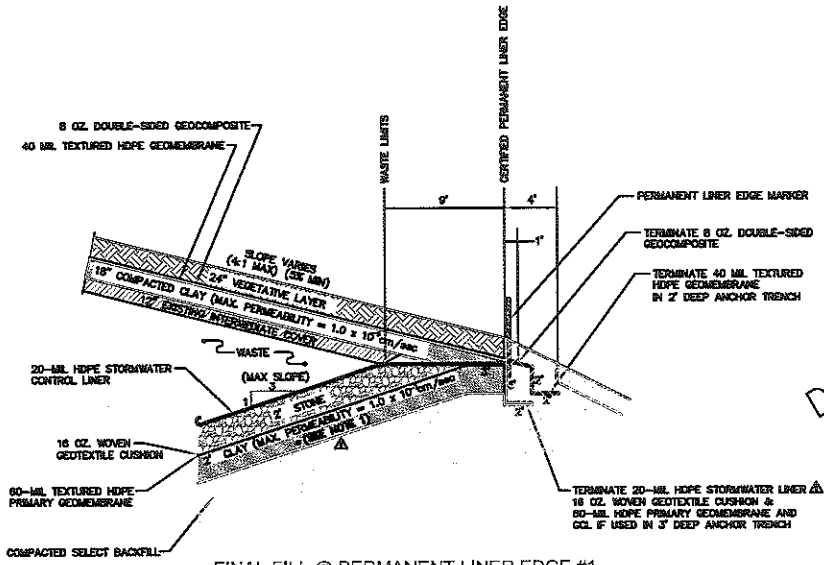
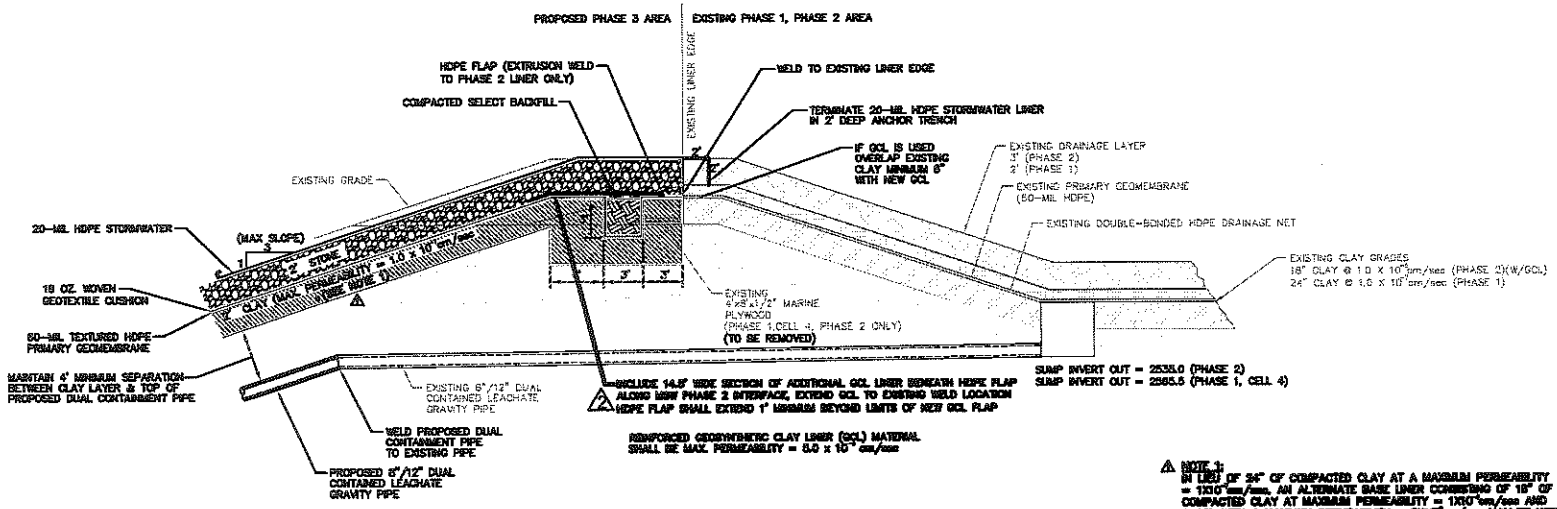


TYPICAL PUMP STATION/RISER PIPE DETAIL
NTS



FINAL FILL @ PERMANENT LINER EDGE #1
NTS



CONNECTION TO EXISTING PHASE 1 & PHASE 2 LINER EDGE
NTS

⚠ NOTE 1:
IN LIEU OF 24" OF COMPACTED CLAY AT A MAXIMUM PERMEABILITY = 1X10⁻⁷cm/sec, AN ALTERNATE BASE LINER CONSISTING OF 18" OF COMPACTED CLAY AT MAXIMUM PERMEABILITY = 1X10⁻⁷cm/sec AND A GCL WITH A MAXIMUM PERMEABILITY = 5X10⁻⁹cm/sec MAY BE USED, AS SHOWN ON SHEET D5.

NO.	DATE	BY	REVISION DESCRIPTION
2	12/11/09	DP	REVISED TO INCLUDE ADDITIONAL GCL FLAP
1	9/11/09	KS	REVISED FOR ALTERNATE BASE LINER

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DRAFT

WHITE OAK MSW LANDFILL
PERMIT TO CONSTRUCT
MSW PHASES 3 & 4
HAYWOOD COUNTY
HAYWOOD COUNTY, NORTH CAROLINA

MISCELLANEOUS DETAILS

SHEET
D6

Bill Sperry

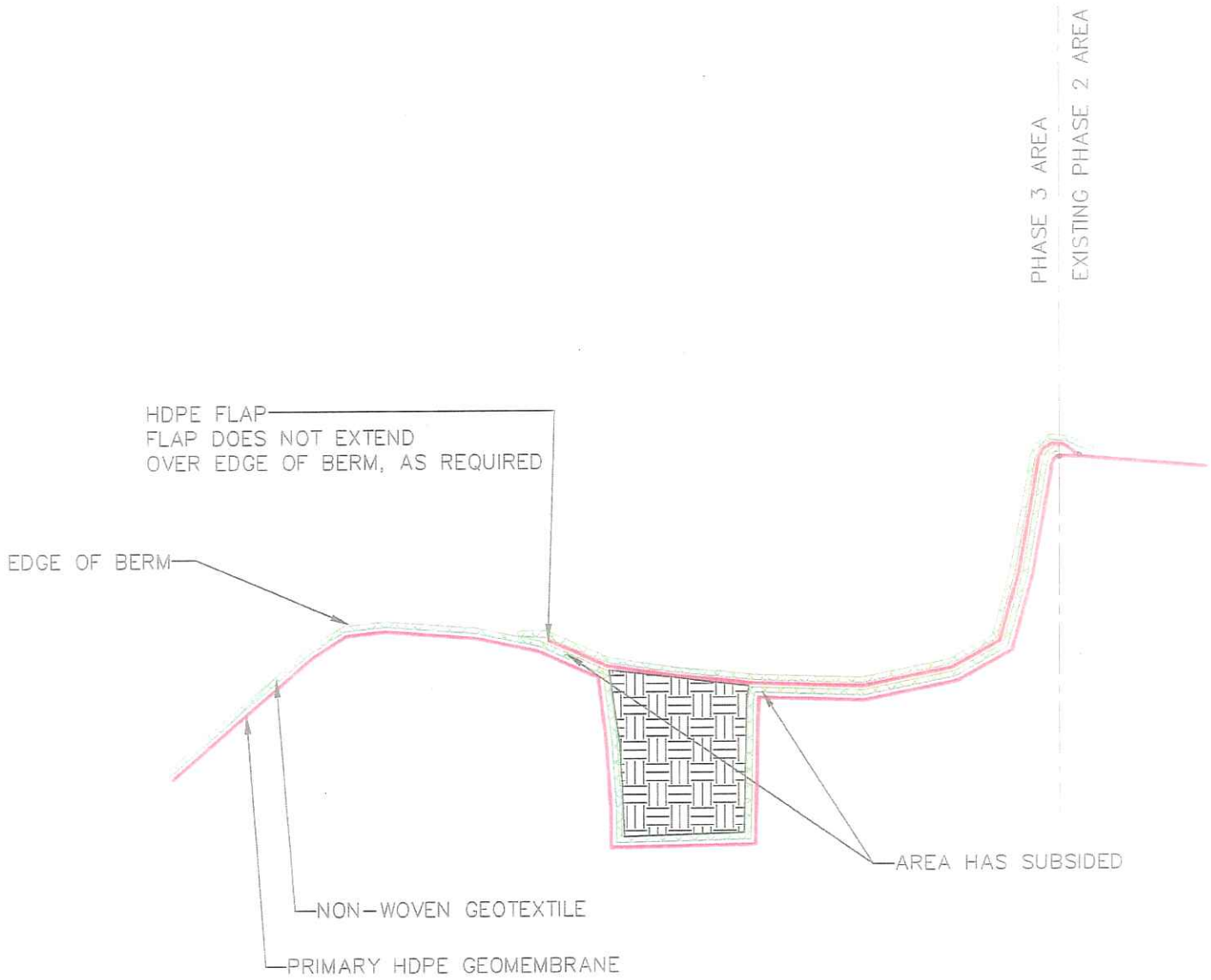
From: Dave Pasko [dpasko@mcgillengineers.com]
Sent: Wednesday, April 14, 2010 5:22 PM
To: 'Keith Vess'
Cc: 'Chris Haverstrom'; roy@mcgillengineers.com; 'Hannu Kemppinen'; 'Sperry, Bill (McGill)'; 'Sarah McKee'
Subject: Installation of GCL at Phase 2/Phase 3 Interface
Attachments: Existing Conditions 4-14-10.pdf; Suggested Repair 4-14-10.pdf

Keith,

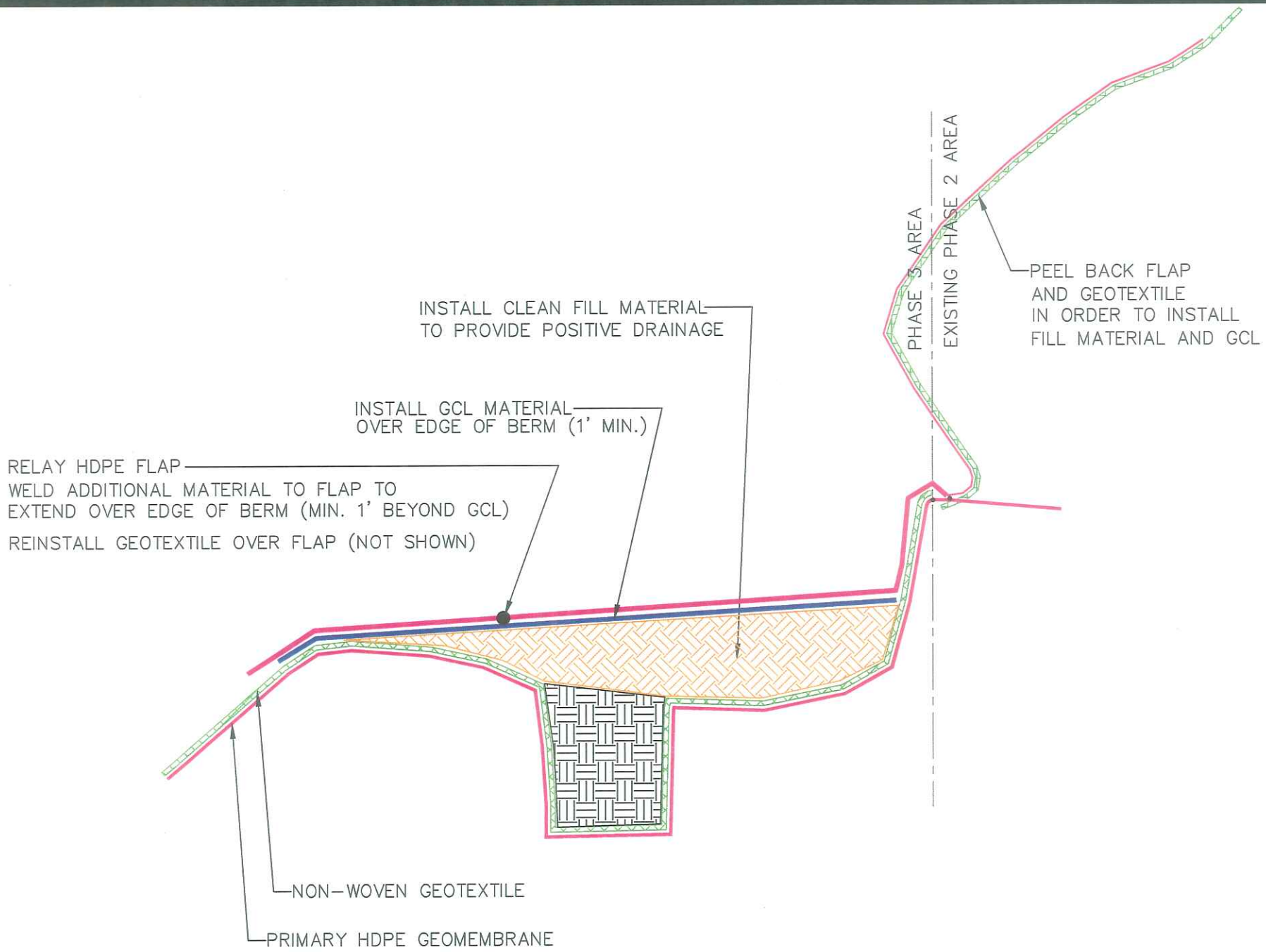
We had a look today in the vicinity where the GCL is to be installed near the Phase 2 interface and the area is not quite ready for Halleton to do their work. Additional material will need to be removed so that Halleton can install the GCL, and then the HDPE flap will need to be extended over the GCL and over the edge of the berm. Also, the anchor trench has subsided in this area, creating a ponding area for leachate. We suggest adding clean fill dirt (free of stones) to create positive drainage to Phase 3, as shown on the attached sketches. Additionally, drainage layer stone in this area does not meet the project requirements for fine materials, and will require removal. We would like to talk with you for strategies for removing this stone.

We're near the finish line, let's make this happen. Please give me or Bill Sperry a call if you wish to discuss this and let us know when you plan to install the GCL.

Dave Pasko
McGill Associates
828/252-0575



EXISTING CONDITIONS 4/14/10



SUGGESTED REPAIR OF AREA