

AMENDMENT TO PERMIT

MUNICIPAL SOLID WASTE AND CONSTRUCTION AND DEMOLITION LANDFILL FACILITIES

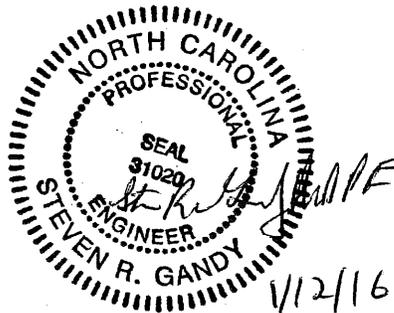
Permit Numbers: 9606-MSWLF-1998
9601-CDLF-1997

Site Location: 460B South Landfill Rd.
Dudley, NC 28333

Applicant: County of Wayne

Applicant's Address: 224 E. Walnut St., 3rd Floor
Goldsboro, NC 27530

MESCO Project Number
G15124



January 2016

Submitted by the Garner Office of:



MUNICIPAL ENGINEERING SERVICES CO., P.A.

TRANSMITTAL

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TO Mr. Ming-Tai Chao, PE
NCDEQ
Solid Waste Section
217 West Jones Street
Raleigh, NC 27603

DATE	1/12/2016	PROJ. NO.	G15124
ATTENTION	Mr. Ming-Tai Chao		
RE:	Wayne County MSW and C&D Landfill		
	Permit Amendment		

Please find enclosed:

COPIES	DATE	NO.	DESCRIPTION
1	1/12/2016		Permit Amendment Book
1	"		CD with Electronic copy (inside front of book)
1			Updated Landfill Gas Monitoring Plan and CD with Electronic Copy

If you have any questions or need any additional info please give us a call.

TRANSMITTED BY: Lisa H. Crawford, Garner Office

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PART 1 (MSWLF):

SECTION 1.0

ENGINEERING PLAN

1.1 Analysis of the Facility Design and Landfill Capacity

The Wayne County Municipal Solid Waste Landfill Facility (MSWLF), Permit number 96-06, was originally permitted in 1998. The county currently has three Municipal Solid Waste(MSW) phases of operation permitted: Phase 1, Phase 2 and Phase 3. The County also has two phases of Construction and Demolition Landfill (C&DLF) permitted. The County is proposing a vertical expansion, Phase 4, on the existing permitted area of the MSWLF and a vertical expansion, Phase 3, of the existing permitted C&DLF.

The MSW Facility consists of approximately 168.5 acres. This facility was originally designed and approved in 1998 (Phase 1), 2004 (Phase 2) and 2013 (Phase 3).

The facility consists of the Municipal Solid Waste Landfill (MSWLF) and a Construction and Demolition Landfill (C&D). In addition to these elements several things are processed at the facility. Processing includes storage, separation and/or grinding but not disposal of the materials processed. The processing facilities consist of Public Drop-off Area, Scrap Tire Storage, White Goods/Appliance Storage, Recycling Facility and Yard Waste.

The MSWLF unit is located a minimum of 300' from the property lines, 500' from existing wells, and 100' from any stream, river or lake, and the post settlement subbase elevation was prepared a minimum of four feet above the seasonal high groundwater table and bedrock. The liner system consists of a 60 mil HDPE geomembrane liner which was installed above and in direct uniform contact with a geosynthetic clay liner and compacted clay liner.

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches bridging material (temporary cover), 18 inches of soil liner with a permeability no greater than 1.0×10^{-5} cm/sec, 40 mil Linear Low Density Polyethylene (LLDPE), drainage layer, 24 inches of protective/erosive layer. All depths shall be measured perpendicular to the slope surface. The cap contains gas venting system consisting of a series of washed stone trenches below the soil liner that will be vented through pipes with membrane boots that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices.

Landfill Capacity

The Life Expectancy calculations were calculated for Phase 4 of development (vertical expansion on Phases 2 and 3). Existing Phases 1, 2 and 3 combined are approximately 65 acres in size. Each successive phase will vary in size due to the vertical expansion above the previously filled areas. The current footprint (65 acres) has a permitted total capacity of 5,365,695 cubic yards.

LIFE EXPECTANCY CALCULATIONS PHASE 4

Given:

Life expectancy is based on actual air space used from FY 2014-2015, which was 101,959 cubic yards.

Therefore using 101,959 cubic yards the first year and the waste stream growing at a 0.83% rate which is the same annual rate the population had grown between 1990 and 2000.

Phase 4 = 561,630 cubic yards available = 5.51 years

Soil requirements for daily cover and final cap for Phase 4
(on top of Existing Phase 2 and Phase 3)

Soil needed for Daily Cover (8:1, trash:soil) = 62,403 cubic yards
Soil needed for Closure (65 acres) = 471,900 cubic yards

Soil requirements for daily cover and final cap for Phases 1-8 (proposed 5,365,695 cubic yards of waste)

Soil needed for Daily Cover (8:1, trash:soil) = 596,188 cubic yards

Soil needed for Closure (65 acres) = 471,900 cubic yards

Overall Soil Requirements = 1,068,088 cubic yards (soil needed for closure, and daily cover)

The County's property consists of approximately 168.5 acres, of which, 143.5 acres is used for landfilling (active and closed). As the need arises the County will construct additional borrow sites utilizing the remaining property.

Note: All air space and soil calculation were determined by Autodesk Land Development computer program.

MSW - ACTIVE/INACTIVE PHASING TABLE

PHASE	WASTE FOOTPRINT (ACRE)	GROSS CAPACITY (CUBIC YARDS)	STATUS
1, 2 and 3	65	2,538,681	ACTIVE
4	VERTICAL EXPANSION	561,630	NEW PTO REQUESTED
5	VERTICAL EXPANSION	575,270	TO BE DEVELOPED
6	VERTICAL EXPANSION	625,214	TO BE DEVELOPED
7	VERTICAL EXPANSION	649,015	TO BE DEVELOPED
8	VERTICAL EXPANSION	415,885	TO BE DEVELOPED
TOTAL	65	5,365,695	

The estimate of maximum inventory of MSW wastes on-site over the life to date of the landfill facility is 1,355,031 tons.

Estimated schedule of closure will be approximately 26 years.

1.1.1 Base Liner System Standards

The base liner system consists of a geomembrane liner which is installed above and in direct uniform contact with a compacted clay liner.

1. The site has met the following design requirements for Landfill subgrade.

The landfill subgrade was adequately free of organic material and consist of *in situ* soils.

2. The site has met the following material requirements for the Standard/Alternate Liner Systems.

The soil materials used in construction of the compacted clay liner may consist of on-site sources and possessed adequate native properties. The soil was free of particles greater than ¾ inch in dimension.

The compacted standard clay liner (Phases 1 and 2) are 24 inches thick (measured perpendicular to slope) with a permeability not to exceed 1.0×10^{-7} cm/sec.

The compacted alternate clay liner (Phase 3) is 18 inches thick (measured perpendicular to slope), with a permeability not to exceed 1.0×10^{-5} cm/sec. and is overlain by a Geosynthetic Clay Liner (GCL) and a geomembrane liner.

The geomembrane liner material is high density polyethylene geomembrane with a thickness of 60 mils., which has a demonstrated water vapor transmission rate of not more than 0.03 gm/m²-day. The liner and seaming materials have chemical and physical resistance not adversely affected by environmental exposure, waste placement and leachate generation.

3. The site has met the following design requirements for the Leachate Collection System.

The Leachate Collection System is designed with stone filled trenches, collection pipes and 0.6 cm double bonded drainage net that allows less than one foot of head on the liner.

The impingement rate on the drainage layer is at least equal to the peak monthly precipitation rate.

The geometry of the landfill controls and contains the volume of leachate generated by the 24-hour, 25-year storm.

The Leachate Collection System includes a pipe network with clean-outs, geotextile and filter fabrics.

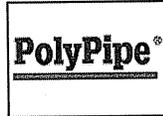
The Leachate Collection Piping has a minimum nominal diameter of six inches.

The chemical properties of the pipe and all materials used in installation shall not be adversely affected by waste placement or leachate generated by the landfill.

The pipe provides adequate structural strength to support the maximum static and dynamic loads and stresses imposed by the overlying materials and any equipment used in construction and operation of the landfill.

Strength of Pipe Calculations:

Rinker Materials PolyPipe Division Design and Engineering Guide for Polyethylene Piping



C Earthloading Critical Buckling

$$P_t = P_b + P_L + P_s$$

$$P_{cb} = \frac{1}{SF} \sqrt{\frac{2.67 \times B \times RW \times \Sigma_s \times \Sigma}{SDR^3}}$$

$$P_{cb} \geq P_t$$

See Page C-5 Thru C-8

09/17/2009

Rho	60	lbs/ft ³
H	200	ft
PL	21	psi
PS	0	psi
HW	5	ft
SF	2	
DR	17	
E	30000	psi
Es	3000	psi
Pt	104.33	psi
Pcb	110.12	

Variable descriptions

Note: If Pcb is less than Pt, critical buckling of the pipe may occur.

DR = standard dimension ratio

Pcb = critical buckling stress

SF = safety factor (recommend SF = 2)

Rw = water buoyancy factor

$Rw = (1 - (0.33 * hw/h))$

Note: hw must be less than h

H = height of soil cover above pipe

Hw = height of water table above pipe

B = empirical coefficient of elastic support
e = 2.718

Es = soil modulus (see table C-4)

E = pipe modulus of elasticity

Ps = surface load exerted by a permanent structure in close proximity to buried pipe. See page C-6 for value calculation

PL = live load exerted by heavy equipment on surface above the pipe. See page C-7 for table of values. If depth of bury is greater than 4ft. then H20 load is 3psi and E80 load is 21psi. For depth of bury greater than 10ft. E80 load is 9psi.

Rho = Density of backfill material

Using this CD for Design Purposes

Due to wide variations in service conditions, quality of installation, etc., no warranty or guarantee, expressed or implied, is given in conjunction with the use of the calculations and analytical solutions.

Select the appropriate soil modulus Es (psi). For crushed rock bedding use 3000 psi.



C Earthloading % Deflection

$$\% \text{ Deflection} = \frac{\Delta x}{D} \times 100$$

$$\text{where } \Delta x = \frac{DI \times K \times W}{\frac{2}{3} E + 0.81 \times E_s}$$

$$\text{where } W = \frac{C_d \times \rho \times B_d \times D}{144}$$

See Page C-4

09/17/2009

CD	3.0	
Rho	60	lbs/ft ³
Bd	2	ft
D	6.625	in
DR	17	
H	200	ft
DI	1.50	
K	0.1	
E	30000	psi
Es	3000	psi
W	16.563	psi
delta X	0.013546	
% deflection	0.20446	

Variable descriptions

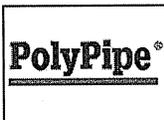
- W = earthload
- Cd = trench coefficient (See figure 15)
- Rho = soil density
- D = outside diameter of pipe
- DR = Standard Dimension Ratio
- Bd = trench width at top of pipe
- H = height of backfill above top of pipe
- delta x = vertical deflection of pipe
- DI = deflection lag factor (1.50)
- K = bending constant (0.10)
- E = modulus of pipe elasticity
- Es = soil modulus

Using this CD for Design Purposes

Due to wide variations in service conditions, quality of installation, etc., no warranty or guarantee, expressed or implied, is given in conjunction with the use of the calculations and analytical solutions. PolyPipe® has checked the calculations in this CD and to the best of our knowledge these calculations are accurate. However, users of this CD assume all responsibility for the accuracy of the analytical solutions. In all cases, third party verification or a licensed professional engineer should be consulted prior to any actual selection of product or material specification or use.

Contact our Technical Services Group at (800) 433-5632 for further assistance.

Maximum allowable safe deflection for flexible polyethylene pipe w/DR 17 is 5%.



C Earthloading % Deflection

$$\% \text{ Deflection} = \frac{\Delta x}{D} \times 100$$

$$\text{where } \Delta x = \frac{DI \times K \times W}{\frac{2E}{3 \times DR^3} + 0.01 \times E_s}$$

$$\text{where } W = \frac{C_d \times \rho \times B_d \times D}{144}$$

See Page C-4

09/17/2009

CD	3.0	
Rho	60	lbs/ft ³
Bd	2	ft
D	8.625	in
DR	17	
H	200	ft
DI	1.50	
K	0.1	
E	30000	psi
Es	3000	psi
W	21.563	psi
delta X	0.017635	
% deflection	0.20446	

Variable descriptions

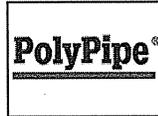
- W = earthload
- Cd = trench coefficient (See figure 15)
- Rho = soil density
- D = outside diameter of pipe
- DR = Standard Dimension Ratio
- Bd = trench width at top of pipe
- H = height of backfill above top of pipe
- delta x = vertical deflection of pipe
- DI = deflection lag factor (1.50)
- K = bending constant (0.10)
- E = modulus of pipe elasticity
- Es = soil modulus

Using this CD for Design Purposes

Due to wide variations in service conditions, quality of installation, etc., no warranty or guarantee, expressed or implied, is given in conjunction with the use of the calculations and analytical solutions. PolyPipe® has checked the calculations in this CD and to the best of our knowledge these calculations are accurate. However, users of this CD assume all responsibility for the accuracy of the analytical solutions. In all cases, third party verification or a licensed professional engineer should be consulted prior to any actual selection of product or material specification or use.

Contact our Technical Services Group at (800) 433-5632 for further assistance.

Maximum allowable safe deflection for flexible polyethylene pipe w/DR 17 is 5%.



C Earthloading % Deflection

$$\% \text{ Deflection} = \frac{\Delta x}{D} \times 100$$

$$\text{where } \Delta x = \frac{D \times K \times W}{\frac{2 E}{3 \times \text{DR}^3} + 0.81 \times E_s}$$

$$\text{where } W = \frac{C_d \times \rho \times B_d \times D}{144}$$

See Page C-4

09/17/2009

CD	3.0	
Rho	60	lbs/ft ³
Bd	2	ft
D	10.75	in
DR	17	
H	200	ft
DI	1.50	
K	0.1	
E	30000	psi
Es	3000	psi
W	26.875	psi
delta X	0.02198	
% deflection	0.20446	

Variable descriptions

- W = earthload
- Cd = trench coefficient (See figure 15)
- Rho = soil density
- D = outside diameter of pipe
- DR = Standard Dimension Ratio
- Bd = trench width at top of pipe
- H = height of backfill above top of pipe
- delta x = vertical deflection of pipe
- DI = deflection lag factor (1.50)
- K = bending constant (0.10)
- E = modulus of pipe elasticity
- Es = soil modulus

Using this CD for Design Purposes

Due to wide variations in service conditions, quality of installation, etc., no warranty or guarantee, expressed or implied, is given in conjunction with the use of the calculations and analytical solutions. PolyPipe® has checked the calculations in this CD and to the best of our knowledge these calculations are accurate. However, users of this CD assume all responsibility for the accuracy of the analytical solutions. In all cases, third party verification or a licensed professional engineer should be consulted prior to any actual selection of product or material specification or use.

Contact our Technical Services Group at (800) 433-5632 for further assistance.

Maximum allowable safe deflection for flexible polyethylene pipe w/DR 17 is 5%.

The Geosynthetic filter materials have adequate permeability and soil particle retention, and chemical and physical resistance which is not adversely affected by waste placement, and overlying material or leachate generated by the landfill.

All calculations for Sliding Block Stability Analysis, Foundation Settlement Calculations were provided by ECS Carolinas, LLP, in Phases 1, 2 and 3 Permit Applications.

1.1.2 Horizontal Separation Requirements

1. The MSWLF units are located a minimum of 300' from the property lines.
2. The MSWLF units are located a minimum of 500' from existing residences/wells.
3. The MSWLF units are located a minimum of 100' from any stream, river, or lake.

1.1.3 Vertical Separation Requirements

The MSWLF units were constructed so that post settlement bottom elevation of the base liner system is a minimum of four feet above the seasonal high ground-water table and bedrock.

1.1.4 Location Coordinates and Survey Control

Survey control coordinates are shown on the drawings and any additional information will be furnished upon request. Any location surveys will be performed by North Carolina Professional Land Surveyor.

1.1.5 Sedimentation and Erosion Control Plan

The Sedimentation and Erosion control plan was completed for the 24-hour, 25-year storm and submitted with Phases 1, 2 and 3 Permit Applications.

1.1.6 Cap System Standards

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches bridging material (temporary cover), 18 inches of soil liner with a permeability no greater than 1.0×10^{-5} cm/sec, 40 mil Linear Low Density Polyethylene (LLDPE), drainage layer, 24 inches of protective/erosive layer. All depths shall be measured perpendicular to the slope surface. The cap contains a gas venting system that consists of a series of washed stone trenches below the soil liner that will be vented through pipes with membrane boots that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices.

Prior to beginning closure, the County will notify the Division of Waste Management that a notice of the intent to close the unit has been placed in the operating record. The County will begin closure activities no later than thirty (30) days after the date on which the landfill receives the final wastes or if the landfill has remaining capacity and there is a reasonable likelihood that the landfill will receive additional wastes, no later than one year after the most recent receipt of wastes. Extensions beyond the one-year deadline for beginning closure may be granted by the Division of Waste Management if the County demonstrates that the landfill has the capacity to receive additional waste and the County has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the closed landfill.

The County will complete closure activities in accordance with the closure plan within 180 days following the final receipt of waste. Extensions of the closure period may be granted by the Division of Waste Management if the County demonstrates that closure will, of necessity, take longer than one hundred eighty (180) days and the County has taken and will continue to take all steps to prevent threats of human health and environment from the enclosed landfill.

Following closure of the landfill, the County will record a notation on the deed to the landfill property and notify the Division of Waste Management that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed will in perpetuity notify any potential purchaser

of the property that the land has been used as a landfill and its use is restricted under the closure plan approved by the Division of Waste Management. The County may request permission from the Division to remove the notation from the deed if all waste is removed from the landfill.

1.1.7 Leachate Storage Requirements

The County's existing leachate lagoon was designed and built with a minimum of two feet of freeboard. Odor and vector controls are practiced when necessary. A groundwater monitoring system has been installed. The lagoon is protected from external damage by an 8' high chain link fence.

The management of leachate is a major daily operational task. The generation of leachate should always be kept to a minimum. The leachate that is generated will be pumped to the City of Goldsboro Wastewater Treatment Plant. The leachate is treated according to the pre-treatment agreement with the City of Goldsboro. The reason for this testing is to assure the City that the leachate will not harm the biological processes in their treatment facility. The County also records rainfall events as they occur and leachate generation to track the effect rainfall amounts have on the amount of leachate that is generated.

The leachate will be collected in the existing double lined lagoon, which will hold approximately 1,012,029 gallons at 8 feet deep. The Lagoon is 10 feet deep which allows for 2 feet of free board. In the event that the lagoon fills up faster than it can be pumped by forcemain to the City of Goldsboro WWTP, the control valves on the leachate lines can be turned off which will allow the lagoon to be drawn down. Once the leachate levels have been lowered, the valves can be opened. Leachate will be a management problem from the time the garbage is placed in the landfill until long after closure has taken place. Consequently, it is imperative that stormwater be diverted away from any solid waste and managed properly.

All stormwater falling outside of the existing lined areas will be diverted away from the lined section through the use of diversion berms and ditches. Stormwater that falls within the lined area but does not come in contact with solid waste can be diverted to the perimeter areas of the landfill.

The County will close the leachate lagoon within 180 days after liquid collection has ceased.

All solid waste will be removed from the leachate lagoon, connecting sewer lines, and manholes. All solid waste removed will be properly handled and disposed of according to Federal and State requirements. All connecting lines will be disconnected and securely capped or plugged.

All waste residues, contaminated system components (composite liner system), contaminated subsoils, structures and equipment contaminated with waste will be removed and appropriately disposed. If the groundwater surrounding the impoundment is contaminated, other corrective actions to remediate a contaminant plume will be performed if required by the Division. If the groundwater, surrounding the lagoon is found not to be contaminated, the liner system may remain in place if drained and cleaned to remove all traces of waste, and both liners punctured so that drainage is allowed. The lagoon is to be backfilled and re-graded to the surrounding topography.

1.1.8 Existing Landfill Leachate Permit and Flow Data

The County has pumped 8,654,072 gallons of leachate from July 2014 thru June 2015 to the City of Goldsboro Waste Water Treatment Plant.

March 3, 2000

Utility Agreement between the County of Wayne and City of Goldsboro to Treat Wastewater

County Attorney E. B. Borden Parker stated the State of North Carolina would not renew the permit for the Genoa wastewater treatment plant without improvements being made and placing it on another site. The City of Goldsboro has agreed to treat the wastewater and monitor the wastewater, but not take over the system. The County of Wayne is responsible for the new line to the City of Goldsboro wastewater treatment plant and from the Genoa wastewater treatment plant to the users. The City of Goldsboro will treat the County of Wayne as an outside user. The County shall pay the City two times the City's prevailing rate for an outside user who has not purchased reserved capacity for the volume of exceedance multiplied by the number of days in the billing cycle for any 30 days the County exceeds 10,000 gallons over 400,000 gallons per day. The rate for exceeding 25,000 gallons per day is equal to three times the City's prevailing rate for an outside user. The County of Wayne is responsible for any damage it causes the City of Goldsboro wastewater treatment plant. Satellite annexation users and Brogden Middle School are not counted in the County's gallons per day allocation. The County will need to install a sampling station at the landfill due to the leachate. Inflow and infiltration must be stopped so the County does not have to pay for it. If the manhole has unacceptable odors, the county will need to install a device to filter out odors. The County is not getting out of sewer business; we are only getting out of the sewer treatment business. The City will be the entity to give permits for significant industrial users and the County will be one with the landfill. The County of Wayne will have to adopt Goldsboro's sewer ordinance. The State of North Carolina is requiring all municipalities and counties to adopt storm water ordinances and programs. Wayne County's will have to be the same as Goldsboro's.

Al Hodge with the Division of Water Quality of the North Carolina Department of Environment and Natural Resources urged the Board of Commissioners to approve the agreement with the City of Goldsboro. The Division of Water Quality supports centralized wastewater treatment systems. Centralized systems tend to do a better job of treating wastewater. If the County does not approve the agreement, the Genoa wastewater treatment plant would have to be built on another site. The agreement is best for the environment and best for the County of Wayne. He recommended the County remove leaking ground water and water running into the manhole covers. Mr. Hodge expected the permit for the City of Goldsboro to increase its effluent to be approved by the end of the year. Wastewater treatment has become very expensive. He stressed the need to search for alternate methods of using wastewater; such as irrigation uses, outside uses and for toilets.

County Manager Will R. Sullivan stated the effluent for the County of Wayne will remain at 400,000 gallons per day. There is no automatic increase for the County of Wayne even if the City of Goldsboro receives an increase in its effluent.

Upon motion of Commissioner Wilbur E. Anderson, the Board of Commissioners unanimously approved and authorized an utility agreement between the County of Wayne and City of Goldsboro to treat wastewater, attached hereto as Attachment D.

Chairman Atlas Price, Jr. thanked the City of Goldsboro, County Manager Will R. Sullivan, County Attorney E. B. Borden Parker and Buildings and Grounds Superintendent Brant Brown for their cooperation in bringing the agreement to fruition.

STATE OF NORTH CAROLINA
COUNTY OF WAYNE

UTILITY AGREEMENT-CITY AND COUNTY

THIS AGREEMENT, made and entered into this 3rd day of March, 2000 by and between THE CITY OF GOLDSBORO, a municipal corporation existing under the laws of the State of North Carolina (hereinafter called "the City"), and WAYNE COUNTY, a body politic existing under the laws of the State of North Carolina (hereinafter called "the COUNTY").

W I T N E S S E T H:

WHEREAS, the City is the owner and operator of a wastewater treatment plant, which is being expanded to at least 14.2 MGD of treated capacity; and

WHEREAS, the County has reviewed and analyzed many different options relative treatment of it's wastewater at the Genoa Wastewater Treatment Plant; and

WHEREAS, the most cost effective, environmentally sound, and best long term method of wastewater disposal for the County is achieved by abandoning the County's existing wastewater treatment facility and conveying wastewater to the City's wastewater treatment plant.

NOW, THEREFORE, for and in consideration of the respective rights, powers, duties and obligations hereinafter set forth to be performed by the City and the County, the parties mutually agree as follows:

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1. Definitions

- a. County - County of Wayne
- b. City - City of Goldsboro
- c. MGD - Million Gallons Per Day
- d. GPD - Gallons Per Day
- e. GPM - Gallons Per Minute
- f. IU - An industrial user that does not fall under the criteria for a SIU
- g. IUP - Industrial User Permit
- h. SIU - Significant Industrial User (See definition in current Sewer Use Ordinance)
- i. NPDES - National Pollutant Discharge Elimination System
- j. SUO - Sewer Use Ordinance
- k. EPA - Environmental Protection Agency
- l. CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
- m. DENR - Department of Environment, and Natural Resources
- n. RU - Residential User - A single-family or multi-family residential user
- o. NRU - Non-Residential User - A wastewater contributor that is not a single-family or multi-family residential user.

2. Users to be Served: Since the sewer capacity of the City and its waste treatment plant is limited, the ability of the City to serve its users within the City must have a first priority. However, under the terms of this Agreement, the City and County have agreed upon a priority for providing sewer service to certain areas outside the City of Goldsboro in the following order:

(a) Those users in the area of Wayne County which are currently being provided sewer service by the Genoa WasteWater Treatment Plant as shown on Exhibit "A";

(b) Those users to which the County has obligated itself to provide sewer service as shown on Exhibit "B";

(c) Those potential users who are experiencing sewer problems on existing septic tanks or improper soil conditions so

septic tanks cannot be installed and are located so that they can connect with the Genoa WasteWater Treatment Plant;

(d) Those users in (a) and (b) above who have requested additional sewer service; and

(e) Additional users who desire sewer service through the Genoa WasteWater Treatment Plant.

Except for the users referred to in (a) and (b) above, the County shall obtain the City's concurrence and approval before the addition of any non-residential user or increased flow on existing non-residential users. Additionally, the extension of sewer service to any other governmental entity shall require the City's approval and/or a separate agreement.

Even though the City has agreed to extend sewer service to the current users set forth on Exhibit "A" and to fulfill the commitment of the County to the users set forth on Exhibit "B", it is understood and agreed that the total monthly flow from all county users (excluding Brogden Middle School), shall not exceed 400,000 GPD. Users annexed into the City shall not be included in computing the total monthly flow allowed the County. Further, the County shall adopt a fee schedule of flow exceedences for the users shown on Exhibits "A" and "B" that have a permitted daily flow and any additional users assigned a permitted daily flow hereinafter served by the City to insure that the aggregate monthly flow of its customers shall not exceed 400,000 GPD. Finally, County acknowledges and has agreed that City's Sewer Use

Ordinance allows City to regulate significant industrial users, industrial users, residential users and non-residential users.

3. Construction of Line, Meter and Maintenance, by County:

The County shall be responsible for the design and construction of the wastewater conveyance system from it's Genoa plant to the City's wastewater treatment plant culminating at the influent structure. In order to limit flows to those specified in this Agreement, capacity of the wastewater conveyance system from the County's system shall be limited to 1.5 of the maximum daily flow allowable under this Agreement. This limitation on capacity shall be designed into the proposed system and approved by the City. The methods of flow constraints shall include, but shall not be limited to, one or more of the following:

- a. Pump station design; the pump station will be designed to not exceed 417 GPM maximum pumping capacity. (417 GPM = 400,000 gal. x 1.5)
- b. Force main design;
- c. Restricting valves;
- d. or A semi-permanent flow constriction designed into the system.

At the time the City's wastewater treatment expansion is completed to at least 14.2 MGD, the aforementioned flow constraint may be adjusted to accommodate additional flows provided the City has additional capacity. The system to be designed and constructed by the County shall consist of the following elements:

a. One (1) 0.60 MGD (peak day) pumping station to be located as determined by the County's Engineer.

b. A twelve inch (12") force main from the Genoa plant to the City's wastewater treatment plant.

c. A flow meter to be located as determined by the City's Engineer between the County's force main and the City's wastewater treatment plant.

d. All wastewater shall flow through a bar screen before entering a force main. The screen shall have not more than 3/8 inch spaces between the bars before entering a force main.

e. The City reserves the right to require the County to install such odor control/re-aeration facilities as the City deems necessary from time to time to prevent odors or septic conditions.

f. County shall be responsible for the operation and maintenance of its collection system, the pumping station, force main, and odor control/re-aeration facilities.

4. Metering Facility - Maintenance: The point of flow measurement shall be installed at a location to be approved by the City so as to provide accurate measurements. It shall be designed by the County's engineer and approved by the City Public Utilities Director and installed at the County's expense. A vault shall be constructed with a magnetic flow measuring device which will measure, display and transmit flow information to the City's SCADA system. The metering device shall be capable of instantaneous measurement to a prescribed accuracy with continuous readout of

flow rate and totalized flow. The in-line meter shall be recalibrated every 6 months or sooner, if needed, by an independent contractor employed by the City. The maintenance of the metering facility shall be performed by the City. The County shall reimburse the City for the actual cost of said maintenance and re-calibration and the replacement and/or repair thereof which shall be billed by the City on a monthly basis. The City shall have access to the meter at all times.

5. Sampling Stations:

(a) The County shall construct a suitable wastewater sampling station for use by the City at the County's expense. This facility shall be integrated with the metering facility as previously described under Section 4 above and approved by the City. This wastewater sampling station shall include a refrigerated sampler with the capabilities of timed volume/flow proportional, sequential sampling device, housed in a locked compartment. The maintenance of this sampling station shall be performed by the City. The County shall reimburse the City for the cost of the maintenance, replacement and/or repair thereof, including utility cost, which shall be billed by the City on a monthly basis.

(b) The County shall also construct a sampling station for use by the City at the County's expense to accept the County's landfill Leachate. This sampling station shall be located at the County landfill with a twenty-four hour composite sampling station and flow meter acceptable to the City. In addition, the County

shall be treated by the City as an SIU for its landfill Leachate with its permit allowing up to 15,000 gallons per day. In the event the County's Leachate causes a toxicity or other problem for the City and its wastewater plant, then the County, after written notice from the City, shall immediately cease to discharge its Leachate into the City's collection system until the County can provide adequate pretreatment to resolve the problem. The maintenance of this sampling station shall be performed by the City. The County shall reimburse the City for the cost of the maintenance, replacement and/or repair thereof which shall be billed by the City on a monthly basis.

6. City Review:

a. The City shall receive a copy of the State-approved engineering drawings for the County's forced main from the Genoa plant to the City's wastewater treatment plant prior to the construction of these facilities, along with a copy of notice to proceed and a copy of the certificate of completion submitted by the County to DENR along with a copy of DENR's final approval.

b. The County shall provide the City with a list of all current non-residential users who discharge into the County's existing system. Each non-residential user shall be required to obtain written permission from the City to continue to discharge into the County's existing system. The City reserves the right to require a new discharge permit for all of the County's existing non-residential users in accordance with the City's current policies and procedures. Further, all new non-residential users,

or expanding existing non-residential users, who discharge industrial and/or domestic wastewater into the County's system shall obtain written permission from the City or, in the City's discretion, a discharge permit from the City before connecting to the County's wastewater conveyance system.

c. The County shall provide the City with copies of all proposed applications to be forwarded to DENR for non-discharge permits for all sewer main extensions for the City's approval. The City's approval shall be based upon the subsequent approval by DENR, and the City's ability to accept additional customers.

7. Limitations on Acceptance of County Flows and Effluent Limits: Due to limitations of its current NPDES permit, the City is unable to accept additional flows and effluent from the County's system. Therefore, it is necessary for the City's wastewater treatment plant to be expanded to at least 14.2 MGD or have the City's permit re-rated to 700,000 GPD.

Before the County can connect to the City's wastewater treatment plant, the City must have its permit re-rated or its plant expanded to 14.2 MGD, and the acceptance of the County's wastewater by the City approved by DENR. Further, the County agrees to transfer all of its nitrogen poundage and all other additional effluent rights or privileges under its current Genoa NPDES permit without cost to the City.

8. City's Rates: On a monthly basis, the County shall pay to the City an amount equal to the City's prevailing rate for an outside the City user who has not purchased reserve capacity. In

the event there are sewer users served by the County who have been annexed into the City, then and in that event these users will be charged for sewer as inside the City users based upon the user's monthly metered water flow. Any credit due a user located in an annexed area who is billed by the County shall receive a refund from the City on a semi-annual and not monthly basis. The County shall be responsible for the payment of all bills to the City for any and all users (including other governmental entities) who are served on the County's wastewater conveyance system. In the event there are surcharges, these surcharges (see Exhibit C, Resolution No. 1995-64, paragraph 3) shall be paid monthly to the City by the County in an amount equal to the City's prevailing rate charged other similar users.

All bills received by the County under this Agreement, are due and payable within fifteen (15) days after receipt thereof. The City shall provide the County forty-five (45) days written notice of any rate changes enacted by the City.

9. Monitoring Charges: In addition to the rates set forth in Section 8 above, the County shall be required to pay to the City monitoring charges.

For the purpose of determining these monitoring charges, the City shall collect at the sampling station flow proportional composite samples, and shall analyze these samples at a minimum of not less than one time per week. The results of the analysis of said samples shall be utilized in determining the sampling criteria as shown in Exhibit D (Sewer Regulations, Chapter 51 of

the City of Goldsboro Code of Ordinances). Upon request, the City shall provide the County equal split portions of the samples which have been taken for analysis by the City. The analysis reports shall be submitted monthly in writing to the County. The discovery by the City of violations of the discharge limitations by the County as shown on Exhibit D shall be verbally reported to the County within 24 hours of becoming aware of the violation. A written report shall be issued within thirty (30) days. The County shall reimburse the City quarterly for its cost in collecting samples and preparing these analysis (See Exhibit C).

10. ~~Monthly Flow Limitations - Exceedences:~~ As set forth in Section 7, this Agreement is subject to the re-rating of the City's current permit or to a new expanded permit being issued to the City for 14.2 MGD and approval by DENR.

The County's average monthly flow shall not exceed 400,000 GPD. When the County's average monthly flow reaches 320,000 GPD, the City and County shall immediately meet for the purpose of addressing the County's average monthly flow and its customers and potential flow problems. In the event the County's average monthly flow reaches 360,000 GPD, the County shall issue a moratorium on any additional customers or increases in flow from existing customers and shall again meet with the City to address its average monthly flow and potential flow problems. In the event the County's average monthly flow exceeds 400,000 GPD, the County shall immediately take steps to reduce the monthly flow of

its customers and shall present to the City its plan for said reduction in that regard.

In the event the County's average monthly flow exceeds 400,000 GPD for a period of thirty (30) days, the County shall pay to the City the following:

(a) For any 30 days that the County's monthly exceedance is 10,000 GPD, the County shall pay to the City an amount equal to two times the City's prevailing rate for an outside the City user who has not purchased reserved capacity for the volume of the exceedance multiplied by the number of days in the billing cycle;

(b) For any 30 days that the County's monthly exceedance is 25,000 GPD or greater, the County shall pay to the City an amount equal to three times the City's prevailing rate for an outside the City user who has not purchased reserved capacity for the volume of the exceedance multiplied by the number of days in the billing cycle; and

(c) In the event the exceedance over 400,000 GPD is not corrected by the County within 120 days, after its first monthly flow exceedance, this exceedance shall constitute a breach of this Agreement and cause for the City to terminate this agreement as provided for under Section 22.

11. County's User Charge System: The County shall establish and maintain a User Charge system which shall generate sufficient revenue to provide for the complete and adequate operation of its sewerage system and its maintenance. The County shall also maintain, at all times during the term of this agreement,

sufficient funds to finance the cost of any capital improvements that may be necessary to maintain its sewerage system. Such user charges shall be updated from time to time to remain in compliance with all federal and State laws and regulations, including an ongoing effort and commitment to resolve the County's inflow and infiltration problems, it may be necessary to maintain its sewer system.

12. County's Rates: The County shall charge and collect sewer connection fees in an amount not less than those charged by the City. In addition, the County shall not charge wastewater sewer service to any user within the service area unless such charge is at a rate equal or greater than City's charges to supply wastewater sewer service to the County.

13. County's Sewer Use Ordinance and Storm Water Management Plan:

a. The County shall adopt the City's Sewer Use Ordinance (including all amendments and additions thereto). In the event the County contracts with another governmental entity to perform its duties and obligations under this Agreement, the contract shall be subjected to the City's approval. The sewer use ordinance adopted by the County shall comply with all current State and/or EPA regulations and shall be updated from time to time to meet all future federal and State requirements. The sewer use ordinance adopted by the County shall be forwarded to the City.

(b) The County shall adopt a Storm Water Management Plan which shall be no less stringent than the City's Storm Water Management Plan. Further, any additional governmental entity which shall become a user of the County shall likewise adopt a similar Storm Water Management Plan. Any Storm Water Management Plan adopted by the County or any other governmental entity shall comply with all current State and/or EPA regulations which shall be updated from time to time to meet all future Federal and State requirements. Any Storm Water Management Plan shall be approved by the City prior to its adoption by the County or any other governmental entity.

14. Industrial Pre-Treatment Program: The City shall administer and issue all permits for the industrial pre-treatment program for the County or any other governmental entity which conveys wastewater to the City. If any enforcement action is needed, the City shall follow its enforcement policy and, when necessary, the County shall terminate the non-residential user's water and/or sewer service after written notification to such user from the City. It shall be the City's responsibility to collect any and all fines and penalties from any SIU. The City shall notify the County of any civil penalty to be assessed against a non-residential user. The City shall assess and collect civil penalties of the County's non-residential users in accordance with the City's policies and procedures. The failure by the County to terminate a non-residential user's water and/or sewer service

shall constitute a breach of this Agreement and cause for the City to terminate this Agreement as provided for under Section 22.

15. Emergency Condition: In the event an emergency condition arises at the City's wastewater treatment facility, the County, after notice, shall immediately take such remedial action in order to assist the City in the elimination of the emergency condition. The County shall and does hereby assume and agree to indemnify and hold harmless the City, its successors and assigns, from and against any and all losses, fines, costs, and expenses, including attorney fees, from damage to the City's system or other property caused by, or in any way resulting from an emergency event caused by the County. Finally, the City shall and does hereby assume and agree to indemnify and hold harmless the County, its successors and assigns, from and against any and all losses, fines, costs, and expenses, including attorney fees, from damage to the County's system or other property caused by, or in any way resulting from an emergency event caused by the City, provided the County has utilized a proper remedial action in resolving the emergency conditions.

16. Interference, Pass-Through Biological Upset: The County shall and does hereby assume and agree to hold harmless the City, its successors and assigns, from harm and against any and all losses, fines, costs, and expenses, including attorney fees, from damage caused by or in any way resulting from a biological upset of the City's treatment facility as a result of the levels of

metals or toxic contaminants contained in the wastewater being discharged by the County to City's wastewater treatment plant.

17. Environmental Liability: The County shall and does hereby assume and agree to hold harmless the City, its successors and assigns, from and against all losses, costs, expenses, including attorney fees, fines and penalties caused by, or in any way resulting from, any claim resulting from wastewater being discharged by the County to the City's wastewater treatment plant, or as a result of any other discharges, including a spill, from the County or any of its users.

18. Force Majeure: In the event either the City or the County is unable, in whole or in part, by reason of force majeure to carry out its obligations, other than to make payments for wastewater treatment services received, it is agreed that on giving notice of such force majeure as soon as possible after the occurrence of the cause relied upon, then the obligation of the City or the County, so far as each may be affected by such force majeure, shall be suspended from performance hereunder during the continuance of any inability to obtain permit, but for no longer period and such cause shall be, as far as possible, be remedied with all due speed. The term "force majeure" shall mean acts of God, strikes, lockouts or other industrial disturbances, acts of public enemy, war, blockades, riots, landslides, droughts, storms, floods or washouts, arrest and restraints of governments and people, civil disturbances, explosions, unavoidable breakage, accident to machinery and equipment and sanitary sewer lines,

inability to obtain permits or materials and equipment and supplies, and any other cause not within the control of the City or the County, which by the exercise of reasonable diligence by the City of the County, is not preventable.

19. Term: This Agreement shall be effective after the date of its approval by the County and the City. It shall continue for a period of twenty (20) years from the date upon which wastewater sewer service is first treated for the County, pursuant to the terms of this Agreement. The City shall, prior to the beginning of the seventeenth year of the term of this Agreement, give notice to the County of its desire to renew this Agreement. Upon giving such notice, the City and the County shall negotiate in good faith with reference to a renewal agreement based upon the same rate format contained in this Agreement. However, without cause, the County may terminate this Agreement at any time upon one year's written notice.

20. Arbitration: Any dispute concerning this Agreement shall, at the request of either the City or the County, be submitted to and determined by an arbitration panel of three (3) arbitrators, pursuant to the terms of this section and the Uniform Arbitration Act (hereafter "the Act") as adopted by the State of North Carolina, and its general statutes in Section 1-567.1 through 1-567.29, as amended. The City and the County shall each appoint one (1) qualified member to the arbitration panel, and these appointees shall select a third member. A majority vote of the arbitration panel shall control and be binding on the City and

the County without recourse, except as otherwise provided in the Act. If the two (2) arbitrators first chosen can not agree on the selection of a third arbitrator, then, upon application by the City or the County, such third arbitrator shall be appointed by the Court having jurisdiction over such matters as provided in the Act. To be qualified, such third arbitrator shall be a professional engineer with experience in production and delivery of sanitary sewer service, a certified public accountant, or a practicing attorney with experience in municipal utility matters. Pursuant to the Act, the cost to be paid by the City and the County associated with arbitration shall be determined by the arbitration panel. The City and the County shall each continue to perform all other obligations under the terms of this Agreement pending final resolution of any dispute arising out of or relating to this Agreement which has been submitted to arbitration. Neither the City nor the County may violate any federal, state, or local law or regulation regarding the wastewater sewer service being provided herein during the course of pursuing its rights under this section, or shall the user be denied the wastewater sewer service necessary to reasonably maintain the public health and safety.

21. ~~Discrimination~~: It is specifically agreed by both parties hereto, as part of consideration of the signing of this Agreement, that neither the County nor the City, its agents, officials, employees, or servants shall discriminate in any manner on the basis of race, color, creed, sexual orientation, or

national origin with reference to the subject matter of this Agreement.

22. Nonpayment and/Default: The City may terminate this Agreement and terminate the County's right to discharge wastewater to the City's wastewater treatment plant one hundred and twenty (120) days after written notification to the County by the City for the non-payment of fees, cost, charges or fines as set forth in this Agreement, or for the breach by the County of any other condition contained in this Agreement.

23. Waivers: Neither the failure nor the delay on the part of the City or County hereto to exercise any right, power, or privilege hereunder shall operate as a waiver hereof, nor shall any single or partial exercise of any other right, power, or privilege, nor shall any custom or practice at variance with the terms of this Agreement constitute a waiver of the right of either party to demand exact compliance with such terms.

24. Invalid Terms: Should any one or more of the provisions contained in this Agreement be held invalid, illegal, or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained in this Agreement shall not in any way be affected or impaired thereby, and this Agreement shall otherwise remain in full force and effect.

25. Controlling Law: This Agreement and the rights and obligations of the parties hereunder shall be construed and interpreted in accordance with laws of the State of North

Carolina, and shall be binding upon and inure to the benefit of their successors and, with consent of the other party, the assigns of either party hereto.

26. Notices: Any notices required or permitted under this Agreement, including address changes, shall be made in writing, either by mailing registered or certified mail, return receipt requested, and postage prepaid, to the other party at the address shown herein for that party, or at such different address for that party, notice of which has been properly given hereunder, or by personally delivering such a notice to an officer of the other party. The notice, if mailed as provided for herein, shall be deemed given on the day of receipt or refusal to accept receipt, and if personally delivered, on the date of delivery. The addresses are as follows:

To the City: City Manager
City of Goldsboro
P. O. Drawer A
Goldsboro, NC 27533

To the County: County Manager
County of Wayne
P.O. Box 227
Goldsboro, NC 27533-0227

27. Entire Agreement: This Agreement reflects and contains the entire and only agreement between the parties related to the subject matter herein, and, as such, supersedes all negotiations, commitments and agreements, whether oral or otherwise.

28. Amendments: This Agreement may be amended only by an instrument in writing executed by both parties hereto.

IN WITNESS WHEREOF, The City and the County have caused this Agreement to be executed its Mayor and Chairman respectively, their corporate seals to be affixed and attested by their respective Clerks, all by the authority of their respective governmental bodies the day and year first written.

CITY OF GOLDSBORO

BY: _____
Mayor

ATTEST:

City Clerk

APPROVED (as to form only)
W. Harold Lewis
City Attorney

County of Wayne
Wayne County Board of Commissioners

BY: _____
Chairman

ATTEST:
Marcia R. Nelson
County Clerk

APPROVED (as to form only)

County Attorney

NORTH CAROLINA
WAYNE COUNTY

This the _____ day of _____, 2000, personally came before me _____, a Notary Public in and for said State and County, SANDRA JUSTICE, who by me duly sworn, says that she knows the common seal of the CITY OF GOLDSBORO and is acquainted with _____, who is the Mayor of said municipal corporation; that she, the said SANDRA JUSTICE, is its Clerk; and that she saw the Mayor sign the foregoing instrument; and that she, the said Clerk, saw the said common seal of said corporation affixed thereto, and that she, the said Clerk, signed her name in attestation of said instrument in the presence of said Mayor of said municipal corporation.

Witness my hand and seal this the _____ day of _____, 2000.

Notary Public

My Commission Expires: _____

NORTH CAROLINA
WAYNE COUNTY

This the 13th day of March, 2000, personally came before me Cynthia B. Furcron, a Notary Public in and for said State and County, MARCIA WILSON, who by me duly sworn, says that she knows the common seal of the WAYNE COUNTY BOARD OF COMMISSIONERS and is acquainted with ATLAS PRICE, who is the Chairman of said body politic; that she, the said MARCIA WILSON is its Clerk; and that she saw the Mayor sign the foregoing instrument; and that she, the said Clerk, saw the said common seal of said body politic affixed thereto, and that she, the said Clerk, signed her name in attestation of said instrument in the presence of said Chairman of the Wayne County Board of Commissioners.

Witness my hand and seal this the 13th day of March, 2000.


Notary Public

My Commission Expires:
April 20, 2003

1.1.9 Foundation Settlement, and Slope Stability Analysis

All calculations for Sliding Block Stability Analysis, Foundation Settlement Calculations were provided by ECS Carolinas, LLP, in Phases 1, 2 and 3 Permit Applications.

1.1.10 Applicable Location Restriction Demonstrations

All location restrictions were handled in the site study.

SECTION 2.0

**OPERATION
PLAN**

2.1 Introduction

The County Landfill will only accept Municipal Solid Wastes (MSW) from the County. The County will perform the proposed Phase 4 vertical expansion on the existing 65 acre Municipal Solid Waste Landfill (Phases 1, 2 and 3) according to Subtitle D requirements.

The perimeter of the lined area is marked off by 2 inch PVC pipe at 100' intervals that are placed in the anchor trenches. Solid waste will not be placed within four (4) feet of this boundary to assure that it is being placed directly above the liner system so that no leachate can flow outside of this area.

All stormwater that comes in contact with solid waste will be handled as leachate. The leachate is collected in the sump area, where it is pumped by force main to the lagoon.

Storm water that has not come in contact with waste can be removed from the landfill by pumping thru a sump pump over the berm prior to waste being placed in the sump basin. A mobile pump can also be used to pump storm water over the berm.

Leachate will be pumped and treated at the Goldsboro Wastewater Treatment Plant. The leachate will have to be tested according to the pretreatment conditions outlined in the pre-treatment agreement.

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

Daily cover is the combination of soil and/or approved Alternate Cover Material (ACM). (See Section 2.2 for cover requirements, see Section 2.4 for approved ACM's).

The County will monitor all areas of MSW filling for possible leachate break-outs. The County will implement a program for corrective actions for leachate break-outs (See Section 5.5-Appendix III).

The County will continue a program at the landfill for detecting and preventing the disposal of hazardous and liquid wastes. The program consists of random inspection of incoming loads at a minimum of 1% of the weekly traffic. Landfill personnel will be trained to recognize hazardous and liquid wastes. Records will be kept on the training and the inspections. (See Section 2.3).

The County will monitor for explosive gases at landfill structures and the perimeter of the landfill. There are two (2) existing methane monitoring probes at the MSWLF and three(3) existing methane probes at the C&DLF. (see 2.5 for Explosive Gas Control Plan).

The concentration of methane and hydrogen sulfide (H₂S) gases generated by the landfill cannot exceed 25 percent of the lower explosive limit for methane and hydrogen sulfide (H₂S) in the structures, and it cannot exceed 100 percent of the lower explosive limit for methane and hydrogen sulfide (H₂S) at the landfill property boundary. (See Section 2.5) If methane and/or hydrogen sulfide (H₂S) gas is found to exceed the acceptable limits at either the property boundary or landfill structures, it is the County's responsibility to do the following:

1. Immediately take all necessary steps to ensure protection of human health, i.e. no smoking, temporarily abandon the structure and notify the Division of Waste Management.

2. Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
3. Within 60 days of detection, implement a remediation plan for the methane and/or hydrogen sulfide (H₂S) gas releases, place a copy of the plan in the operating record, and notify the Division of Waste Management that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

Off and on site erosion will be controlled through erosion control structures and devices. Provisions for a vegetative ground cover sufficient to restrain erosion will be accomplished within 30 working days or 120 calendar days upon completion of any phase of landfill development.

The County will record and retain at the landfill an operating record of the following information:

- (1) Inspection records, waste determination records, and training procedures;
- (2) Amounts by weight of solid waste received at the landfill;
- (3) Waste determination, Leachate sampling data and analytical data, leachate levels, meteorological data ;
- (4) Gas monitoring results and any remediation plans;
- (5) Any demonstration, certification, findings, monitoring, testing or analytical data required for surface and groundwater monitoring;
- (6) Any monitoring, testing or analytical data required for closure or post-closure;
- (7) Any cost estimates and financial assurance documentation.

All information contained in the operating record will be furnished upon request to the Division of Waste Management or be made available at all reasonable times for inspection by the Division.

Ground and surface water will be sampled and analyzed according to Subtitle D Appendix I detection monitoring requirements. The monitoring frequency for all Subtitle D Appendix I detection monitoring constituents will be at least semi-annually during the life of the facility (including closure) and the post-closure period. A minimum of four independent samples from each well (background and downgradient) will be collected and analyzed for the Subtitle D Appendix I constituents during the first semi-annual sampling event. At least one sample from each well (background and downgradient) will be collected and analyzed during subsequent semiannual sampling events. (see Section 2.7 for Monitoring Plan)

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

2.2 Operational Requirements

1. Waste Acceptance and Disposal Requirements
 - a. The Municipal Solid Waste Landfill (MSWLF) will only accept those solid wastes which it is permitted to receive. The County will notify the Division within 24 hours of attempted disposal of any waste the landfill is not permitted to receive. Signs are placed at the entrance to the Landfill stating that Hazardous and Liquid wastes are not accepted and that random waste screening is performed.
 - b. The following wastes are prohibited from disposal at the MSWLF:
 - i. Hazardous waste as defined within 15A NCAC 13A, to also include hazardous waste from conditionally exempt small quantity generators.
 - ii. Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761.
 - iii. Bulk or non-containerized liquid waste will not be placed in the landfill unless:
 - (i) The waste is household waste other than septic waste and waste oil,
 - (ii) The waste is leachate or gas condensate derived from the landfill.
 - iv. White Goods, Yard Waste, Tires.
 - v. Containers holding liquid wastes will not be placed in the landfill unless:
 - (i) The container is a small container similar in size to that normally found in household waste;
 - (ii) The container is designed to hold liquids for use other than storage; or
 - (iii) The waste is household waste.
 - vi. For the purpose of this paragraph:
 - (i) Liquid waste means any waste material that is determined to contain "free liquids" as defined by Method 9095 (Paint Filter Liquids Test), S. W. 846.
 - c. Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste delivered to the disposal site will be covered immediately.
 - d. The following are items that are banned from the landfill:
 - i. Beverage containers that are required to be recycled under G.S. 18B-1006.1
 - ii. Recyclable rigid plastic containers that are required to be labeled as provided BELOW that have a neck smaller than the body of the container and that accept a screw top, snap cap, or other closure. The prohibition on disposal of recyclable rigid plastic containers in landfills does not apply to rigid plastic containers that are intended for use in the sale or distribution of motor oil.
 - (a) For polyethylene terephthalate, the letters "PETE" and the number 1.
 - (b) For high density polyethylene, the letters "HDPE" and the number 2.
 - (c) For vinyl, the letter "V" and the number 3.
 - (d) For low density polyethylene, the letters "LDPE" and the number 4.
 - (e) For polypropylene, the letters "PP" and the number 6.
 - (f) For polystyrene, the letters "PS" and the number 7.
 - (g) For any other, the letters "OTHER" and the number 7.
 - iii. Motor vehicle oil filters.

- iv. Wooden pallets, except that wooden pallets maybe disposed of in a landfill that is permitted to only accept construction and demolition debris.
- v. Discarded computer equipment (effective April 1, 2011).
- e. Asbestos waste will be accepted and managed in accordance with 40 CFR 61. The waste will be covered immediately with soil in a manner that will not cause airborne conditions and must be disposed of separate and apart from other solid wastes:
 - i. At the bottom of the working face or;
 - ii. In an area not contiguous with other disposal areas. Separate areas will be clearly designated so that asbestos is not exposed by future land disturbing activities.
- f. Wastewater treatment sludges may be accepted either as a soil conditioner incorporated into or applied onto vegetative growth layer but in no case greater than six inches in depth. Or wastewater treatment sludges may be co-disposed in the lined area.
- g. The County will continue a program at the Landfill for detecting and preventing the disposal of hazardous and liquid wastes. (Section 2.3) This program will include, at a minimum:
 - i. Random inspections of incoming loads or other comparable procedures;
 - ii. Records of any inspections;
 - iii. Training of facility personnel to recognize hazardous and liquid wastes.
 - iv. If hazardous wastes are identified by facility personnel, Emergency Management or personnel trained, shall be notified to identify the waste and address removal, storage and final deposition of the waste.
- h. Waste placement will be within the areal limits of the base liner system and in a manner consistent with the effective permit.
- i. Special Wastes

The Landfill has handling capabilities and recycling/disposal options in place for all non-hazardous and non-regulated special wastes currently banned from landfill disposal by the State. These materials include whole tires, white goods, used oil, oil filters and lead-acid batteries. These materials are stored under canopies, covered shelters, buildings and/or tractor trailers.

- i. Whole tires are accepted at the landfill and stored in two tractor trailers until they are transported out of the county. They are either recycled or place in a monofil so they can easily be reclaimed when reuse and recycling alternatives are in place.
- ii. White goods and other scrap metals are collected at the landfill and are managed in a building adjacent to office. Freon is removed weekly by landfill staff, and materials are then transported to a metals recycler.
- iii. Used oil is collected at the landfill, at the household trash and recycling convenience center in 250 gallon tanks with secondary containment. All oil collected is recycled either as refined lubrication oil or as fuel.
- iv. Oil filters also have a designated collection area at the convenience center. These are collected and recycled by a contracted oil recycler.
- v. Lead-acid batteries are accepted for recycling at the household trash and recycling convenience center at the landfill.
- vi. Antifreeze has a designated collection container for recycling. This material is handled by the contracted oil recycler.
- vii. Electronic waste is deposited by homeowners in the electronic waste recycling area at the convenience center at the landfill. The material is recycled by a certified e-recycler.

j. Recovered/Recyclable Wastes

Recovered material is not regulated as solid waste under GS 130A-309.5(c). Materials must meet the following requirements to be qualified as recovered material:

- i. A majority of the recovered material at the facility will be sold, used, or reused within one year;
- ii. The recovered material or the products or the by-products of operations that process recovered material shall not be discharged, deposited, injected, dumped, spilled, leaked, or placed into or upon any land or water so that the products or by-products or any constituent thereof may enter other lands or be emitted into the air or discharged into any waters including groundwater, or otherwise enter the environment or pose a threat to public health and safety; and
- iii. The recovered material shall not be a hazardous waste or have been recovered from a hazardous waste.
- iv. For the purpose of this paragraph:
 - (i) "Recovered Material" means a material that has known recycling potential, can be feasibly recycled, and has been diverted or removed from the solid waste stream for sale, use, or reuse.
 - (ii) "Recyclable Material" means those materials which are capable of being recycled and which would otherwise be processed or disposed of as solid waste.
- v. Documentation of all contractors who are transporting, treating, processing, or disposing of the recyclables or recovered materials at an off-site facility, shall be placed in the operating record.

k. Destruction of Abandoned Manufactured Homes

The county will accept Manufactured Homes for destruction, provided the following criteria are met:

- i. Only mobile homes originating in Wayne County will be accepted for deconstruction.
- ii. The landfill will require 24 hour notice prior to accepting the mobile home for deconstruction.
- iii. The established disposal/processing fee will be collected upon arrival at the Landfill.
- iv. The mobile home will be transported to the MSW or the C&D landfill and placed adjacent to the working face for deconstruction.
- v. The mobile home will be secured by the hauler to prevent spillage during transport.
- vi. Prior to deconstruction, white goods shall be removed from the mobile home unit if the mobile home is safe to enter. The white goods shall be taken to a white goods collection site. Should the mobile home be severely damaged, or if there are inherent health risks to entering the unit, the white goods may be disposed along with the mobile home.
- vii. All removed appliances shall be placed in the white goods area and the Freon removed by the County or certified contractor.
- viii. Appliances and all other metals shall be loaded into a container for recycling.
- ix. Efforts shall be made to remove any putrescible waste prior to deconstruction of the mobile home.

- x. Household Hazardous Waste (HHW) should be removed for separate disposal. If the mobile home is not safe to enter, incidental quantities may be disposed along with the mobile home.
- xi. The metal frame, tires, and axles shall be removed by the transporter to be salvaged or recycled before disposal of the mobile home.
- xii. As asbestos may be present in building materials of mobile homes constructed prior to 1983, all mobile homes built prior to 1983 shall be thoroughly sprayed with water (interior and exterior) to minimize dust.
- xiii. The mobile home shall be deconstructed within 45 days of receipt.
- xiv. A permit from NCDOT and approval from the Division of Motor Vehicles must be obtained before moving a mobile home on a state highway.

2. Cover material requirements.

- a. Except as in Part (b), the County must cover disposed solid waste with six inches of earthen material at the end of each operating day, or at more frequent intervals if necessary, to control disease vectors, fires, odors blowing litter, and scavenging.
- b. Alternative cover materials may be used as daily cover on the working face or until it is necessary to cover with earthen material. The alternative cover material must be approved by the Division of Waste Management and applied according to manufacturers recommendations. At a minimum soil cover will be used once every seven (7) days. (See Section 2.4)
- c. Areas which will not have additional wastes placed on them for 12 months or more, but where final termination of disposal operations has not occurred, will be covered with a minimum of one foot of intermediate cover.

3. Disease vector control

- a. The County will prevent or control on-site populations of disease vectors using techniques appropriate for protection of human health and the environment. At the end of every day, waste will be covered either by synthetic cover or 6" of soil cover. At a minimum soil will be used once a week. Any waste that requires immediate cover, will be covered immediately with soil.
- b. "Disease vectors" means any rodents, flies, mosquitoes, or other animals, including insects, capable of transmitting disease to humans.

4. Explosive gases control

- a. The County must ensure that:
 - i. The concentration of methane and hydrogen sulfide (H₂S) gases generated by the landfill does not exceed 25 percent of the lower explosive limit for methane and hydrogen sulfide (H₂S) in landfill structures (excluding gas control or recovery system components); and
 - ii. The concentration of methane and hydrogen sulfide (H₂S) gas does not exceed 100 percent of the lower explosive limit for methane and hydrogen sulfide (H₂S) at the landfill property boundary.
- b. The County will continue a routine gas monitoring program to ensure that the standards of 4 (a) are met. (Section 2.5-Appendix III-Explosive Gas Monitoring Plan)

- i. The type and frequency of monitoring must be determined based on the following factors:
 - (i) Soil conditions;
 - (ii) The hydrogeologic conditions surrounding the facility;
 - (iii) The hydraulic conditions surrounding the facility;
 - (iv) The location of facility structures and property boundaries.
- ii. The minimum frequency of monitoring will be quarterly.
- c. If methane and hydrogen sulfide (H₂S) gas levels exceeding the limits specified in 4 (a) are detected, the owner or operator will:
 - i. Immediately take all necessary steps to ensure protection of human health, i.e. no smoking, temporarily abandon the structure and notify the Division of Waste Management.
 - ii. Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
 - iii. Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the Division of Waste Management that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.
- d. "Lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25° C and atmospheric pressure.

5. Air Criteria

- a. The County will ensure that the landfill does not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the US EPA Administrator pursuant to Section 110 of the Clean Air Act, as amended.
- b. Open burning of solid waste, except for the infrequent burning of land clearing debris generated on site or debris from emergency clean-up operations, is prohibited. Any such infrequent burning will be approved by the Division of Waste Management, NC Division of Air Quality and the local fire department or fire marshal.
- c. In the event of an emergency the operator(s) will call 911. Earth moving equipment will be provided to control accidental fires. Arrangements have been made with the local fire department to provide actual fire protection. The site will be served by the Thoroughfare Volunteer Fire Department. This Fire Department is located within 2 miles of the landfill. Should the need arise Grantham Volunteer Fire Department and Arrington Volunteer Fire Department are also located with 7 miles of the landfill. This Fire department has access at all times to the landfill to provide fire fighting services when needed. Fire extinguishers are located in all buildings and on all equipment. Dirt piles are also on site to use in emergency situations. Landfill personnel can use soil to isolate the fire so it will not spread any further but actual fighting of the fire should be the responsibility of the trained fire department.
- d. Fires that occur at the landfill will be reported to the Division of Waste Management within 24 hours and written notification will be submitted within 15 days. Written Notification may be submitted by using NCDENR - Fire Occurrence Form.(Section 2.9-Appendix VII)

6. Access and safety requirements

- a. The landfill will be adequately secured by means of gates, chains, beams, fences and other security measures approved by the Division of Waste Management to prevent unauthorized entry.

- b. An attendant will be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.
- c. The access road to the site will be of all-weather construction and maintained in good condition.
- d. Dust control measures will be implemented when necessary. If dust problems should arise, the county will use any reasonable means necessary to reduce it. At a minimum the county will spray water on necessary areas.
- e. Signs providing information on tipping or disposal procedures, the hours during which the site is open for public use, the permit number and other pertinent information will be posted at the site entrance.
- f. Signs will be posted stating that no hazardous or liquid waste can be received.
- g. Traffic signs or markers will be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.
- h. The removal of solid waste from the landfill will be prohibited unless the County approves and the removal is not performed on the working face.
- i. Barrels and drums will not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein, except fiber drums containing asbestos.

7. Erosion and Sedimentation Control Requirements

- a. Adequate sediment control measures (structures or devices), will be utilized to prevent silt from leaving the landfill.
- b. Adequate sediment control measures (structures or devices), will be utilized to prevent excessive on-site erosion.
- c. Provisions for a vegetative ground cover sufficient to restrain erosion will be accomplished within 15 working days or 90 calendar days upon completion of any phase of landfill development.

8. Drainage Control and Water Protection Requirements

- a. Surface water will be diverted from the operational area and will not be impounded over waste.
- b. Solid waste will not be disposed of in water.
- c. Leachate will be contained on site and properly treated prior to discharge.
- d. The landfill will not:
 - (i) Cause a discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements pursuant to Section 402.
 - (ii) Cause the discharge of a nonpoint source of pollution to waters of the United States, including wetlands, that violates any requirements of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

9. Liquids Restriction

- a. Bulk or non-containerized liquid waste will not be placed in the landfill unless:
 - (i) The waste is household waste other than septic waste and waste oil,
 - (ii) The waste is leachate or gas condensate derived from the landfill.
- b. Containers holding liquid wastes will not be placed in the landfill unless:
 - (i) The container is a small container similar in size to that normally found in household waste;
 - (ii) The container is designed to hold liquids for use other than storage; or
 - (iii) The waste is household waste.
- c. For the purpose of this paragraph:
 - (i) Liquid waste means any waste material that is determined to contain "free liquids" as defined by Paint Filter Free Liquid Testing Method SW-846 Method 9095B(2004).
- d. Test for free liquids:

Sludges or other wastes may be tested for free liquids after previous screening tests have shown that the waste is not hazardous and does not contain PCB's. The specified test to determine whether or not a material is considered to be a liquid is the Paint Filter Free Liquid Testing Method SW-846 Method 9095B (2004). The procedure for conducting this test is as follows:

 - (i) Obtain standard 400- micron paint filter;
 - (ii) Place a properly-sized, clean, dry funnel in a ring stand or similar device;
 - (iii) Fold the filter and line the funnel with it;
 - (iv) Place a 100 ml sample of waste into the funnel;
 - (v) Place a clean, dry container under the funnel; and,
 - (vi) Check in exactly 5 minutes to see if any liquid is in the container.
 - (vii) If any liquid passes through the filter in 5 minutes or less, the waste is considered to be a liquid. The filtrate can be water, oil or any combination of any non-hazardous liquids.

10. Record keeping Requirements

- a. The County MSWLF will record and retain at the facility, or an alternative location near the facility approved by the Division of Waste Management, in an operating record the following information as it becomes available.
 - (i) Inspection records, waste determination records, and training procedures;
 - (ii) Amounts by weight of solid waste received at the landfill to include source of generation.
 - (iii) Waste determination, Leachate sampling data, leachate levels, meteorological data;
 - (iv) Gas monitoring results and any remediation plans;

- (v) Any demonstration, certification, findings, monitoring, testing or analytical data required for surface and groundwater monitoring;
 - (vi) Any monitoring, testing or analytical data required for closure or post-closure; and,
 - (vii) Any cost estimates and financial assurance documentation.
- b. All information contained in the operating record will be furnished upon request to the Division of Waste Management or be made available at all reasonable times for inspection by the Division.
 - c. The County will maintain a copy of the operation plan at the landfill.

11. Spreading and Compacting Requirements

- a. The landfill will restrict solid waste into the smallest area feasible, typically 60' x 75' area.
- b. Solid waste will be compacted as densely as practical into cells. The compactor should run over an area of solid waste a minimum of 6 times.
- c. Appropriate methods such as fencing and diking will be provided within the area to confine solid waste subject to be blown by the wind. At the conclusion of each day of operation, all windblown material resulting from the operation will be collected and returned to the area.

12. Leachate Management Plan

- a. The County will record the flows weekly from the sump pumps to the lagoon and the volume pumped from the lagoon to the Waste Water Treatment Plant. Monthly visually inspect the lagoon liner for damage. Utilizing the Leachate Collection System Inspection Log (Section 2.6 - Appendix IV) the County will:
 - (i) Record the rainfall after every occurrence;
 - (ii) Record pump readings weekly; and
 - (iii) Inspect Leachate Lagoon monthly
- b. The County will maintain records for the amount of leachate pumped to the lagoon from the sumps and the amount pumped to the Waste Water Treatment Plant. Records of the visual inspections and any repairs made will also become part of the operating record.
- c. The County will quality sample their leachate bi-annually for Subtitle D Appendix I constituents, pH, BOD, COD, TDS, phosphate, nitrate, and sulfate. The sample will be obtained from the lagoon and sampled the same time as the monitoring wells. The results will be part of the operating record and submitted with the semiannual groundwater sampling events.
- d. The leachate is being treated by Goldsboro Wastewater Treatment Plant.
- e. Under extreme operational conditions, the County has the option of shutting down the flow of leachate to the lagoon by shutting off the pump. The leachate will be temporarily stored within the MSWLF units until such a time the flow of leachate can continue to the lagoon. If any rain or other event requires storage of leachate or storm water in the cell, the Division of Waste Management will be notified immediately followed by written communication.
- f. The leachate lines shall be flushed at least once per year. This can be done by using a tanker full of either leachate or plain water. The liquid can either be pumped or gravity flow into the cleanouts provided at the ends of the lines. Once the water is unloaded into the collection system, there needs to be a visual inspection at the leachate storage lagoon to assure that the water unloaded into the system appears at the leachate storage lagoon in a short period of time. This is observed as an increase in the flow that is observed prior to unloading the water into the system.

In the event that it cannot be visually determined whether or not the flow in the leachate line at the leachate storage lagoon has not increased, a flow measuring device shall be used at the end of the leachate line flowing into the leachate storage lagoon. The measurements need to be done prior to dumping water into the collection system and after.

If it is determined that a blockage is in the line, the line shall be pressure cleaned and videoed to assure that the blockage has been removed.

Records of all flushing either by gravity or pressurized shall become part of the operating record (Section 2.6-Appendix IV). Any videos that have been taken shall also become part of the operating record.

- g. The video camera accessible leachate lines shall be videoed annually, by the County to assure that no blockages have occurred. If a blockage is encountered, the line will be pressured washed until the blockage is removed and re-videoed. The sediment or other material that has been washed to the sump shall be vacuumed from the sump utilizing a vacuum truck. The lines will be videoed annually and cleaned if necessary until the waste in the landfill has reached the height of the surrounding exterior berms. Once the waste has reached the berm height, the videoing and necessary cleaning shall be done every three years.

Records of all videoing and pressurized washing shall become part of the operating record.

- h. The County will inspect all areas of fill for leachate break-outs. All fill area slopes shall be maintained to insure that no water is impounded on top of waste.

13. Landfill Gas Collection System

All maintenance, conversion, pumping and daily operation of the landfill gas collection system is provided by the gas developer/contractor. All records of actions taken shall be placed in the operating record. Other operational requirements are as follows:

- a. Site Security: The Generator/Flare site has security fence around it so that only authorized people have access to the electrical generation and flaring equipment. Access to the landfill is during normal working hours for the general public. It is secured after hours by gates and fencing.
- b. Contingency and Emergency Response: The system has built safety devices that stop the gas flow if excessive heat is detected. If a fire is detected, the local fire department will be called to extinguish it. The gas will not burn without oxygen; therefore, the fires would be restricted to openings exposed to the atmosphere.
- c. Operations: During the active life of the landfill, all wells, sumps and infrastructure will be modified when required by landfill operations by the gas developer. The modification will include but not limited to the raising of well heads so that the landfill can be filled vertically.
- d. Methane Monitoring Plan: The County will continue to monitor for migrating methane, according to landfill permits, at the boundaries and inside buildings. They will also be responsible for monitoring according to Air Quality Permits and EPA requirements for Green House Gases.
- e. Training and Safety: The operation of the system is the responsibility of the gas developer; consequently, the training and safety of their personnel will be the developer's responsibility. The County is responsible for the training and safety of their personnel in the monitoring of methane gas for the various permits and EPA requirements.

- f. Condensate Management: The condensate is collect in sumps that are placed around the collection system. Each sump has a pneumatic pump that pumps the condensate to the lagoon. The condensate along with the leachate from the landfill is then pump into Goldsboro's sewerage collection system.
- g. Inspection and Maintenance Plan: The County inspects the collection system to satisfy the air quality permit requirements twice a month. The developer is monitoring the system on site and remotely 24 hours a day 7 days a week as long as the system is operating. The maintenance of the system will be the developer's responsibility until the system is decommissioned.
- h. Decommissioning Plan: The extraction wells will be converted to passive vents once the system is no longer required for air quality permits and/or electrical generation. Piping that is on the surface will be removed. All other piping will be left in placed so that not to disturb the capping system. Equipment used for the generation of electricity and the flare will also be removed from the site.
- i. Revised Closure and/or post-closure cost estimates: The cost of removal of the system other than converting the extraction wells to passive methane vents is the responsibility of the gas developer.

2.3 Appendix I Waste Screening Plan

A. INTRODUCTION

The municipal solid waste stream is made up of wastes from all sectors of society. The waste is often categorized by its source or its characteristics. Terms used include commercial, industrial, residential, biomedical, hazardous, household, solid, liquid, demolition/construction, sludge, etc. Regardless of how one classifies wastes, the bottom line is that wastes are delivered to the landfill and a management decision must be made to either reject or accept them. This responsibility rests with the manager of the landfill. Wastes which are not authorized to be accepted at the landfill create a number of potential problems including: (1) liability due to future releases of contaminants; (2) bad publicity if media learns of unacceptable waste entering the landfill; (3) potential for worker injury; (4) exposure to civil or criminal penalties; (5) damage to landfill environmental control systems.

B. HAZARDOUS WASTE REGULATIONS AND MANAGEMENT

In the United States, hazardous waste is regulated under RCRA, Subtitle C. A waste is hazardous if it is listed as a hazardous waste by the Administrator of the Environmental Protection Agency (EPA) in the Code of Federal Regulations, Title 40, Part 261, or if it meets one or more of the hazardous waste criteria as defined by EPA. These criteria are:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity

1. Ignitability

Ignitable waste is a waste that burns readily, causes a fire by friction under normal circumstances, or is an oxidizer. Any waste having a flash point of <140F falls in this category. Flash point is that temperature at which a liquid gives off vapors that will ignite when an open flame is applied. Under Department of Transportation (DOT) definitions, a flammable liquid has a flash point of >100 F. A combustible liquid has a flash point between 100 and 200 F. Therefore, a flammable liquid is always hazardous while a combustible liquid may or may not be hazardous depending upon its flash point.

2. Corrosivity

A corrosive waste is one having a very high or a very low pH. The pH of a liquid is a measure of how acidic or basic (alkaline) the material is. The pH scale ranges from 0 to 14. High numbers are basic and low numbers are acidic. A substance having a pH ≤ 2.0 or ≥ 12.5 is defined as hazardous under RCRA.

3. Reactivity

A waste is reactive if it is normally unstable: reacts violently with water; forms an explosive mixture with water; contains quantities of cyanide or sulfur that could be released to the air; or can easily be detonated or exploded. These wastes may fall into any one of several DOT categories.

4. Toxicity Characteristic Leaching Procedure (TCLP)

A waste is TCLP toxic if the concentration of any constituent in Table 1 exceeds the standard assigned to that substance. The TCLP is a methodology which attempts to simulate the conditions within a landfill. An acidic solution is passed through a sample of waste and the resultant "leachate" is analyzed for contaminants. The TCLP is designed to detect heavy metals, pesticides and a few other organic and inorganic compounds. The purpose of the test is to prevent groundwater contamination by highly toxic materials. TCLP tests the mobility of 40 different elements and compounds.

Except in certain specified circumstances, regulated quantities of hazardous waste must be disposed of at a permitted hazardous waste disposal facility. In accordance with 40 CFR Part 261.3, **any material contaminated by a hazardous waste is also deemed to be a hazardous waste and must be managed as such.** Hazardous waste from conditionally exempt small quantity generators are to be disposed of in a Hazardous waste disposal facility. RCRA permits are also required to store, transport, and treat hazardous waste.

C. POLYCHLORINATED BIPHENYL'S (PCBs)

1. Introduction

PCBs are nonflammable and conduct heat without conducting electricity. These compounds were most frequently used as an additive to oil or other liquids in situations where heat was involved. The PCBs enhance the heat conducting properties of the liquid and thereby increase the heat dissipation or cooling effect obtained. They have also been used in lubricants and paint. In the United States one of the most common applications was in electric transformers. The only effective method for destroying PCBs is high Temperature incineration which is relatively expensive due to a shortage of PCB incineration capacity.

TABLE 1

T.C.L.P. CONSTITUENTS & REGULATORY LEVELS (mg/L)			
CONSTITUENT	REG LEVEL	CONSTITUENT	REG LEVEL
Arsenic	5.0	Hexachlorobenzene	0.13
Barium	100	Hexachloro-1,3-butadiene	0.5
Benzene	0.5	Hexachloroethane	3.0
Cadmium	1.0	Lead	5.0
Carbon Tetrachloride	0.5	Lindane	0.4
Chlordane	0.03	Mercury	0.2
Chlorobenzene	100	Methoxychlor	10.0
Chloroform	6.0	Methyl ethyl ketone	200
Chromium	5.0	Nitrobenzene	2.0
m-Cresol	200	Pentachlorophenol	100
o-Cresol	200	Pyridine	5.0
p-Cresol	200	Selenium	1.0
Cresol	200	Silver	5.0
1,4-Dichlorobenzene	10.0	Tetrachloroethylene	0.7
1,2-Dichloroethane	0.7	Toxaphene	0.5
1,1-Dichloroethylene	0.5	Trichloroethylene	0.5
2,4-Dichlorophenoxyacetic acid	0.7	2,4,5-Trichlorophenol	400
2,4-Dinitrotoluene	0.13	2,4,6-Trichlorophenol	2.0
Endrin	0.02	2,4,5-TP (Silvex)	1.0
Heptachlor (and its hydroxide)	0.008	Vinyl Chloride	0.2

By law PCB's are no longer used as dielectrics in transformers and capacitors manufactured after 1979. There are many millions of pounds of PCBs still in use or in storage. One example is the ballasts used in fluorescent light fixtures. It has been estimated that there are between 0.5 million and 1.5 billion ballasts currently in use in this country. Due to the long life of these units, about half of these may be of pre-1979 manufacture and contain PCBs. Since each ballast contains about one ounce of nearly pure PCB fluid, there are about **20 to 30 million pounds** of PCBs in existing lighting fixtures.

These items are not subject to RCRA Subtitle D Waste Screening!

Commercial or industrial sources of PCB wastes that should be addressed by the program include:

- Mineral oil and dielectric fluids containing PCBs;
- Contaminated soil, dredged material, sewage sludge, rags, and other debris from a release of PCBs;
- Transformers and other electrical equipment containing dielectric fluids; and
- Hydraulic machines.

2. PCB Regulatory Requirements

As contrasted to hazardous wastes, the Toxic Substance Control Act regulates PCBs based on the concentration of PCBs in the waste rather than the source or characteristic of the waste. The regulations concerning PCB disposal are spelled out in 40 CFR Part 761. Subtitle D of RCRA merely requires that PCB waste not be disposed in a MSW landfill. PCB management requirements include:

Waste containing more than 500 ppm of PCBs must be incinerated. Waste containing from 50 to 500 ppm must be disposed of by incineration, approved burning, or in chemical waste landfill permitted to receive such wastes. The regulations are silent concerning wastes containing less than 50 ppm of PCBs; however, the regulations cannot be circumvented by diluting stronger wastes.

D. FUNDAMENTALS OF WASTE SCREENING

1. Know Your Generators and Haulers

Since the level of sophistication of your waste screening program will be a reflection of the likelihood of hazardous waste and PCB waste being in your incoming waste, **knowledge of the commercial industrial base of your service area is critical.** Some examples are the automotive industry, which generates solvents, paint wastes, lead acid batteries, grease and oil; the dry cleaning industry, which may generate filters containing dry cleaning solvents; metal platers which generate heavy metal wastes; and other industries which generate a variety of undesirable wastes; e.g. chemical and related products, petroleum refining, primary metals, electrical and electronic machinery, etc.

Landfill managers should also know the haulers and trucks serving the businesses in their community which are likely to carry unacceptable wastes.

Some local governments and solid waste management agencies have enacted legislation requiring haulers to provide a manifest showing the customers whose wastes make up that particular load. Such a manifest is an extremely useful tool when a load is found to contain prohibited wastes. It is unwise to accept wastes from unknown, unlicensed, or otherwise questionable haulers.

2. Inspections

An inspection is typically a visual observation of the incoming waste loads by an individual who is trained to identify regulated hazardous or PCB wastes that would not be acceptable for disposal at the MSWLF unit. The training of landfill personnel will be conducted by a local EMS official or a SWANA certification. An inspection is considered satisfactory if the inspector knows the nature of all materials received in the load and is able to discern whether the materials are potentially regulated hazardous wastes or PCB wastes.

Ideally, all loads should be screened; however, it is generally not practical to inspect in detail all incoming loads. Random inspections, therefore, can be used to provide a reasonable means to adequately control the receipt of inappropriate wastes. Random inspections are simply inspections made on less than every load. At a minimum the inspection frequency will not be less than one percent of the waste stream.

The frequency of random inspections may be based on the type and quantity of wastes received daily, and the accuracy and confidence desired in conclusions drawn from inspection observations. Because statistical parameters are not provided in the regulation, a reasoned, knowledge-based approach may be taken. A random inspection program may take many forms such as inspecting every incoming load one day out of every month or inspecting one or more loads from transporters of wastes of unidentifiable nature each day. If these inspections indicate that unauthorized wastes are being brought to the MSWLF site, the random inspection program should be modified to increase the frequency of inspections.

Inspection priority also can be given to haulers with unknown service areas, to loads brought to the facility in vehicles not typically used for disposal of municipal solid waste, and to loads transported by previous would-be offenders. For wastes of unidentifiable nature received from sources other than households (e.g., industrial or commercial establishments), the inspector should question the transporter about the source/composition of the materials.

Loads will be inspected on the working face of the landfill.

An inspection flow chart to identify, accept, or refuse solid waste is provided as Figure 1.

Inspections of materials may be accomplished by discharging the vehicle load in an area designed to contain potentially hazardous wastes that may arrive at the facility. The waste should be carefully spread for observation using a front end loader or other piece of equipment. The Division of Waste Management recommends that waste should be hand raked to spread the load. Personnel should be trained to identify suspicious wastes. Some indications of suspicious wastes are:

- Hazardous placards or markings;
- Liquids;
- Powders or dusts;
- Sludges;
- Bright or unusual colors;
- Drums or commercial size containers; or
- Chemical odors.

The County will follow these procedures when suspicious wastes are discovered.

- Segregate the wastes;
- Question the driver;
- Review the manifest (if applicable);
- Contact possible source;
- Call the State Solid Waste Management Department;
- Use appropriate protective equipment;
- Contact laboratory support if required; and
- Notify the local Hazardous Material Response Team.

Containers with contents that are not easily identifiable, such as unmarked 55-gallon drums, should be opened only by properly trained personnel. Because these drums could contain hazardous waste, they should be refused whenever possible. Upon verifying that the solid waste is acceptable, it may then be transferred to the working face for disposal.

Testing typically would include the Toxicity Characteristic Leaching Procedure (TCLP) and other tests for characteristics of hazardous wastes including corrosivity, ignitability, and reactivity. Wastes that are suspected of being hazardous should be handled and stored as a hazardous waste until a determination is made.

If the wastes temporarily stored at the site are determined to be hazardous, The County is responsible for the management of the waste. If the wastes are to be transported from the facility, the waste must be: (1) stored at the MSWLF facility in accordance with requirements of a hazardous waste generator, (2) manifested, (3) transported by a licensed Treatment, Storage, or Disposal (TSD) facility for disposal.

E. RECORD KEEPING AND NOTIFICATION REQUIREMENTS

Records must be kept pursuant to an incident where regulated hazardous waste or prohibited waste is found at the landfill. It is also recommended that records be kept of all screening activities and incidents, whether or not, regulated or prohibited wastes are found. This will help prove that the landfill owner/operator has acted in a prudent and reasonable manner.

The best way to prove compliance with this requirement is to document each inspection including:

- Date and time of waste detection
- Hauler name (company and driver)
- Waste(s) detected
- Waste generator(s) if able to identify
- Action(s) taken to manage or return material(s)
- Efforts taken if extreme toxicity or hazard was discovered
- Landfill employee in responsible charge

40 CFR Part 258 requires that records should be maintained at or near the landfill site during its active life and as long after as may be required by the appropriate state or local regulations.

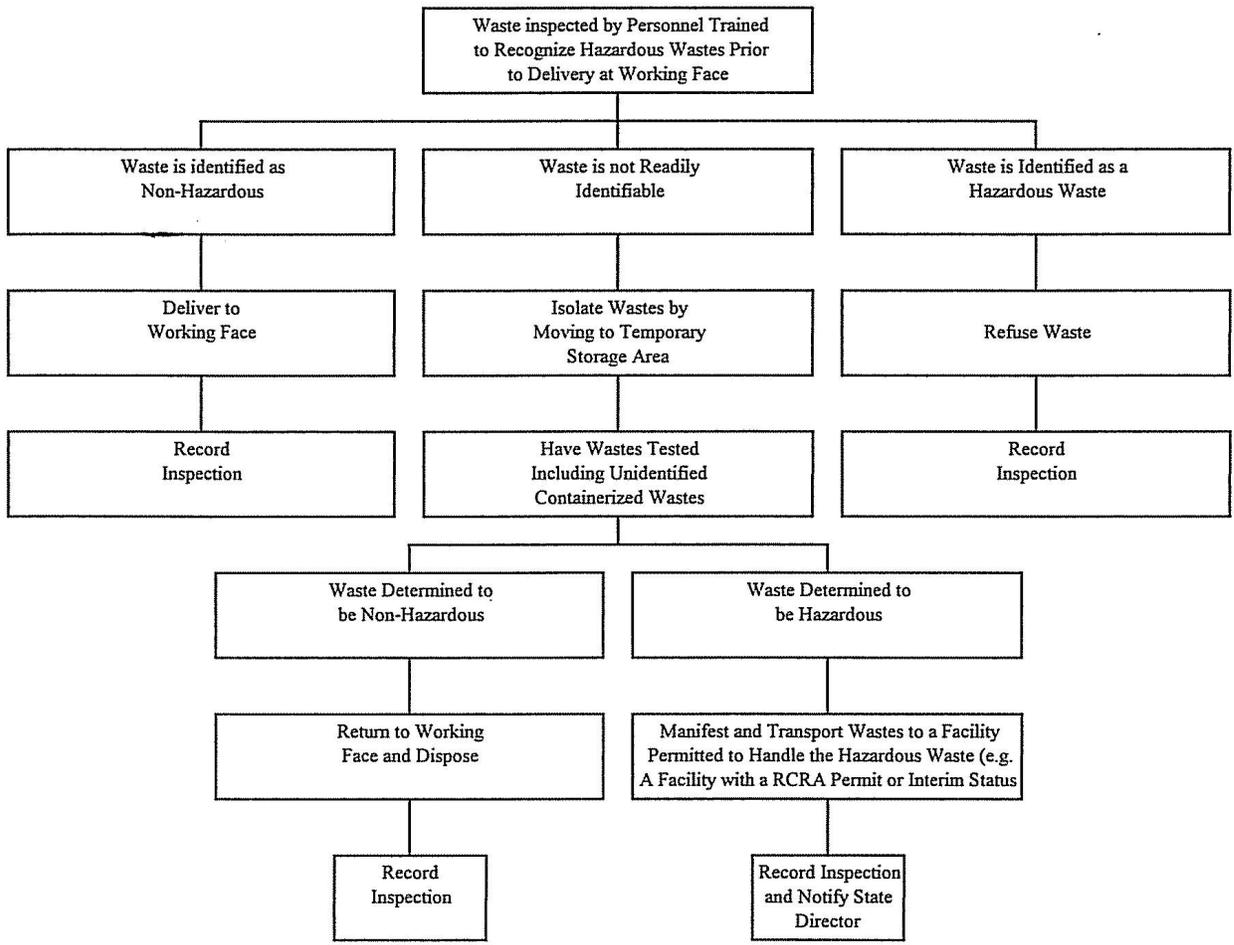


FIGURE 1
Hazardous Waste Inspection Decision Tree
Inspection Prior to Working Face

WASTE SCREENING CHECK LIST
(CHECK ALL THAT APPLY)

CONTAINERS

	YES	NO
FULL.....	_____	_____
PARTIALLY FULL.....	_____	_____
EMPTY.....	_____	_____
CRUSHED.....	_____	_____
PUNCTURED.....	_____	_____

POWDERS/DUSTS

IDENTIFIED.....	_____	_____
UNKNOWN.....	_____	_____

SATURATION..... _____

LABEL/HAZARDOUS..... _____

ODOR/FUMES

STRONG.....	_____	_____
FAINT.....	_____	_____

HEAT..... _____

ITEMS FOUND

BATTERIES..... _____

OIL..... _____

BIOMEDICAL..... _____

RADIOACTIVE..... _____

ASHES/RESIDUE..... _____

SOD/SOIL..... _____

LIQUID..... _____

HAZARDOUS..... _____

PCB'S..... _____

Action Taken:

DETAILED SCREENING REPORT

WASTE SOURCE _____
ADDRESS _____

PROBABLE [] SUSPECTED [] CONFIRMED []

WASTE HAULER _____
ADDRESS _____

DRIVER'S NAME _____
DETAIL _____

NOTIFIED:

WASTE SOURCE [] HAULING MANAGEMENT [] SITE MANAGEMENT []

STATE [] FEDERAL []

NAME _____
WITNESS (IF ANY) _____
DATE _____ TIME _____ AM PM

ACTION REQUIRED:

2.4 Appendix II - Alternate Cover Materials (ACM)

ACM: Automotive Shredder Residuals (ASR)

Approved Landfill Use: MSWLF and C&DLF (lined)

Material Characteristics: Automotive shredder residuals are the fines remaining after scrap cars have passed through a shredder and all recoverable materials have been removed. ASR can consist of glass, synthetic fibers, rubber, plastics, automobile liquids residue, metal fines and dirt. It is possible for the ASR to contain substances considered hazardous such as lead, cadmium and PCB.

Usage Criteria:

1. ASR can be applied, in lieu of soil, to a depth of six inches given calm site (weather) conditions.
 2. If site (weather) conditions are, or are forecast to be , windy the ASR must either be:
 - a). Mixed with soil at a ration of 50% soil with 50% ASR prior to application on the working face, or
 - b) Placed on the working face to a minimum depth of 3" and then covered with soil a minimum depth of 3".
 3. During use of ASR as an ACM, soil cover to a full depth of six inches shall be applied once per week.
 4. ASR shall not be used on any exterior/outside slopes and may not be used for intermediate cover.
 5. The ASR must be sourced from within the approved service are of the landfill facility.
- * **A CDLF equipped with a liner system may use the ASR as alternate daily cover only. Use of more than six inches equates to disposal. ASR is not a C&D waste. To dispose of ASR in a lined CDLF, contact the Permitting Branch of the solid Waste Section for further clarification.**

ACM: Combustion Residuals (CR)/Ash

Approved Landfill Use: MSWLF and C&DLF (lined)*, IndLF (lined)*

Material Characteristics: Construction Combustion Residuals or Ash are, generally, the residuals remaining from the combustion of coal or the incineration of waste materials. The CR/Ash generally consists of fine particles such as fly-ash as well as larger particles similar to sand, gravel or stone.

Usage Criteria:

1. CR/Ash can be applied, in lieu of soil, to a full depth of six inches given calm site (weather) conditions.
2. If site (weather) conditions are, or are forecast to be , windy the CR/Ash must either be:
 - a). Mixed with soil at a ration of 50% soil with 50% CR/Ash prior to application on the working face if it can become airborne or exhibits dust like properties, or
 - b) Placed on the working face to a minimum depth of 3" and then covered with soil a minimum depth of 3".
3. During use of CR/Ash as an ACM, soil cover to a full depth of six inches shall be applied once per week, unless otherwise approved by the Section*.
4. CR/Ash may not be used for intermediate cover, if it can become airborne or exhibits dust like properties.
5. The CR/Ash must be sourced from within the approved service area of the landfill facility..

Warning: Some materials, such as flue gas desulfurization residue, are destined for recycle and cannot be contaminated with soil. Site Specific handling practices should be discussed with the Solid Waste Section prior to implementation.

- * **A CDLF equipped with a liner system may use the CR as alternate daily cover only. Use of more than six inches equates to disposal. CR is not a C&D waste. To dispose of CR in a lined CDLF, or a non-CCB industrial landfill, contact the Permitting Branch of the solid Waste Section for further clarification.**

ACM: Construction and Demolition Debris (C&D) Fines

Approved Landfill Use: MSWLF and C&DLF (lined)

Material Characteristics: Construction and Demolition Debris Fines are, generally, the residuals and fine particles remaining in the bottom of dumpsters, roll-off containers and trucks used in the transportation or processing of C&D debris.

Usage Criteria:

1. C&D Fines can be applied, in lieu of soil, to a full depth of six inches given calm site (weather) conditions.
 2. If site (weather) conditions are, or are forecast to be, windy the ASR must either be:
 - a). Mixed with soil at a ratio of 50% soil with 50% C&D Fines prior to application on the working face, or
 - b). Placed on the working face to a minimum depth of 3" and then covered with soil a minimum depth of 3".
 3. During use of C&D Fines as an ACM, soil cover to a full depth of six inches shall be applied once per week.
 4. C&D Fines shall not be used on any exterior/outside slopes and may not be used for intermediate cover.
 5. The C&D Fines must be sourced from within the approved service area of the landfill facility.
- * **Warning: C&D fines can contain large percentages of drywall dust or gypsum. These materials may produce significant amounts of hydrogen sulfide, an obnoxious smelling compound. If odor problems develop, the use of the fines should be suspended immediately and the offending area covered with soil.**

ACM: Petroleum Contaminated Soils (PCS)

Approved Landfill Use: MSWLF and C&DLF (lined)*, IndLF (lined)*

Material Characteristics: Petroleum Contaminated Soils are, generally, native soils contaminated with some petroleum liquid. Generally, these soils are to be sourced from environmental cleanup sites, spill sites or sites associated with above ground or underground storage tank (AST or UST) removal. In the case of ACM usage, petroleum is narrowly defined as low to medium boiling point petroleum derived fuels such as gasoline, kerosene, diesel, motor oil, mineral spirits and fuel oils #11 through #6. All other petroleum derived liquids such as solvents, acids, tars and asphalts are excluded. In all cases, the concentration of Total Petroleum Hydrocarbons (TPH) in the PCS cannot exceed 3,000 parts per million (PPM) regardless of type or test method. The material may not contain chlorinated solvents or other hazardous materials or exhibit the hazardous characteristic of flammable.

Usage Criteria:

1. PCS can be applied, in lieu of soil, to a full depth of six inches.
2. The PCS must be stockpiled within the disposal area and shall be managed and applied in such a way that runoff cannot leave the lined landfill area.
3. The PCS shall be managed in such a way to prevent run-off and fugitive emissions (i.e. use of tarps, berms and/or wetting to prevent blowing).
4. PCS is prohibited from disposal. Therefore, the facility may not accept more PCS than can be used in a 45 day period. The amount of PCS accepted should not exceed 20% of the permitted facility average monthly waste stream.
5. PCS shall not be used on any exterior/outside slopes and may not be used for intermediate cover.
6. The PCS must be sourced from within the approved service area of the landfill facility.
7. PCS can only be used at lined landfill facilities.
8. Records must be maintained in the facility operating record indicating the volume of PCS accepted and applied at the facility on a daily basis.

- * **A CDLF or IndLF equipped with a liner system may use the PCS as alternate daily cover only. Use of more than six inches equates to disposal. PCS is neither a C&D nor an Industrial waste. To dispose of PCS in a lined CDLF, or a non-CCB industrial landfill, contact the Permitting Branch of the Solid Waste Section for further clarification.**

ACM: Spray-applied Mortar Coating (SMC)

Approved Landfill Use: MSWLF, C&DLF and IndLF

Material Characteristics: SMC is, generally, a commercially sourced non-flammable, non-toxic product containing proprietary components including mix setting agents, reinforcing materials and cement. Other components, such as latex paint, may also be added to the mixture. All of the components are mixed on site with water and/or leachate to produce a slurry that is then spray applied to the working face.

Usage Criteria:

1. SMC can be applied, in lieu of soil, given appropriate site (weather) conditions.
2. SMC must be applied in accordance with the manufacturer's application guidelines.
3. SMC must be applied in two directions to ensure adequate coverage.
4. During the use of SMC as an ACM, soil cover to a full depth of six inches shall be applied once per week unless otherwise approved by the Section.
5. The use of non-hazardous latex or water based paint in the mixture is approved provided that the paint has been collected for recycling.

ACM: Foam Coating (Foam)

Approved Landfill Use: MSWLF, C&DLF and IndLF

Material Characteristics: Foam Coating is, generally, a commercially sourced non-flammable, non-toxic, non-hardening water based product. The proprietary liquid concentrate is delivered to the site and diluted with water prior to application with proprietary equipment.

Usage Criteria:

1. Foam can be applied, in lieu of soil, given appropriate site (weather) conditions.
2. Foam must be applied in accordance with the manufacturer's application guidelines.
3. During the use of Foam as an ACM, soil cover to a full depth of six inches shall be applied once per week.
4. The use of non-hazardous latex or water based paint in the mixture is approved provided that the paint has been collected for recycling.
5. Foam shall not be used on any exterior/outside slopes and may not be used for intermediate cover.

ACM: Foundry Sand (Sand)

Approved Landfill Use: MSWLF, C&DLF (lined)* and IndLF (lined)*

Material Characteristics: Foundry Sand is, generally, a by-product of the smelting and forging processes for metals fabrication. Metal pieces and particulate may also be found in the sand. Prior to use, a Toxicity Characteristic Leaching Procedure (TCLP) analysis must be performed to ensure no hazardous constituents are found in the sand at the source. The TCLP analysis results must be submitted with the Operation Plan revision.

Usage Criteria:

1. Sand can be applied, in lieu of soil, to a full depth of six inches.
2. The Sand must be stockpiled within the disposal area and shall be managed and applied in such a way that runoff cannot leave the lined landfill area.
3. The Sand shall be managed in such a way to prevent runoff and fugitive emissions (i.e. use of tarps, berms and/or wetting to prevent blowing).

4. Sand is prohibited from disposal. Therefore, the facility may not accept more Sand than can be used in a 45 day period. The amount of Sand accepted should not exceed 20% of the permitted facility average monthly waste stream.
5. Sand shall not be used on any exterior/outside slopes and may not be used for intermediate cover.
6. The Sand must be sourced from within the approved service area of the landfill facility.
7. Sand can only be used at lined landfill facilities.
8. Records must be maintained in the facility operating record indicating the volume of Sand accepted and applied at the facility on a daily basis.

* **A CDLF or IndLF equipped with a liner system may use the Sand as alternate daily cover only. Use of more than six inches equates to disposal. Sand is not a C&D waste. To dispose of Sand in a lined CDLF, a lined landfill not previously permitted to accept it or a or an non-CCB industrial landfill, contact the Permitting Branch of the Solid Waste Section for further clarification.**

ACM: Soil/Mulch Mixture (S&M)

Approved Landfill Use: MSWLF, C&DLF and IndLF

Material Characteristics: Soil/Mulch Mixture is, generally, a mixture of native soils and wood mulch generated from grinding of yard trash, land clearing debris and pallets constructed of unpainted and untreated natural wood. Additionally, shredded tire chips may be used in addition to, or in lieu of, wood mulch.

Usage Criteria:

1. S&M can be applied, in lieu of soil, to a full depth of six inches.
2. S&M can be mixed at a ratio from 80% soil to 20% mulch up to 50% soil to 50% mulch by volume.
3. During the use of S&M as an ACM, soil cover to a full depth of six inches shall be applied once per week.
4. S&M may not be used for intermediate cover.

ACM: Synthetic Tarps (Tarps)

Approved Landfill Use: MSWLF, C&DLF and IndLF

Material Characteristics: Synthetic Tarps are, generally, a commercially sourced non-flammable, non-toxic, sheet product constructed of an impermeable synthetic polymer typically reinforced with fibers. Acceptable sheet products include, but are not limited to, geotextiles, polyethylene membranes, plastic film, tarps and composite geotextile/plastic membranes. Tarps may be applied by hand, using landfill equipment and/or and Automatic Tarping Machine (ATM).

Usage Criteria:

1. Tarps can be applied, in lieu of soil, given appropriate site (weather) conditions.
2. Tarps must cover the entire working face. Any waste not covered by tarps must be covered by soil.
3. Tarps must be secured in place with the use of soils or other ballast system such as tires or sand bags.
4. During the use of Tarps as an ACM, soil cover to a full depth of six inches shall be applied once per week.
5. Tarps shall not be used on any exterior/outside slopes and may not be used for intermediate cover.

2.5 Appendix III - Explosive Gas Control Plan (MSW and C&D)

North Carolina Solid Waste Management Rules 15A NCAC 13B require quarterly monitoring of methane gas (at MSW landfills) and quarterly monitoring of methane and other explosive landfill gases (LFG) (at C&D and other landfills) to ensure that methane does not exceed the lower explosive limit (LEL) in the soil at the facility property boundary or 25 percent of the lower explosive limit within facility structures. If the concentration exceeds the specified limits, steps must be taken to ensure the protection of public health and a remediation plan must be implemented immediately.

Per the [SWS Guidance Document](#) (November 2010), subsurface gas typically migrates above the groundwater table and is restricted laterally by streams. On-site perennial tributaries and adjoining wetlands namely Jacob's Branch and Yellow Marsh Branch comprise portions of the Thoroughfare Swamp. Almost the entire area surrounding the waste units are isolated by these perennial hydraulic barriers which significantly decreases the potential for LFG migration beyond Wayne County's property boundaries.

The uppermost aquifer across the entire site has been identified to be within the unconsolidated regolith. The vertical LFG migration potential extent is the water table which ranges from approximately 0 to 20 feet below ground.

In accordance with Rule 15A NCAC 13B LFG readings will be recorded quarterly and results will be kept in the facility operating records. Wayne County will follow all operational requirements for MSWLF facilities; ensuring the measured concentrations of methane gas does not exceed the lower explosive limit (100% LEL or 5% by volume) at the facility boundary and (25% LEL or 1.25% by volume) in structures. Hydrogen sulfide gas should not exceed the lower explosive limit (100% LEL or 4% by volume) at the facility boundary and (25% LEL or 1% by volume) in structures. LFG records will be submitted to the SWS in the event that stabilized methane or hydrogen sulfide levels exceed these limits or upon SWS request.

Wayne County Landfill facility located in Dudley, NC consists of three discrete waste units. An active Subtitle D Lined MSWLF, an active construction and demolition (C&D) landfill vertical expansion atop an unlined landfill and a closed sanitary landfill. The locations of monitoring points were chosen following careful consideration of spatial relationship between property boundaries, hydraulic barriers and both on and off-site structures. The LFG monitoring locations are shown in the facility drawings.

The contiguous lined landfill shall be monitored at existing probes MP-29 and MP-30. LFG migration through soil originating from lined landfill is effectively bound by perennial streams on all sides except for a small portion in a northeastern direction. No probes are located within any future planned landfill development areas however in the unlikely event their location inhibits any site development they will be properly abandoned per 15A NCAC2C.0113(d). No additional monitoring locations are currently proposed around the lined landfill.

Active CDLF and closed unlined landfill units shall be monitored by five existing LFG probes (MP-4, MP-10, MP-11, MP-12 and MP-13). Monitoring probes (MP-4, MP-12 and MP-13) are located adjacent to two small properties that are not owned by Wayne County. Monitoring probes (MP-10 and MP-11) are located along the north side of Landfill Road in which both sides are owned by Wayne County. These probes are not located within any future planned landfill development areas; however in the unlikely event their location inhibits any site development they will be properly abandoned per 15A NCAC 2C .0113(d). No additional monitoring locations are currently proposed around the unlined landfills.

New probes are not proposed to be installed. In the event unrepairable damage occurs to existing probes or migration investigations are initiated new probes will be installed per specifications outlined in SWS Guidance Document with the exception the probes may be constructed of 1" PVC and the outer protective case may be constructed out of non-sparkable aluminum. All probes will be equipped with a stopcock ball valve bushed to the well casing, quick connect coupling threaded into the well cap or an equivalent device that allows air flow to be controlled at the wellhead.

The inside of eight on-site structures (CONV_BLG, SCALES_1, SHOP_BRM, SHOP_GRG, GARAGE_1, HUT_WTGS, SCALES_2 and CH4_BLDG) will be monitored quarterly for LFG accumulation in accordance with the Guidance Document. If new on-site structures are erected in the future they will be monitored along with the existing ones. All on-site habitable structures are shown on the facility drawings.

2.6 Appendix IV - Leachate Collection System Inspection Log

Leachate Collection System Inspection Log

Rainfall

_____ inches (measured after each occurrence)

Pump Readings

Pump #_____:

_____ Date

_____ Hrs. Run (total weekly)*

_____ Gallons Pumps (total weekly)**

Manually Operate Pump _____ Date (monthly)

Pump #_____:

_____ Date

_____ Hrs. Run (total weekly)*

_____ Gallons Pumps (total weekly)**

Manually Operate Pump _____ Date (monthly)

Leachate Lagoon(s)

Inspection of Storage Lagoon _____ Date (Monthly)

Repairs to Storage Lagoon(s) _____ Date

Leachate Lines

Date Videoed _____

Date Flushed _____

Comments

* **Hours Run/Week** = Previous Week's Hours – This Weeks Hours

** **Gallons Pumped/Week** = Previous week's gallons – This week's gallons

2.7 Appendix V - Surface and Groundwater Monitoring Plan

Introduction

The objective of the Ground and Surface water Sampling and Analysis Plan is to provide clear guidelines and procedures for field and laboratory personnel when obtaining and testing ground and surface water samples. This plan is an update, and supersedes the November 1995 SAP for the Wayne County C&D Landfill on top of Closed MSW landfill. The sampling procedures outlined in this analysis plan are guidelines by which sampling will be performed. Deviation from the procedures may be warranted depending on facility conditions or unforeseen sampling variables. Alternative sampling procedures must conform to the N.C. Water Quality Monitoring Guidance Document for Solid Waste Facilities (Guidance Document).

All groundwater and surface water monitoring points shall be sampled semi-annually for the constituents listed in Appendix I and Appendix II. In addition to the Appendix I and Appendix II constituents monitoring wells MW-1, MW-2 and MW-8 will be sampled for the following suite of Monitored Natural Attenuation (MNA) parameters.

MNA Performance Parameters		
Parameter	Analysis Type	Analytical Method
Dissolved Oxygen (DO)	Field Reading	Multi-parameter Field Instrument w/ flow-through cell
pH	Field Reading	
Oxidation-Reduction Potential (ORP)	Field Reading	
Turbidity	Field Reading	
Conductivity	Field Reading	
Temperature	Field Reading	
Dissolved CO ₂	Field Reading	
Alkalinity (Total as CaCO ₃)*	Laboratory/Field*	EPA 310.2
Chloride*	Laboratory/Field*	SM 4500-CLB
Iron	Laboratory	SM3111B
Nitrate*	Laboratory/Field*	EPA 353.2 / SM 2320B
Sulfate*	Laboratory/Field*	EPA 375.4 / SM 4500-SO4E
Sulfide*	Laboratory/Field*	EPA 376.1 or SM 4500SE
TOC/BOD/COD	Laboratory	EPA 415.1 / EPA 405.1 / EPA 410.1
Methane	Laboratory	RSK 175
Ethane, Ethene	Laboratory	RSK 175
Hydrogen	Laboratory	AM19GA
Volatile Fatty Acids	Laboratory	AM23G

*For budgetary considerations these analyses may be performed in the field using Hach® brand color wheel test kits.

Water Quality Monitoring Summary

The nature of the groundwater flow, geology, location of Edwards Branch, and close proximity of several drainage features will require extensive monitoring for early detection of a landfill release. The monitoring plan consists of eleven (11) monitoring wells numbered MW-1 through MW-11 and three (3) surface monitoring points numbered SW-1, SW-2 and SW-3.

Monitoring well MW-1 is the background well located up gradient of the landfill. MW-2 is a downgradient monitoring well for the western portion; designed to intersect groundwater flow from the eastern portion prior to reaching the western tributary of Edwards Branch. MW-3 is a downgradient monitoring well in the northeastern portion of the western landfill. MW-4 is installed on the eastern half of the landfill to detect a potential release from the southeastern area via advection. MW-5 is a downgradient well utilized for the detection of a release from the middle of the landfill. MW-6 is a downgradient monitoring well located on the northeastern side of the landfill, positioned to detect a release from the landfill center. MW-7 is a downgradient monitoring well for the southernmost route of contamination. MW-8 is a downgradient monitoring well for the eastern unit. MW-9 is used as a background well for statistical analysis, and MW-11 serves as a sentinel well for the plume area near MW-2.

Surface water sampling point SW-1 is located downstream of the landfill below the confluence of the two forks of Edwards Branch. Surface water sampling points SW-2 and SW-3 are located upstream of the landfill on the two separate forks of Edwards Branch.

Assessment Monitoring

Assessment Monitoring will be performed on MW-1 through MW-11. Assessment monitoring will consist of collection of groundwater for analysis for the complete list of Appendix I constituents, as well as Appendix II constituents as determined by the Solid Waste Section. Additionally, field parameters including dissolved oxygen (DO), oxidation reduction potential (ORP), pH, temperature, turbidity, and conductivity will also be collected.

As indicated in the *Corrective Action Plan*, MNA monitoring will be performed on monitoring wells MW-1, MW-2, and MW-8.

Sampling Equipment

Groundwater purging and sampling will be performed using a submersible pump and disposable polyethylene bailers. A new bailer will be used to sample each individual well. *Under no circumstance will a disposable bailer used to sample a given well be used to sample any remaining well.* The following procedure will be used to decontaminate the submersible pump:

1. Phosphate-free detergent & de-ionized or distilled water rinse.
2. De-ionized or distilled water rinse.
3. Isopropyl alcohol (isopropanol) rinse.
4. De-ionized or distilled water rinse.

At least one (1) equipment blank will be collected during pump decontamination procedures to ensure that cross-contamination has not occurred as a result of the decontamination process. The standard equipment necessary to conduct sampling for each well consists of sample containers (including trip blanks and equipment blanks), one wide-mouth container, at least one 100-ft spool of nylon twine, at least one box of disposable latex/nitrile gloves, temperature/pH/ORP/conductivity indicator, water level indicator, storage coolers, and ice. All equipment subject to damage and contamination will be transported in sealed, plastic bags or storage containers. The water level indicator will be decontaminated in accordance with Steps 2 and 3 described above prior to placement in a clean plastic bag or storage container.

Sampling Containers

Ground and surface water monitoring will include organic (volatile organic compounds- VOCs) and inorganic (metals) analyses. Samples will be collected for the various analyses in laboratory-supplied containers.

1. Each sample container will be clearly labeled providing the following information: site name, county location, sample identification number, parameters to be analyzed, preservative added, date and time of sampling, and initials of the sampler.
2. Samples to be analyzed for VOC concentrations will be collected first, using three 40-ml glass vials with Teflon septa caps. The sample vials will be completely filled to create zero headspace in the vials.
3. Samples to be analyzed for inorganic contamination will be collected second, using a quart/1-liter polyethylene container.

All sample containers will be obtained from an independent laboratory in a sterilized condition and with the appropriate, method-specific preservative. Care will be taken by the field technician to not allow the preservative to wash out of the sample containers during sampling.

MNA Sampling Containers

Groundwater samples to be analyzed for MNA performance parameters will be collected into the container types listed in the table below.

MNA Parameter	Volume	Bottle Type	Preservative
Alkalinity	250 mL	Plastic	none; cool to 4°C
Chloride	125 mL	Plastic	none; cool to 4°C
TOC/COD	250 mL	Glass	Sulfuric acid (H ₂ SO ₄)
BOD	500 mL	Polyethylene	none; cool to 4°C
Iron	125 mL	Plastic	Nitric acid (HNO ₃)
Nitrate	125 mL	Plastic	Sulfuric acid (H ₂ SO ₄)
Sulfate	125 mL	Plastic	none; cool to 4°C
Sulfide	250 mL	Glass	Sodium hydroxide (NaOH)
Methane/Ethane/Ethene	125 mL	Plastic	none; cool to 4°C
Hydrogen	-	-	proprietary lab sampler
Volatile Fatty Acids	40 mL	Glass	Hydrochloric Acid (HCl)

Sampling

Wells will be sampled from upgradient to downgradient locations; or when previous analytical data is available, from least to greatest contamination. This procedure is required to limit potential cross contamination between sampling points.

A clean sheet of plastic will be placed around the well to provide a clean surface for sampling equipment. The total well depth read from the well tag and the measured depth to water, determined using the water level indicator, will be used to compute the depth of water in the well. The total well depth will be measured and compared to the depth indicated on the well tag as a check for silt buildup or blockage at depth.

All meters used to monitor purge parameters will be calibrated immediately prior to purging and sampling, and those readings recorded in a field logbook. Entries will always include pre- and post- calibration readings as well as the model and serial number of the equipment and the date, time, and person performing the calibration(s). Two standards, which bracket the average or suspected measurements for pH and specific conductance, will be used at the site. Since natural waters (including those impacted by environmental contaminants) tend to have pH values less than 7.0, pH buffers of 4.0 and 7.0 will typically be used for instrument calibration.

Disposable nitrile gloves will be worn by the field technician during sampling to minimize the risk of personal exposure to potentially harmful chemical substances and to minimize the risk of sample cross-contamination. Fresh pairs of nitrile gloves will be worn during each purge and sampling event. The groundwater samples will be transferred from the bailers into method-specific and appropriately preserved containers and placed into a clean cooler containing ice to chill the samples to a temperature of approximately 4°C.

Indicator parameters such as pH, temperature and specific conductance will be measured during purging as an indication that groundwater representative of the formation surrounding a given well is being sampled. Purging is considered complete when at least three well volumes have been purged and indicator parameters have stabilized such that three successive readings vary by no more than 10%. Purging may need to be continued beyond five well volumes if indicator parameters have not stabilized. All information will be recorded on a field data sheet or in a field logbook with copies submitted to the Division of Waste Management with the analytical results.

Purging

Each well will be purged of approximately three (3) to five (5) volumes of standing water and allowed to settle prior to collection of groundwater samples. If the well should go dry and not recharge before the requisite well volumes are removed, the well will be allowed to recharge and a sample will be collected within 24 hours of the initial purging. The amount of standing water will be calculated by first subtracting the depth-to-water from total well depth.

After determination of the amount of water to be purged from a given well, the equipment necessary for purging will be assembled at the well. The disposable bailer will be maintained in a stable, upright position while the upper portion of the plastic wrapping will be pulled away to expose only the eyelet used for securing twine to the bailer. After the twine has been secured to the bailer with gloved hands, the bailer will be suspended as the remaining plastic is removed. The bailer will be lowered slowly into the well until the bailer contacts groundwater. The bailer twine will then be cut to an adequate length and secured to prevent loss of the bailer in the well. At no time during purging will the bailer twine be allowed to touch the ground. In order to not allow the twine to touch the ground during purging, the twine will be collected when raising the bailer either by loops gathered in one hand or by alternating hand-to-hand as the bailer is pulled from the well. When purging deep wells (in excess of 40 feet), the ground and the well head may be covered with a clean plastic bag or sheet of plastic with a slit cut to allow the plastic to slide over the well head. This will be a separate sheet of plastic from the one used for the sampling equipment.

Groundwater Sample Collection

The bailer will be lowered slowly into the well to avoid volatilization of any dissolved-phase compounds that may be present in the groundwater. Once full, the bailer will be retrieved and containers filled by emptying the water through the hole at the bottom of the bailer. Glass 40-mL vials for VOC analyses will be filled in such a manner as to produce zero headspace in the vials. Polyethylene containers for metals analyses will be filled and sealed with the cap, leaving about ½-inch of airspace at the top. In addition to collecting the samples, water will be collected in the wide-mouth container for pH, temperature, and conductivity measurements. Upon completion of sampling, all groundwater samples, including equipment and trip blanks, will be placed in labeled and sealed plastic bags and stored in ice-filled coolers to chill the samples to 4°C pending transport to a NCDENR-certified analytical laboratory. Contaminated nitrile gloves and twine will be discarded.

Surface water Sample Collection

Surface water sampling will be taken with given consideration to minimize turbulence and aeration. As during groundwater sampling, surface water samples will be collected by a field technician wearing disposable gloves. Containers will be dipped at sampling location points by gently dipping the sample container into surface water and allowing surface water to flow over the mouth of container so as not to displace any preservative within the sample container. If there is little current movement, the container will be moved slowly through the water laterally. During times of low water, if the water is not deep enough to allow filling of sample containers, an appropriately decontaminated sampling cup will be used to retrieve the sample. All containers will be treated in the same manner as the groundwater samples. The samples will be sealed in labeled, plastic bags, and stored in an ice-filled cooler to chill the samples to 4°C pending transport to a NCDENR-certified analytical laboratory.

Chain of Custody

Chain-of-custody forms will be used to document the handling of all samples collected and listing all individuals who have taken possession of a given set of samples, including field personnel, laboratory couriers, and laboratory personnel. Trip blanks, equipment blanks, and sample containers will all travel and be stored together. Trip blanks will remain in the condition they are received from the laboratory and will not be opened or tampered with during the sampling. A chain-of-custody record will be completed for each day's samples, indicating the date and time, sample location, sample matrix (soil, water, etc.), and laboratory analyses to be conducted.

Analysis

When the water samples reach the laboratory, they will be transferred to a sample custodian who will sign the chain of custody documentation as receipt of the samples. Internal control of the water samples in the laboratory will be in accordance with QA/QC procedures for the laboratory. Copies of QA/QC manuals for approved laboratories are on file at the Division.

Groundwater and surface water will be analyzed for the Appendix I list of constituents. QA/QC procedures utilized during the testing will be in conformance with laboratory QA/QC manual. Monitoring wells MW-1, MW-2 and MW-8 will be sampled for the Appendix I list and the aforementioned MNA parameters.

ATTACHMENT 1

BASELINE DATA

TO BE ADDED IN THE FUTURE

2.8 Appendix VI – Corrective Action For Leachate Break-Outs

CORRECTIVE ACTION FOR LEACHATE BREAK-OUTS

Leachate breakouts can be prevalent during and after any wet weather period. These breakouts are created by standing water on a landfill that drains through the cover into the waste. Once the water is in the waste, it moves through it both vertically and horizontally until it reaches a less permeable layer. Once it reaches this layer, it will move horizontally along it until it pools up or finds a less permeable area to flow vertically through that layer. If it pools up, it will eventually work through the layer to also flow vertically. If the less permeable layer is on a slope, the leachate will never pool up but flow horizontally along this slope until it “breaks out” the side of the landfill.

The best solution to breakouts is to avoid any standing water on top of the landfill. If waste is placed down a slope, provide trench excavations perpendicular to the flow direction into the intermediate cover so that the leachate flow is directed downward instead of along the plane between the waste and the intermediate cover.

If a breakout occurs, first and foremost contain it on the landfill foot print. In the case of the lined landfill, it needs to be within the lined area. Containment on the surface cannot be the only solution. The breakout must be repaired so that the flow of the leachate is downward and does not continue along the plane between any cover and the waste. Containment of leachate breakouts by berming along the edge is not a permanent fix for two reasons. First, storm water is being impounded behind the berms and impoundment of storm water over waste is a violation of the NC Solid Waste Rules. Second, if storm water continues to be impounded behind the berms, it has the potential eventually to pond up higher than the berm and erode the berm releasing all contained leachate with the storm water. The storm water cannot flow downward into the waste as fast as it flows down the slopes; consequently, a pond will form and all of the above can and will happen.

The liquid that is impounded behind any berm has to be removed by pumping into a tank and hauling it either to the leachate lagoon or the waste water treatment plant. It cannot be allowed accumulate because it will break through the containment berm.

All leachate breakouts need to be repaired immediately. The repair consists of vertically excavating above (uphill) of the actual breakout. The leachate is flowing down hill from the ponding on top of the landfill; consequently, it needs to be intercepted by the excavation. Vertically excavate down through the waste until the intermediate or cover soils have been penetrated so waste below these layers of soil has been exposed. Immediately remove all excavated waste to the working face of the landfill.

Place a more permeable material in the excavation. The best material is rock because it is the most permeable material. The rock can be either on site or purchased from a quarry. The only criteria is that it be relatively free of soil. The excavation needs to be filled with this material up to and including the soil layers where the leachate is flowing. This allows the leachate to move vertically instead of horizontally. Once the material has been filled above the soil layers, re-cover the area with soil cover material.

If the outbreak is at the edge of the landfill (MSW or C&D), do not excavate at his point. Step into the landfill at least 20 feet to excavate. In the lined landfill, do this with extreme caution. In the lined landfill, the excavation should be no deeper than 6 feet. Within 6 feet, the intermediate soil layers should have been penetrated. Do not excavate into the initial waste placement.

In the C&D landfill, the vertical excavation may have to penetrate the final cap of the MSWLF. The cap was supposed to be two feet but may be thicker. Whatever the thickness, the excavation needs to penetrate this cap until the MSW is exposed. Fill the excavation with the more permeable material up to the top of the excavation and place the methane vent pipe in the material and re-cover with intermediate cover. However, unlike the MSWLF, place at least two feet of intermediate soil cover over the surface at the breakout. Also, unlike the MSWLF, the leachate may be following the final cap of the closed MSW landfill and a considerable amount of leachate may be seeking the low point along the landfill cap. If the low point happens to be at the edge of the landfill, the excavation into the landfill may have to be considerable in order to allow the amount of

leachate to flow vertically. The additional soil cover will have a damming effect so that the water is forced vertically into the trench that has been excavated and filled with rock, preferably.

Also, the top of the C&D landfill needs to be graded so that there is very little standing water. The water that is accumulating on the top is the source of the breakouts. The less there is on top, the less the potential of a breakout.

If leachate has been impounded behind a berm, immediately obtain a water sample for laboratory testing for Appendix I constituents. If leachate from a breakout has left the foot print of the landfill, obtain a water sample from a sediment basin or other areas that the leachate may have been ponding. Once the sample has been obtained, remove the ponding water by pumping it into a tank and disposing of it in either the leachate lagoon or the waste water treatment plant. Once the water has been removed, remove the top one foot of soil in the pond and dispose of it in the lined MSW landfill. Once the top one foot of soil has been removed, test the remaining soil to assure that there are no Appendix I constituents in the surface of the soil that is in the pond area.

2.9 Appendix VII - Solid Waste Management Facility Fire Occurrence Notification Form

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



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

NAME OF FACILITY: _____ PERMIT # _____

DATE AND TIME OF FIRE: _____ @ _____

HOW WAS THE FIRE REPORTED AND BY WHOM:

LIST ACTIONS TAKEN:

WHAT WAS THE CAUSE OF THE FIRE:

DESCRIBE AREA, TYPE, AND AMOUNT OF WASTE INVOLVED:

WHAT COULD HAVE BEEN DONE TO PREVENT THIS FIRE:

DESCRIBE PLAN OF ACTIONS TO PREVENT FUTURE INCIDENTS:

NAME: _____ TITLE: _____ DATE: _____

THIS SECTION TO BE COMPLETED BY SOLID WASTE SECTION REGIONAL STAFF
DATE RECEIVED _____

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

FOLLOW-UP REQUIRED:
 NO PHONE CALL SUBMITTAL MEETING RETURN VISIT BY: _____ (DATE)

ACTIONS TAKEN OR REQUIRED:

Revised 6/8/09

2.10 Engineering/Operation Drawings

- 2.10.1 Title Sheet
- 2.10.2 Index Sheet
- 2.10.3 Existing Conditions (MSW)
- 2.10.4 5 Year Fill Plan (MSW)
- 2.10.5 5 Year Fill with Gas Collection Wells (MSW)
- 2.10.6 Operation Details
- 2.10.7 Existing Conditions (C&D)
- 2.10.8 5 Year Fill Plan (C&D)
- 2.10.9 5 Year Fill with Gas Collection Wells (C&D)
- 2.10.10 Baseline Profiles and Cross Sections (MSW/C&D)

WAYNE COUNTY MUNICIPAL SOLID WASTE LANDFILL FACILITY

ENGINEERING/OPERATION PLAN

Permit Number: 9606-MSWLF-1998 and 9601-CDLF-1997

Site Location: 460 B South Landfill Road
Dudley, NC 28333

Applicant: Wayne County

Applicant's Address: 224 E. Walnut St., 3rd Floor
Goldsboro, NC 27530

BOARD OF COMMISSIONERS

Joe Daughtery - Chairman

Bill Pate - Vice-Chairman

George Wayne Aycock

Edward Cromartie

John M. Bell

E. Ray Mayo

A. Joe Gurley, III

COUNTY MANAGER

George Wood

SOLID WASTE DIRECTOR

Tim Rogers

Engineer

Municipal Engineering Services Company, P.A.
Garner, NC - Boone, NC

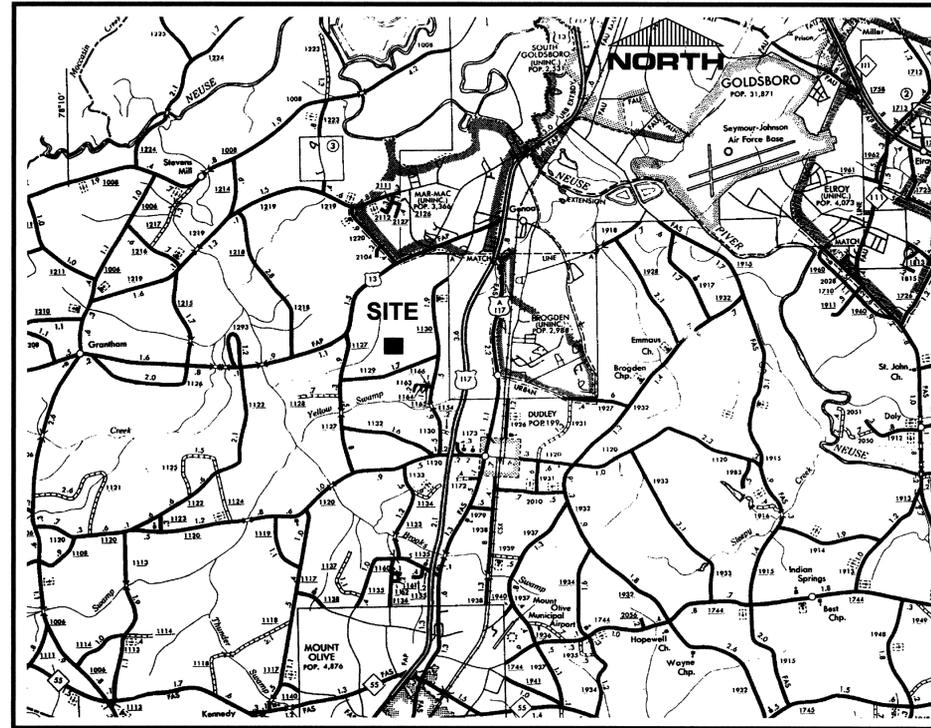
by  11216
Professional Engineer
(Garner Office)



SCALE:	1:1
DATE:	12/10/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	S. GANDY
PROJECT NUMBER:	G15124
DRAWING NO.:	T1
SHEET NO.:	1 OF 10

INDEX

SHEET NO.	DRAWING NO.	DESCRIPTION
1	T1	TITLE SHEET
2	T2	INDEX AND VICINITY MAP
3	E1	EXISTING CONDITIONS
4	E2	5 YEAR FILL PLAN (MSW)
5	E3	5 YEAR FILL PLAN WITH GAS COLLECTION SYSTEM (MSW)
6	E4	OPERATION DETAILS
7	E5	EXISTING CONDITIONS (C&D)
8	E6	5 YEAR FILL PLAN (C&D)
9	E7	5 YEAR FILL PLAN WITH GAS COLLECTION SYSTEM (C&D)
10	E8	BASELINE PROFILE AND CROSS SECTIONS (MSW AND C&D)



VICINITY MAP

Engineering Company, P.A.
 P.O. BOX 348 BOONE, N.C. 28607
 (828) 262-1767
 LICENSE NUMBER: C-0281

Municipal Services
 P.O. BOX 97 GARNER, N.C. 27529
 (919) 772-5393

**MUNICIPAL SOLID WASTE
 LANDFILL FACILITY
 WAYNE COUNTY
 NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION
			INDEX AND VICINITY MAP

SCALE: 1:1
 DATE: 12/23/2015
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 CHKD. BY: S. GANDY
 PROJECT NUMBER: G15124
 DRAWING NO. T2 SHEET NO. 2 OF 10

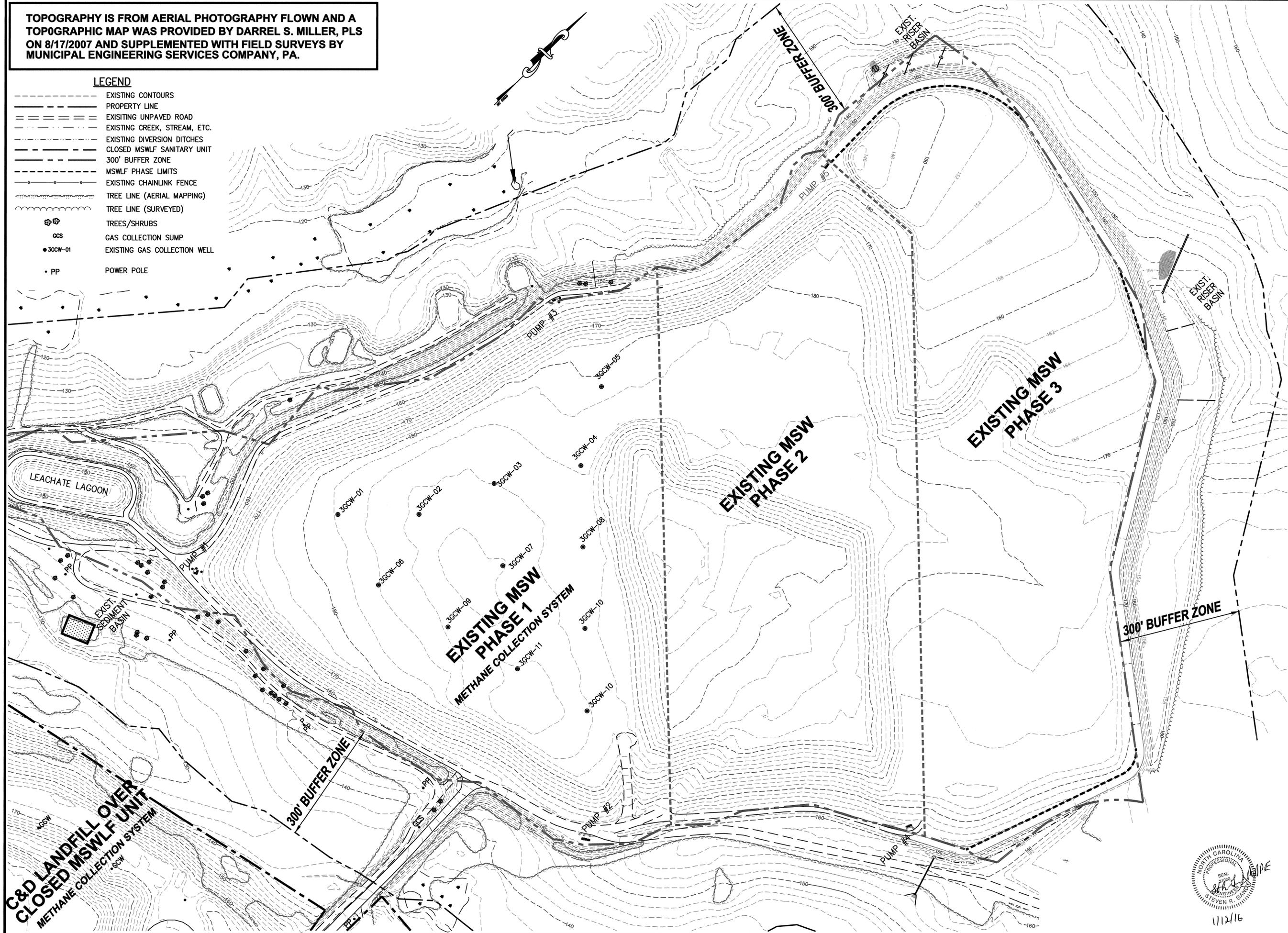


1/12/16

TOPOGRAPHY IS FROM AERIAL PHOTOGRAPHY FLOWN AND A TOPOGRAPHIC MAP WAS PROVIDED BY DARREL S. MILLER, PLS ON 8/17/2007 AND SUPPLEMENTED WITH FIELD SURVEYS BY MUNICIPAL ENGINEERING SERVICES COMPANY, PA.

LEGEND

- EXISTING CONTOURS
- - - - - PROPERTY LINE
- - - - - EXISTING UNPAVED ROAD
- - - - - EXISTING CREEK, STREAM, ETC.
- - - - - EXISTING DIVERSION DITCHES
- - - - - CLOSED MSWLF SANITARY UNIT
- - - - - 300' BUFFER ZONE
- - - - - MSWLF PHASE LIMITS
- - - - - EXISTING CHAINLINK FENCE
- - - - - TREE LINE (AERIAL MAPPING)
- - - - - TREE LINE (SURVEYED)
- TRESSES/SHRUBS
- GCS GAS COLLECTION SUMP
- 3GCW-01 EXISTING GAS COLLECTION WELL
- PP POWER POLE



Municipal Engineering Services Company, P.A.

P.O. BOX 97 GARNER, N.C. 27529
P.O. BOX 349 BOONE, N.C. 28607
(919) 772-5393 (828) 262-1767
LICENSE NUMBER: C-0281

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION

ENGINEERING/OPERATION PLAN - MSW AND C&D
EXISTING CONDITIONS PHASE 4 (MSW)

SCALE: 1" = 100'
DATE: 12/29/2015
DRWN. BY: L. CRAWFORD
CHKD. BY: S. GANDY

PROJECT NUMBER
G15124

DRAWING NO. E1 SHEET NO. 3 OF 10

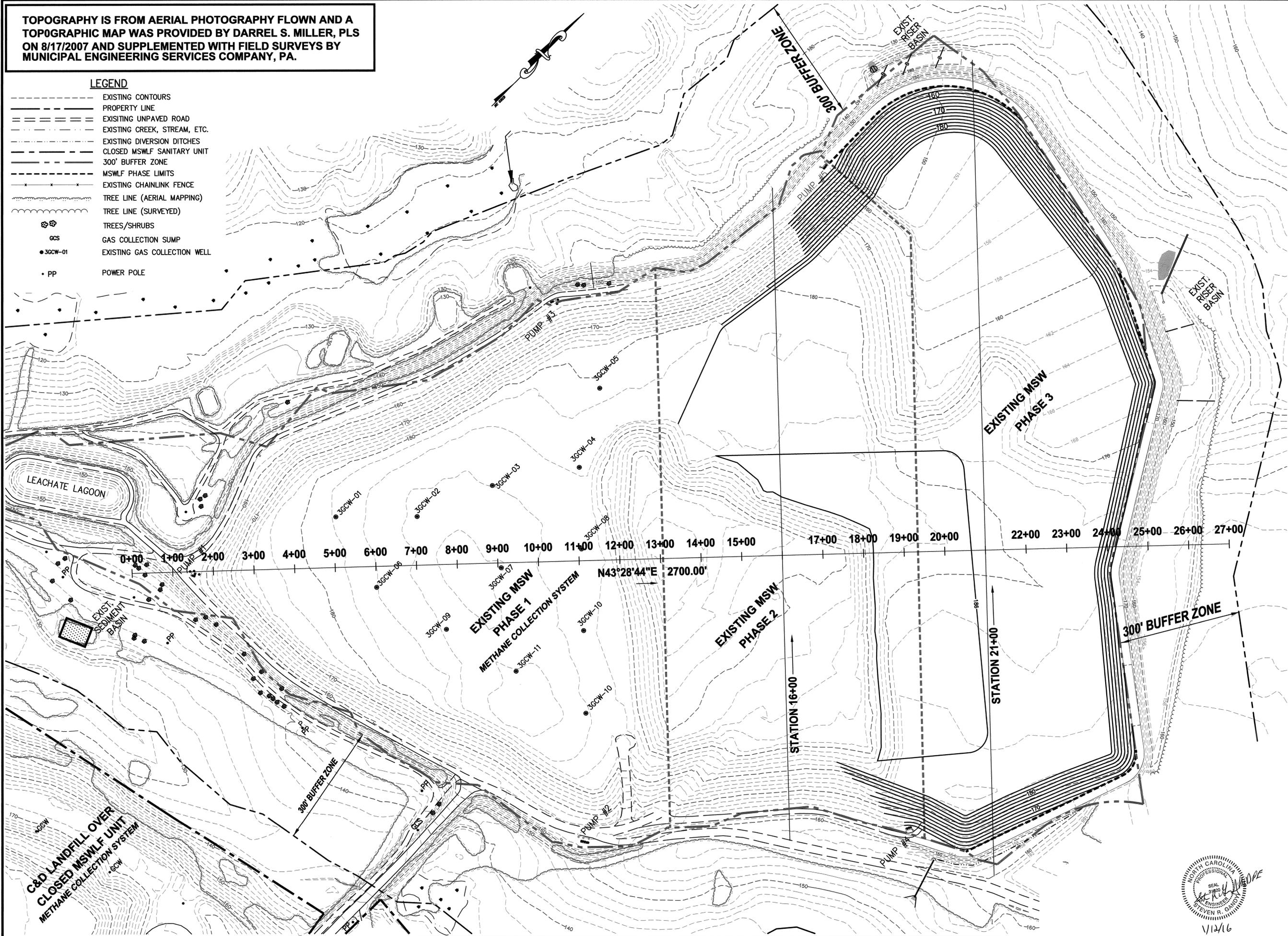


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LEGEND

- EXISTING CONTOURS
- PROPERTY LINE
- EXISTING UNPAVED ROAD
- EXISTING CREEK, STREAM, ETC.
- EXISTING DIVERSION DITCHES
- CLOSED MSWLF SANITARY UNIT
- 300' BUFFER ZONE
- MSWLF PHASE LIMITS
- EXISTING CHAINLINK FENCE
- TREE LINE (AERIAL MAPPING)
- TREE LINE (SURVEYED)
- GCS
- 36CW-01
- PP
- EXISTING GAS COLLECTION SUMP
- EXISTING GAS COLLECTION WELL
- POWER POLE



Municipal Engineering Services Company, P.A.
 P.O. BOX 97 GARNER, N.C. 27529
 (919) 772-5393
 LICENSE NUMBER: C-0281

MUNICIPAL SOLID WASTE LANDFILL FACILITY WAYNE COUNTY NORTH CAROLINA

DATE	BY	REV.	DESCRIPTION
			ENGINEERING/OPERATION PLAN - MSW AND C&D
			5 YEAR FILL PLAN - PHASE 4 (MSW)

SCALE: 1" = 100'
 DATE: 12/29/2015
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 CHD. BY: S. GANDY
 PROJECT NUMBER: G15124
 DRAWING NO. E2 SHEET NO. 4 OF 10

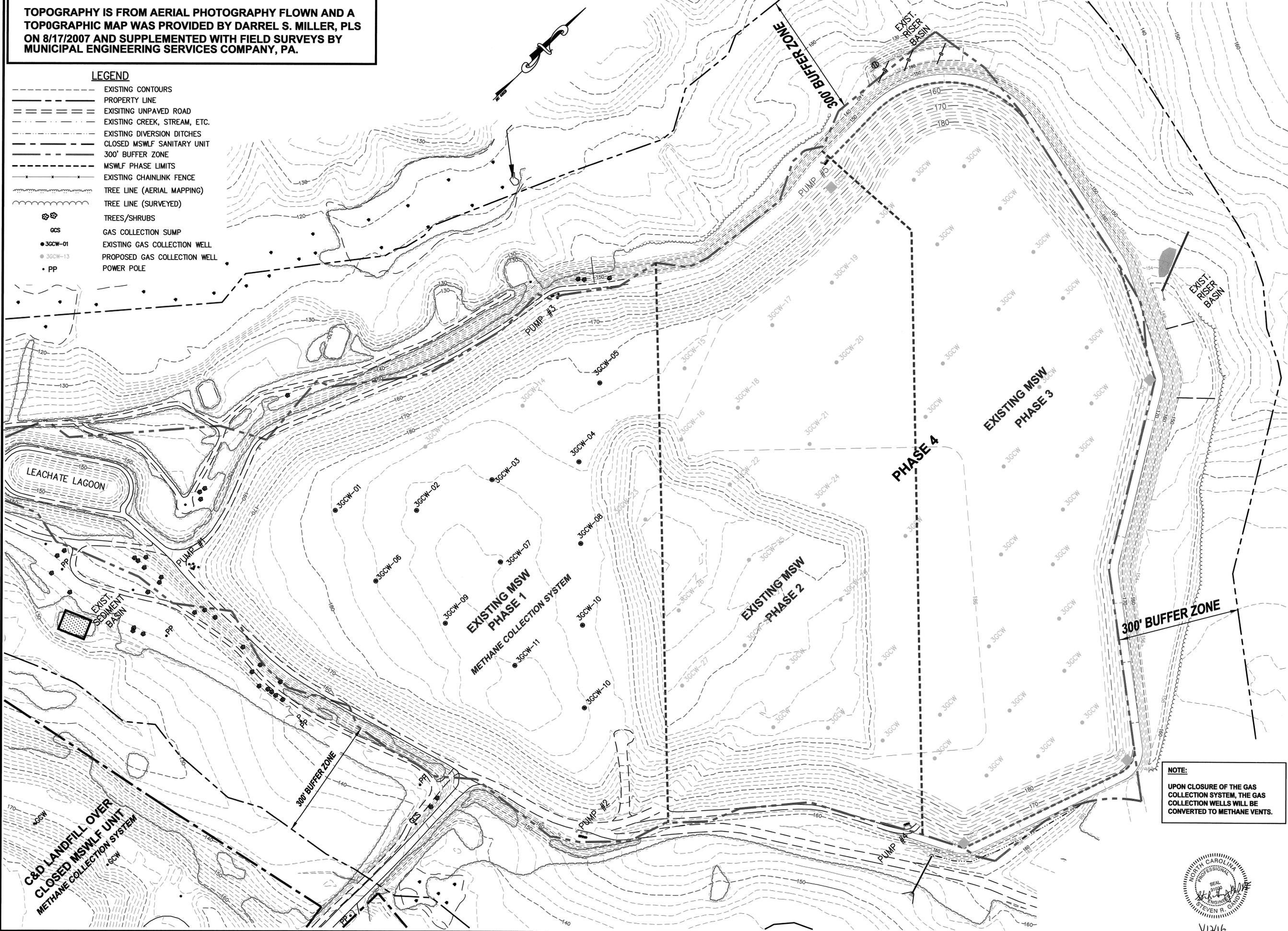


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LEGEND

- EXISTING CONTOURS
- - - - - PROPERTY LINE
- - - - - EXISTING UNPAVED ROAD
- - - - - EXISTING CREEK, STREAM, ETC.
- - - - - EXISTING DIVERSION DITCHES
- - - - - CLOSED MSWLF SANITARY UNIT
- - - - - 300' BUFFER ZONE
- - - - - MSWLF PHASE LIMITS
- - - - - EXISTING CHAINLINK FENCE
- - - - - TREE LINE (AERIAL MAPPING)
- - - - - TREE LINE (SURVEYED)
- TRESSES/SHRUBS
- GCS GAS COLLECTION SUMP
- 3GCW-01 EXISTING GAS COLLECTION WELL
- 3GCW-13 PROPOSED GAS COLLECTION WELL
- PP POWER POLE



NOTE:
UPON CLOSURE OF THE GAS COLLECTION SYSTEM, THE GAS COLLECTION WELLS WILL BE CONVERTED TO METHANE VENTS.



**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

ENGINEERING/OPERATION PLAN - MSW AND C&D
5 YEAR FILL PLAN - PHASE 4 (MSW)
WITH GAS COLLECTION WELLS

SCALE:	1" = 100'
DATE:	12/29/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	S. GANDY
PROJECT NUMBER:	G15124
DRAWING NO.:	E3
SHEET NO.:	5 OF 10

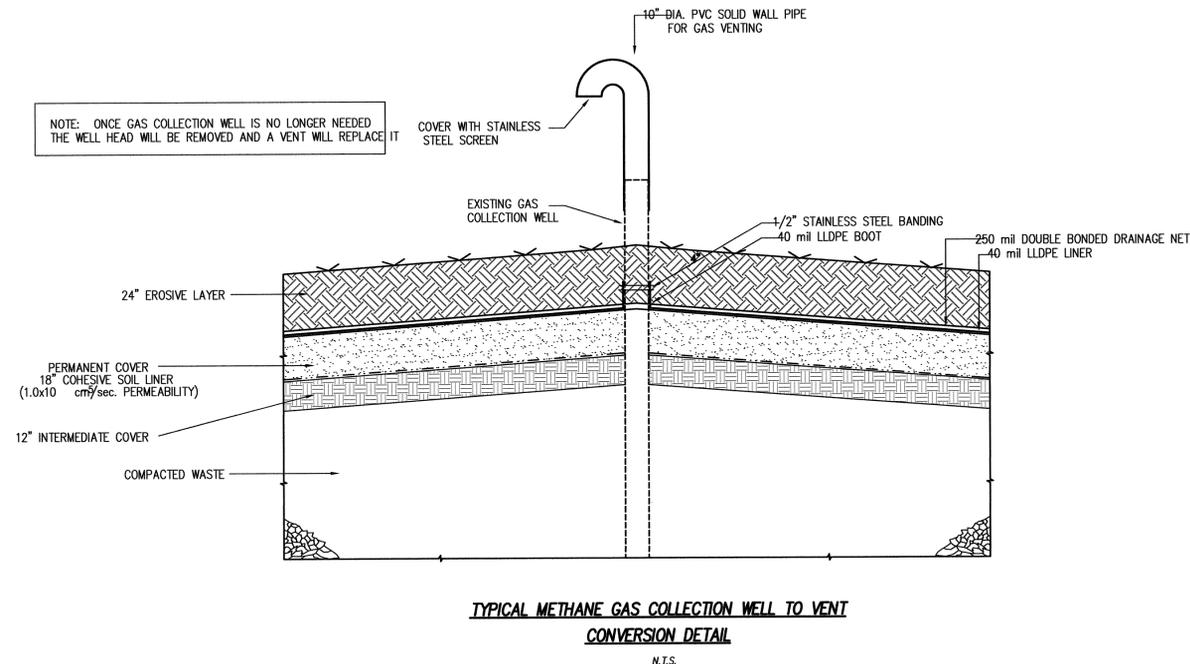
Municipal Services
Engineering Company, P.A.

P.O. BOX 97 GARNER, N.C. 27539
(919) 772-5393

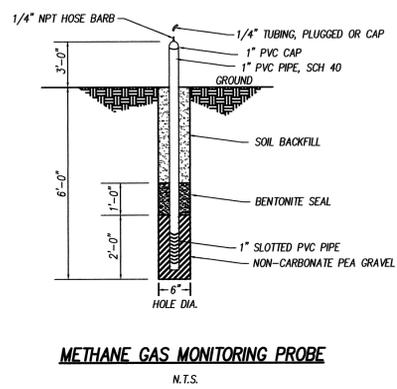
P.O. BOX 349 BOONE, N.C. 28607
(828) 282-1767

LICENSE NUMBER: C-0281

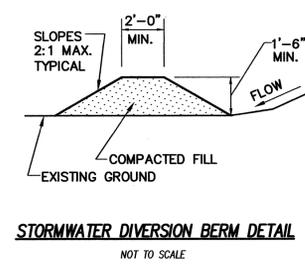
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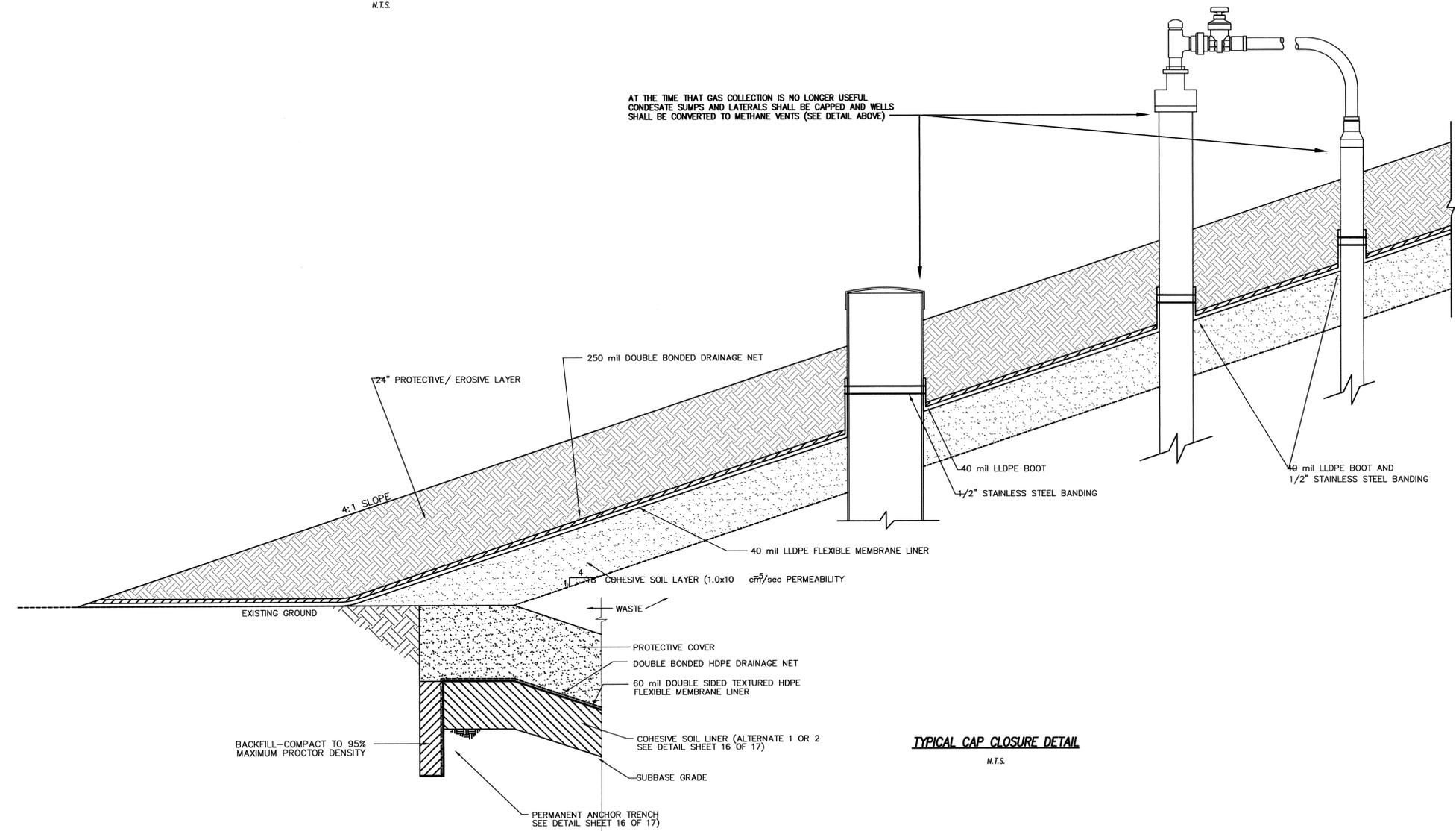
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CONVERSION DETAIL**
N.T.S.



METHANE GAS MONITORING PROBE
N.T.S.



STORMWATER DIVERSION BERM DETAIL
NOT TO SCALE



TYPICAL CAP CLOSURE DETAIL
N.T.S.



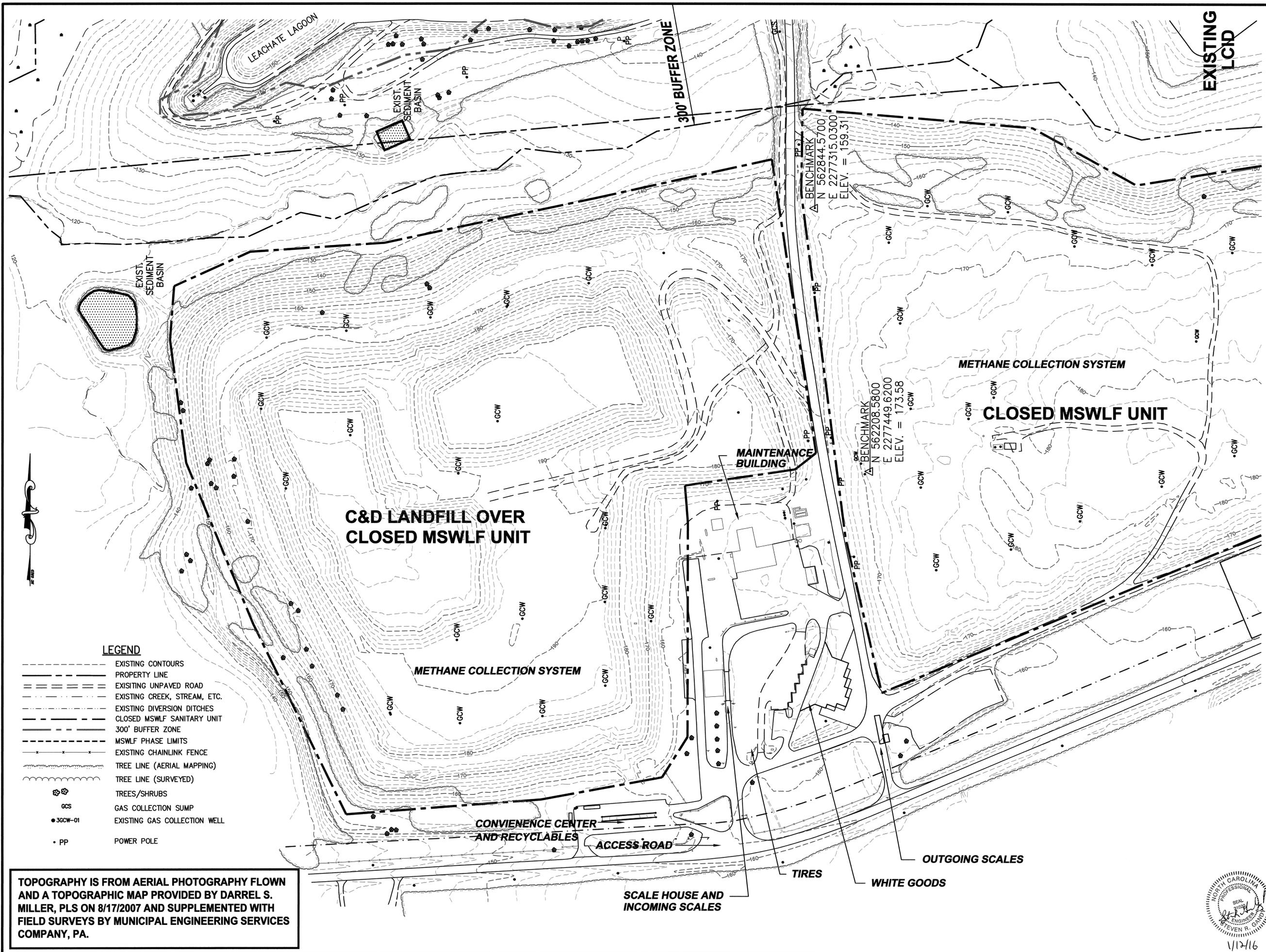
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Municipal Engineering Services
 Engineering Company, P.A.
 P.O. BOX 97 GARNER, N.C. 27529
 (919) 772-5393
 P.O. BOX 349 BOONE, N.C. 28607
 (828) 262-1767
 LICENSE NUMBER: C-0281

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION

SCALE: 1:1
 DATE: 12/23/2015
 DRWN. BY: L. CRAWFORD
 CHKD. BY: S. GANDY
 PROJECT NUMBER: G15124
 DRAWING NO. E4 SHEET NO. 6 OF 10



- LEGEND**
- EXISTING CONTOURS
 - PROPERTY LINE
 - EXISTING UNPAVED ROAD
 - EXISTING CREEK, STREAM, ETC.
 - EXISTING DIVERSION DITCHES
 - CLOSED MSWLF SANITARY UNIT
 - 300' BUFFER ZONE
 - MSWLF PHASE LIMITS
 - EXISTING CHAINLINK FENCE
 - TREE LINE (AERIAL MAPPING)
 - TREE LINE (SURVEYED)
 - TRES/SHRUBS
 - GCS GAS COLLECTION SUMP
 - 36CW-01 EXISTING GAS COLLECTION WELL
 - PP POWER POLE

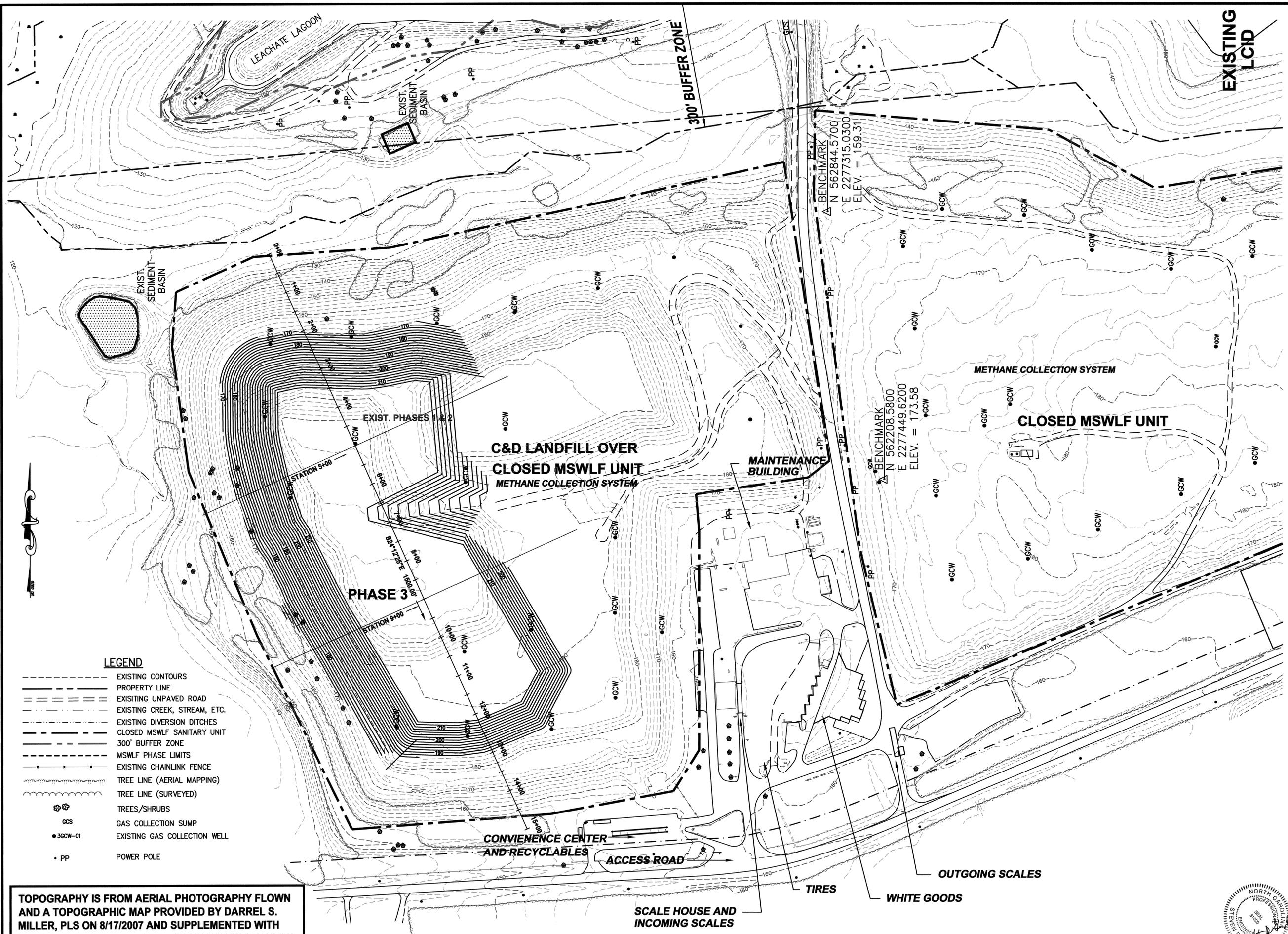
TOPOGRAPHY IS FROM AERIAL PHOTOGRAPHY FLOWN AND A TOPOGRAPHIC MAP PROVIDED BY DARREL S. MILLER, PLS ON 8/17/2007 AND SUPPLEMENTED WITH FIELD SURVEYS BY MUNICIPAL ENGINEERING SERVICES COMPANY, PA.



**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

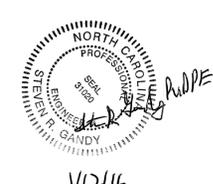
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DATE:	12/29/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	S. GANDY
PROJECT NUMBER:	G15124
DRAWING NO.:	E5
SHEET NO.:	7 OF 10

Municipal Engineering Services
Engineering Company, P.A.
 P.O. BOX 97 GARNER, N.C. 27529
 (919) 772-5393
 P.O. BOX 349 BOONE, N.C. 28607
 (828) 262-1787
 LICENSE NUMBER: C-0281



- LEGEND**
- EXISTING CONTOURS
 - PROPERTY LINE
 - EXISTING UNPAVED ROAD
 - EXISTING CREEK, STREAM, ETC.
 - EXISTING DIVERSION DITCHES
 - CLOSED MSWLF SANITARY UNIT
 - 300' BUFFER ZONE
 - MSWLF PHASE LIMITS
 - EXISTING CHAINLINK FENCE
 - TREE LINE (AERIAL MAPPING)
 - TREE LINE (SURVEYED)
 - ☺ TREES/SHRUBS
 - GCS GAS COLLECTION SUMP
 - 36CW-01 EXISTING GAS COLLECTION WELL
 - PP POWER POLE

TOPOGRAPHY IS FROM AERIAL PHOTOGRAPHY FLOWN AND A TOPOGRAPHIC MAP PROVIDED BY DARREL S. MILLER, PLS ON 8/17/2007 AND SUPPLEMENTED WITH FIELD SURVEYS BY MUNICIPAL ENGINEERING SERVICES COMPANY, PA.



**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION

ENGINEERING/OPERATION PLAN - MSW AND C&D
5 YEAR FILL PLAN (C&D)

SCALE: 1" = 100'
DATE: 12/29/2015
DRWN. BY: L. GRANFORD
CHKD. BY: S. GANDY

PROJECT NUMBER: G15124
DRAWING NO. E6 SHEET NO. 8 OF 10

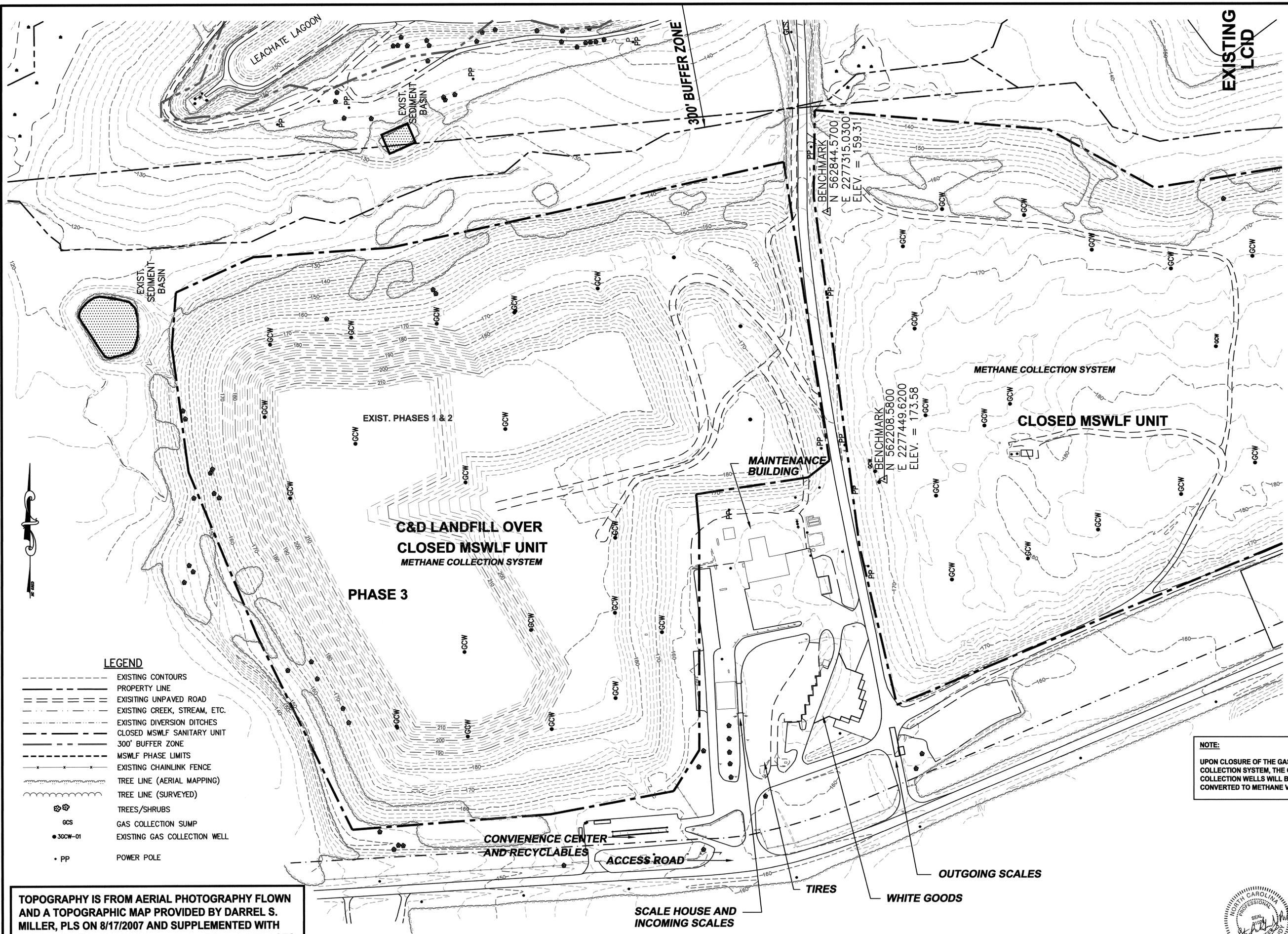
Municipal Engineering Services
Engineering Company, P.A.

P.O. BOX 97 GARNER, N.C. 27529
(919) 772-5393

P.O. BOX 348 BOONE, N.C. 28607
(828) 262-1767

LICENSE NUMBER: C-0281

P:\SolidWaste\G15124-Wayne Co. MSW & CD Permit Renewal\Eng-Op\G15124-08-E6.dwg, 1/8/2016 9:32:33 AM, Inc:\h



LEGEND

- EXISTING CONTOURS
- PROPERTY LINE
- EXISTING UNPAVED ROAD
- EXISTING CREEK, STREAM, ETC.
- EXISTING DIVERSION DITCHES
- CLOSED MSWLF SANITARY UNIT
- 300' BUFFER ZONE
- MSWLF PHASE LIMITS
- EXISTING CHAINLINK FENCE
- TREE LINE (AERIAL MAPPING)
- TREE LINE (SURVEYED)
- TREES/SHRUBS
- GCS GAS COLLECTION SUMP
- 36CW-01 EXISTING GAS COLLECTION WELL
- PP POWER POLE

NOTE:
UPON CLOSURE OF THE GAS COLLECTION SYSTEM, THE GAS COLLECTION WELLS WILL BE CONVERTED TO METHANE VENTS.

TOPOGRAPHY IS FROM AERIAL PHOTOGRAPHY FLOWN AND A TOPOGRAPHIC MAP PROVIDED BY DARREL S. MILLER, PLS ON 8/17/2007 AND SUPPLEMENTED WITH FIELD SURVEYS BY MUNICIPAL ENGINEERING SERVICES COMPANY, PA.

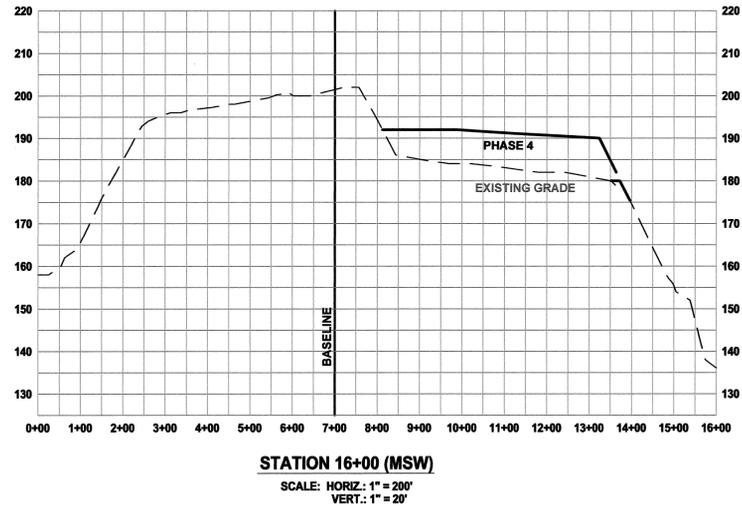
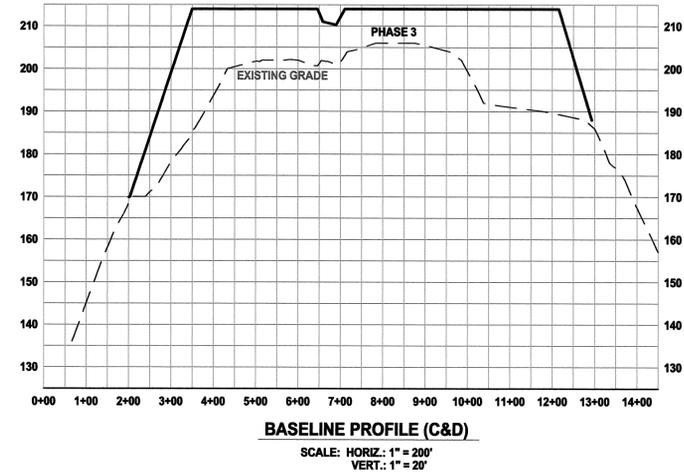
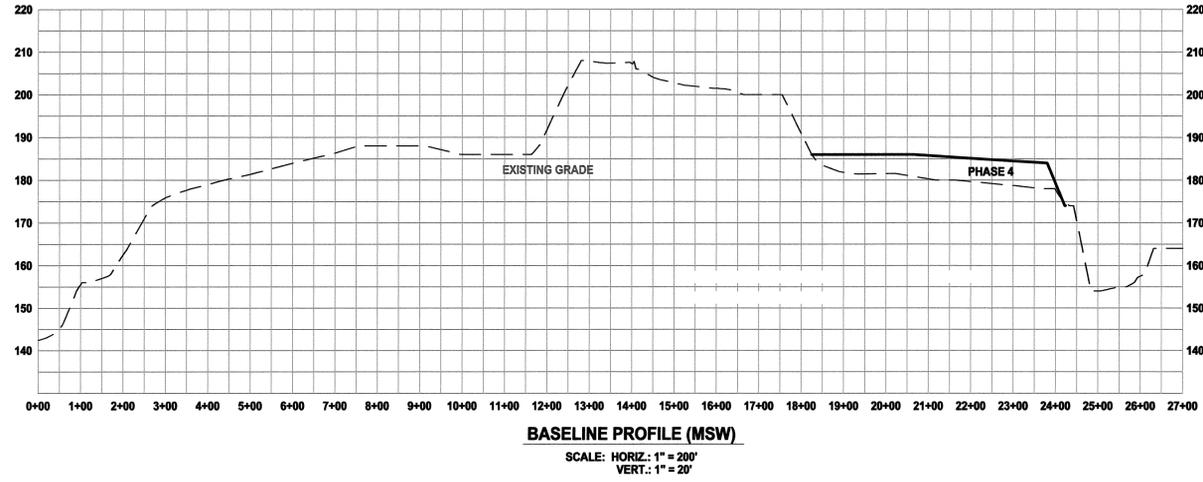


**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

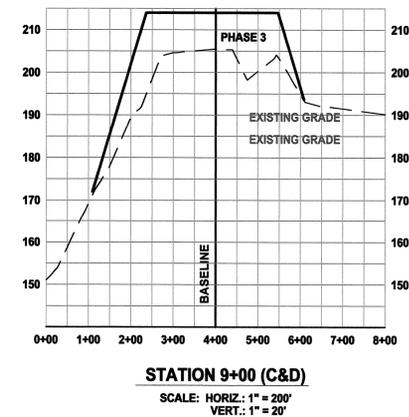
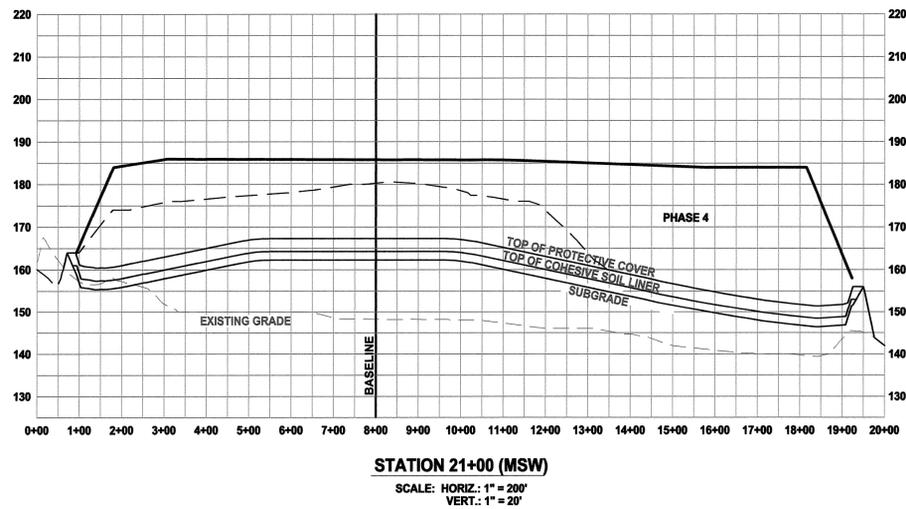
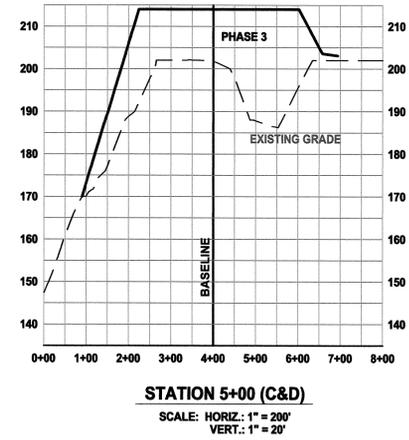
ENGINEERING/OPERATION PLAN - MSW AND C&D
5 YEAR FILL PLAN WITH GAS COLLECTION (C&D)

SCALE:	1" = 100'
DATE:	12/29/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	S. GANDY
PROJECT NUMBER:	G15124
DRAWING NO.:	E7
SHEET NO.:	9 OF 10

Municipal Engineering Services
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NOTE
THESE CROSS SECTIONS ARE INTENDED TO SHOW THE CROSS SECTIONS AT SPECIFIC POINTS AS DEFINED BY THE BASELINE GRID ON DRAWINGS E2 AND E6.



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**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

SCALE:	1" = 200'
DATE:	12/17/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	J. WOODIE
PROJECT NUMBER:	G15124
DRAWING NO.:	E8
SHEET NO.:	10 OF 10

ENGINEERING/OPERATION PLAN - MSW AND C&D
BASELINE PROFILES AND CROSS SECTIONS

SECTION 3.0

**CLOSURE
PLAN**

3.1 Introduction

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches bridging material (temporary cover), 18 inches of cohesive soil liner with a permeability no greater than 1.0×10^{-5} cm/sec, 40 mil Linear Low Density Polyethylene (LLDPE), drainage layer, 24 inches of protective/erosive layer. All depths shall be measured perpendicular to the slope surface. The cap contains gas venting system consisting of a series of washed stone trenches below the soil liner that will be vented through 10" diameter PVC pipes with membrane boots that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices.

The largest area to be closed within the permitted life will be 65 acres.

The Division requires that the Engineer certifies that the constructed cap is built according to approved plans and specifications. The Engineer that will accomplish this task is the one who did the planning and has written the Closure Plan specifications.

Before construction can begin, a pre-construction meeting will be held and the responsibilities and duties of each party will be discussed.

The parties involved in the construction of the landfill are the Owner, Contractor and Engineer. The Contractor is contractually responsible to the Owner. The Engineer is the Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of the Engineer as the Owner's representative are set forth in the Contract Document and will not be changed without written consent of the Owner and Engineer.

The Contractor will purchase and supply all materials that are part of the landfill construction. They will employ subcontractors who will install and non-destructively test all flexible membrane liners. They will also employ a North Carolina licensed geotechnical engineer and professional land surveyor. The geotechnical engineer will test, report and certify the results for all structural and cohesive soils that are incorporated in the landfill. The surveyor will report and certify elevations of the as-built existing grade, top of cohesive soil liner and top of vegetative/protective cover.

The Contractor is responsible for following and meeting the requirements set forth in the contract documents. The Contractors will provide to the Owner of the landfill and the Engineer a completed landfill constructed by Division's approved plans and specifications. The Contractor will give the Engineer a schedule for completion of the landfill including dates for expected construction of the cohesive soil test pad, cohesive soil cap, erosive layer, and estimated time for project completion. The Contractor is responsible for providing a foreman to remain on site at all times during construction, provide qualified personnel to conduct quality control, scheduling and coordinating the subcontractors, provide progress reports and as-built drawings, and coordinating construction activities with the Engineer. The foreman is responsible for supervising and coordinating with his crew, subcontractors, quality control personnel, attending all meetings and notifying the Engineer's Construction Observer when any discrepancies occur. The Contractor will meet with the Construction Observer on a daily basis to discuss the days construction activities. The results of all tests and any change in schedule shall be given to the Construction Observer as soon they are known by the Contractor. The Contractor must be registered in the State of North Carolina.

As the owner's representative, the Engineer will employ the onsite construction observer. The Engineer will also employ all third party laboratories for conformance testing of the geosynthetics, destructive flexible membrane liner tests and random cohesive soil permeability tests.

The Engineer is responsible for providing the engineering design, drawings and specifications, contract documents and Construction Quality Assurance (CQA) needed for construction of the landfill. The Engineer is responsible for conducting the pre-construction meeting, which will lay out the foundation for the project. The Engineer will approve any design changes and certify to the Division that the cap was constructed according to the requirements of Rule .1621 Construction Quality Assurance Plan and .1624 Construction requirements for MSWLF Facilities, and Division approved plans and specifications. This will be accomplished by on-site observation and independent laboratory soil testing to test site-specific soil properties including permeability.

The Engineer will provide Quality Assurance by spot testing along side the Contractor, who will be providing the Quality Control. The Engineer will certify that the construction was completed in accordance with the CQA manual. The Engineer must be a professional engineer registered in North Carolina.

The Construction Observer (CO) is the Engineer's representative on-site. It is the CO's responsibility to know and interpret the plans and specifications of the project. On a daily basis the CO will coordinate with the Foreman to help ensure a quality product for the Owner. The CO will keep a daily log on the activities of the Contractor, keep notes on all meetings, and handle all quality assurance activities indicated in this document. The CO will keep a log of all material delivered on site and ensure the materials meets or exceeds the specifications indicated in this report. If the need arises, additional meetings will be scheduled as determined by the CO.

The estimate of the maximum inventory of MSW wastes ever on-site over the active life to date of the landfill facility is 1,355,031 tons.

Prior to beginning closure, the County shall notify the Division of Waste Management that a notice of the intent to close the unit has been placed in the operating record. The County shall begin closure activities no later than thirty (30) days after the date on which the landfill receives the final wastes or if the landfill has remaining capacity and there is a reasonable likelihood that the landfill will receive additional wastes, no later than one year after the most recent receipt of wastes. Extensions beyond the one-year deadline for beginning closure may be granted by the Division of Waste Management if the County demonstrates that the landfill has the capacity to receive additional waste and the County has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the closed landfill.

The County shall complete closure activities in accordance with the closure plan within 180 days following the final receipt of waste. Extensions of the closure period may be granted by the Division of Waste Management if the County demonstrates that closure will, of necessity, take longer than one hundred eighty (180) days and the County has taken and will continue to take all steps to prevent threats of human health and environment from the enclosed landfill.

Estimated schedule of closure will be approximately 26 years.

Following closure of the landfill, the County shall notify the Division that a certification, signed by the project engineer, verifying that closure has been completed in accordance with the closure plan, and has been placed in the operating record. The County shall record a notation on the deed to the landfill property and notify the Division of Waste Management that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed shall in perpetuity notify any potential purchaser of the property that the land has been used as a landfill and its use is restricted under the closure plan approved by the Division of Waste Management. The County may request permission from the Division to remove the notation from the deed if all waste are removed from the landfill.

3.2 Closure Cap System

All materials and equipment shall be furnished by an established and reputable manufacturer or supplier. All materials and equipment shall be new and shall be of first class ingredients and construction, designed and guaranteed to perform the service required and shall conform with the following standard specifications or shall be the product of the listed manufacturers or similar and equal thereto as approved by the Engineer.

3.2.1 Conformance Testing for Interface Friction Angles of Capping Materials

Conformance testing for Interface Friction Angles, for every 200,000 square feet of capping materials is as follows:

1. Minimum Friction Angle for soil to textured LLDPE liner is 26 degrees and the test method is ASTM 5321.

2. Minimum Friction Angle for textured LLDPE liner to 330 mil double bonded geocomposite drainage net is 26 degrees and the test method is ASTM 5321.
3. Minimum Friction Angle for 330 mil double bonded geocomposite drainage net to soil is 26 degrees and the test method is ASTM 5321.

3.3 Closure Cohesive Soil Cap

All materials and equipment shall be furnished by an established and reputable manufacturer or supplier. All materials and equipment shall be new and shall be of first class ingredients and construction, designed and guaranteed to perform the service required and shall conform with the following standard specifications or shall be the product of the listed manufacturers or similar and equal thereto as approved by the Engineer.

Cohesive Soil Cap Borrow Material

Test Name	Test Method	Contractor/Engineer Frequency
Moisture/Density	ASTM D698/D1557	1 per 5000 c.y.
Remolded Permeability	ASTM D5084	1 per 5000 c.y.
Atterberg Limits	ASTM D4318	1 per 5000 c.y.
Visual Classification	ASTM D2488	1 per 5000 c.y.
Grain Size Distribution	ASTM D422	1 per 5000 c.y.

Cohesive Soil Cap Test Pad

Test Name	Test Method	Contractor/Engineer Frequency
Field Moisture/Density	ASTM D1556 (sand cone) ASTM D2922/D3017 (nuclear gauge) ASTM D2937 (drive cylinder)	3 per lift
Permeability	ASTM D5084	1 per lift
Remolded Permeability	ASTM D5084	1 per lift
Atterberg Limits	ASTM D4318	1 per lift
Visual Classification	ASTM D2488	1 per lift
Grain Size Distribution	ASTM D422	1 per lift

In-Place Cohesive Soil Cap

Test Name	Test Method	Contractor/Engineer Frequency
Field Moisture/Density	ASTM D1556 (sand cone) ASTM D2922/D3017 (nuclear gauge) ASTM D2937 (drive cylinder)	1 per lift per acre
Permeability	ASTM D5084	1 per lift per acre
Atterberg Limits	ASTM D4318	1 per lift per acre
Visual Classification	ASTM D2488	1 per lift per acre
Grain Size Distribution	ASTM D422	1 per lift per acre

(a) Suitable on-site and/or off-site soils may be used as cohesive soil cap if it can achieve an in-place permeability of 1.0×10^{-5} cm/sec or less and meets all testing requirements indicated in the material testing paragraph in this section. Wyoming bentonite or an approved equivalent may be blended with the soil to lower the soil's permeability.

(b) A permeability "window" shall be developed for each type of soil from the borrow material that will be used for construction of the cohesive soil cap. The window shall be plotted on a semi-log plot with moisture content versus density. Laboratory testing to develop the window shall include a series of remolded samples compacted to various dry densities and moisture contents utilizing the same compactive effort (ASTM D 698 or D 1557). The remolded samples shall be tested for permeability to determine whether or not the particular soil type will provide the maximum permeability (1.0×10^{-5} cm/sec) at various dry densities and moisture contents. The window is then developed from the accepted

remolded samples and moisture contents from the semi-log plot. A straight line is typically drawn between the acceptable points on the moisture-density curve to indicate a range of probable acceptable permeability results. The window will be used in the construction of the test strip to verify the laboratory remolded permeability results.

(c) Atterberg limits and grain size distribution shall also be conducted on the bulk samples used to prepare the permeability window ASTM D2487, D4318, D422. These tests can be used as indices on random samples collected from the borrow site during construction to verify the soil type is the same as was used to develop the "window". As a minimum, sufficient visual classifications and Atterberg limits shall be conducted in association with each permeability test to verify that the construction materials meet specifications.

(d) A test strip of compacted cohesive soil cap shall be prepared to verify the permeability "window" prior to general installation of the cohesive soil cap. The test strip will be used to verify the results from the remolded permeabilities from the borrow site utilizing the permeability window(s) for each soil type that is going to be used for construction of the cohesive soil cap. At a minimum, the verification will consist of three moisture density tests, one Atterberg limits test, one grain size distribution test (ASTM D2487, D4318, and D422), and one Shelby Tube sample for each lift constructed in the test pad. Laboratory permeability tests shall be performed on tube (Shelby or drive tubes) samples of the cohesive soil cap after placement and compaction. The permeability must be a maximum of 1.0×10^{-5} cm/sec. Tests shall be performed in accordance with the ASTM D5084. The test strip shall be approximately 2,500 sq. ft. in surface area and constructed to conform geometrically to the site topography with a minimum lateral dimension in any direction of 25 ft. The test strip shall consist of at least three compacted 6 inch lifts of cohesive soil cap. Placement and testing of the test strip shall be in conformance with the construction specifications and requirements for general installation of the cohesive soil cap. Test results from the test strip shall be used to guide placement and achievement of the required maximum permeability of 1.0×10^{-5} cm/sec of the cohesive soil cap. The test strip may be used as an integral part of the overall cohesive soil cap if it meets the required specification for the cap. All results shall be given to the Construction Observer.

(e) The soils shall be placed to the total thickness shown on the plans in maximum 8-inch thick loose lifts with a maximum 6" compacted lift compacted preferably at a moisture content between 0 to 3% above optimum moisture content to 95% standard Proctor maximum dry density (ASTM Test Designation D698). A sheepsfoot roller or approved alternative may be used to compact the soil cap provided the compaction and permeability requirements can be achieved. Each lift shall be tested for permeability, moisture content, particle size distribution analysis, Atterberg limits, moisture-density-permeability relation, and if needed percent bentonite admixed with soil, prior to the placement of the succeeding lift and visually inspected to confirm that all soil clods have been broken and that the surface is sufficiently scarified so that adequate bonding can be achieved. Soils for cohesive soil cap shall be screened, disced, or prepared using any other approved method as necessary to obtain a homogeneous cohesive soil with clod sizes in a soil matrix no larger than about 1.5 inches in maximum diameter. After each lift, the surface shall be scarified prior to the placement of the next lift to provide good bonding from one lift to the next.

(f) The cohesive soil cap shall be tested to evaluate the coefficient of permeability. The coefficient of permeability of the soil cap shall be equal to or less than 1.0×10^{-5} cm/sec after placement and compaction. The soil cap must be a minimum of 1.5 feet thick (measured perpendicular to slope).

(g) Laboratory falling head permeability tests shall be performed on tube (Shelby or drive tubes) samples of the cohesive soil cap after placement and compaction. The permeability must be a maximum of 1.0×10^{-5} cm/sec. Tests shall be performed in accordance with ASTM D5084. All laboratory permeability tests shall be performed at a confining pressure of 10 psi and at a hydraulic gradient of 20.

(h) The soil cap shall be tested a minimum of one soil sample per lift per acre for laboratory permeability. All permeability testing will be on random samples judged by the Engineer to be representative of the most permeable soil conditions for the area being tested. The project engineer shall certify that the

materials used in construction were tested according to the Division approved plans. If after placement of the soil cap it fails the required tests, the material will either be reworked or replaced and retested. The soil cap must remain moist at all times, if any section becomes dry, rework the dry area and moisten.

(i) A minimum of two (2) inches of soil shall be removed prior to securing each sample for permeability testing. The sampling tube shall be advanced vertically into the soil with as little soil disturbance as possible and should be pushed using a uniform pressure. The sampling tube (Shelby tube), when extracted, shall be free of dents, and the ends shall not be distorted. A backhoe or approved alternative should be used to advance the sampling tube (Shelby tube) as long as disturbance is minimized. Drive tube samples of the cap may be obtained for permeability testings. If the Engineer judges the sample to be too disturbed, another sample shall be taken. Once an acceptable sample has been secured and properly prepared, all sample excavations or other holes created by survey stakes, etc. shall be backfilled to grade with a 50% mixture of bentonite and similar soils in maximum 3-inch loose lifts and hand tamped with a blunt tool to achieve a tight seal equivalent to the original density.

(j) No additional construction shall proceed on the soil layers at the area being tested until the Engineer has reviewed the results of the tests and judged the desired permeability is being achieved.

(k) As a minimum, sufficient visual classifications (ASTM Test Designation D2487), analyses (ASTM Test Designation D422) and Atterberg limits (ASTM Test Designation D4318) shall be conducted in association with each permeability test to verify that the construction materials meet specifications. The minimum number of tests will be 1 per lift per acre.

(l) If the soil for the cohesive soil cap is incapable of achieving the required permeability when compacted, bentonite or approved alternative may be mixed with the soils to decrease the permeability. The amount of additive required must be determined in the laboratory and mixed in the field using either a pug mill or a soil stabilizer. Where additives are required, the soil shall be placed in maximum 8-inch thick loose lifts and compacted preferably between 0 to +3% optimum moisture content to 95% standard Proctor maximum dry density (ASTM Test Designation D698) for the soil-additive mixture. All other compaction procedures for the soil apply.

(m) Surfaces to be lined shall be smooth and free of debris, roots, and angular or sharp rocks larger than three-eighth (3/8) inches in diameter to a depth of six (6) inches. The cohesive soil cap shall have no sudden sharp or abrupt changes in grade.

(n) The Contractor shall protect the cohesive soil cap from desiccation, flooding and freezing. Protection, if required, may consist of a thin plastic protective cover, (or other material as approved by the engineer) installed over the completed cohesive soil cap until such time as the placement of flexible membrane liner begins. Areas found to have any desiccation cracks or which exhibit swelling, heaving or other similar conditions shall be replaced or reworked and retested by the contractor to remove these defects.

(o) The thickness and grade of the soil cap will be verified by the surveyor before placement of the geomembrane liner. The soil cap will be surveyed at 50 foot grid points and any grade changes (top of slopes, bottom of slopes, breaks in slopes, etc.) where the elevations of the top of landfill will be checked with the top of soil cap to verify 1.5 feet (measured perpendicular to slope) of soil cap. The grade will then be verified with the surveyed information. The survey will be performed by NC professional land surveyor.

(p) Surface Acceptance. Upon request, the Flexible Membrane Liner manufacturer installer shall provide the Engineer with a written acceptance of the surface prior to commencing installation. Subsequent repairs to the cohesive soil cap and the surface shall remain the responsibility of the contractor.

3.4 Closure Flexible Membrane Liner Method of Deployment

All materials and equipment shall be furnished by an established and reputable manufacturer or supplier. All materials and equipment shall be new and shall be of first class ingredients and construction, designed and guaranteed to perform the service required and shall conform with the following standard specifications or shall be the product of the listed manufacturers or similar and equal thereto as approved by the Engineer.

Delivery, Storage and Handling of all materials and equipment shall adhere to the following:

- A. Manufacturer labels must be on all rolls delivered to the project.
- B. A firmly affixed label attached to the selvage edge, shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll type, roll dimensions and roll weight.
- C. The manufacturer protects the geomembrane from mud, dirt, dust, puncture, cutting or any other damaging deleterious conditions.
- D. Continuously and uniformly supported, rolls are stored away from high traffic areas on a smooth, level surface. Chocks keep the rolls secure when necessary.

Material Warranty shall adhere to the following:

Material manufacturer shall guarantee material against defects and premature aging from environmental conditions on a pro rata basis for a specified period of time acceptable to owner and manufacturer.

Flexible Membrane Liner Tests

Test Name	Description	Test Method	Frequency
Air Test	Air Test Seams		Every Seam
Vacuum Test	Every welded area		Where air test impossible
Destructive Tests	Seam Strength	ASTM D4437	Every 500' of seam

Qualified liner installers, seamers, and the liner foreman shall meet a minimum requirement of 1,000,000 square feet of geomembrane installation. There are no other minimum qualifications needed by other parties.

The 40 mil Linear Low Density Polyethylene (LLDPE) is to be placed in direct contact with moist cohesive soil cap. The extrusion rods and/or brads used in seaming the rolls together shall be derived from the same base resin as the liner and shall meet the following minimum properties:

English Units

Table 2(a) – Linear Low Density Polyethylene (LLDPE) Geomembrane (TEXTURED)

Properties	Test Method	Test Value										Testing Frequency (minimum) per roll
		20 mils nom. (-5%) -10% -15%	30 mils nom. (-5%) -10% -15%	40 mils nom. (-5%) -10% -15%	50 mils nom. (-5%) -10% -15%	60 mils nom. (-5%) -10% -15%	80 mils nom. (-5%) -10% -15%	100 mils nom. (-5%) -10% -15%	120 mils nom. (-5%) -10% -15%			
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	16	16	16	16	16	16	16	16	16	16	Every 2 nd roll (2)
Asperity Height mils (min. ave.) (1)	D 7466	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	200,000 lb 20,000 lb
Density g/ml (max.)	D 1505/D 792	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	200,000 lb 20,000 lb
Tensile Properties (3) (min. ave.) • break strength – lb/in. • break elongation - %	D 6693 Type IV	30 250	45 250	60 250	75 250	90 250	120 250	150 250	180 250	250 250	300 250	per formulation
2% Modulus – lb/in. (max.)	D 5323	1200	1800	2400	3000	3600	4800	6000	7200	8400	9600	per formulation
Tear Resistance – lb (min. ave.)	D 1004	11	16	22	27	33	44	55	66	88	110	45,000 lb 45,000 lb
Puncture Resistance – lb (min. ave.)	D 4833	22	33	44	55	66	88	110	132	165	200	per formulation
Axi-Symmetric Break Resistance Strain - % (min.)	D 5617	30	30	30	30	30	30	30	30	30	30	per formulation
Carbon Black Content - %	D 4218 (4)	2.0-3.0 note (5)	2.0-3.0 note (5)	2.0-3.0 note (5)	2.0-3.0 note (5)	45,000 lb 45,000 lb						
Carbon Black Dispersion	D 5596	100	100	100	100	100	100	100	100	100	100	200,000 lb
(e) Standard OIT (min. ave.) — or — (f) High Pressure OIT (min. ave.) Oven Aging at 85°C (7)	D 3895	35	35	35	35	35	35	35	35	35	35	per formulation
(a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5885	60	60	60	60	60	60	60	60	60	60	per formulation
UV Resistance (9) (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs (10)	D 7238 D 3895 D 5885	N. R. (9)	N. R. (9)	N. R. (9)	N. R. (9)	per formulation						

(1) Of 10 readings; 8 out of 10 must be ≥ 14 mils, and lowest individual reading must be ≥ 12 mils; also see Note 9.
 (2) Alternate the measurement side for double sided textured sheet.
 (3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
 (4) Break elongation is calculated using a gage length of 2.0 in. at 2.0 in./min.
 (5) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
 (6) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
 • 9 in Categories 1 or 2 and 1 in Category 3
 (7) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
 (8) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
 (9) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
 (10) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
 UV resistance is based on percent retained value regardless of the original HP-OIT value.

(1) Preparation for Geomembrane Deployment

(a) Panel Layout

Prior to commencement of liner deployment, layout drawings shall be produced to indicate the panel configuration and location of seams for the project.

(b) Identification

Each panel used for the installation shall be given a numeric or alpha-numeric identification number consistent with the layout drawing. This identification number shall be related to manufacturing roll number that identifies the resin type, batch number and date of manufacture.

(c) Verification

The manufacturers certification will be reviewed by the Engineer. If the certification does not meet the requirements of GRI-GM17, the corresponding liner rolls will be rejected.

The Engineer will remove a sample from 1 out of 4 rolls delivered to the site and have a third party lab test for thickness, density, carbon black content, carbon black dispersion and tensile properties. The geomembrane will have been accredited by the Geosynthetic Accreditation Institute (GAI).

(2) Field Panel Placement

(a) Location

The Flexible Membrane Liner Manufacturer/Installer shall install field panels at the location indicated on the layout drawing. If the panels are deployed in a location other than that indicated on the layout drawings, the revised location shall be noted in the field on a layout drawing which will be modified at the completion of the project to reflect actual panel locations.

(b) Weather Conditions

Geomembrane deployment shall not be carried out during any precipitation, nor in the presence of excessive moisture (i.e. fog, dew), in an area of standing water, or during high winds.

(c) Method of Deployment shall follow the manufacturer's recommendations and sound, accepted engineering practices.

- (1) The method and equipment used to deploy the panels must not damage the geomembrane or the supporting subgrade surface.
- (2) No personnel working on the geomembrane will smoke, wear shoes that can damage the geomembrane, or engage in actions which could result in damage to the geomembrane.
- (3) Adequate temporary loading and/or anchoring, (i.e. sandbags, tires), which will not damage the geomembrane, will be placed to prevent uplift of the geomembrane by wind. If uplift occurs, additional sandbags will be placed in necessary areas.
- (4) The geomembrane will be deployed in a manner to minimize wrinkles. The geomembrane will have no fold overs.
- (5) Any damage to a panel of the geomembrane will be repaired. Any area of a panel seriously damaged (torn, twisted, or crimped) will be marked, cut out and removed from the work area with resulting seaming and/or repairs performed.

(3) Field Seaming

(a) Layout

In general, seams shall be oriented parallel to the slope, i.e., oriented along, not across the slope. Whenever possible, horizontal seams should be located not less than five (5) feet from the toe of the slope. Each seam made in the field shall be numbered in a manner that is compatible with the panel layout drawing for documentation of seam testing results.

(b) Personnel

All personnel performing seaming operations shall be trained in the operation of the specific seaming equipment being used and will qualify by successfully welding a test seam. The project foreman will provide direct supervision of all personnel seaming to verify proper welding procedures are followed. Qualified liner installers, seamers, and the liner foreman shall meet a minimum requirement of 1,000,000 square feet of geomembrane installation. There are no other minimum qualifications needed by other parties.

(c) Equipment

(1) Fusion Welding

Fusion Welding consists of placing a heated wedge, mounted on a self propelled vehicular unit, between two (2) overlapped sheets such that the surface of both sheets are heated above the polyethylene's melting point. After being heated by the wedge, the overlapped panels pass through a set of preset pressure wheels which compress the two (2) panels together so that a continuous homogeneous fusion weld is formed. The fusion welder is equipped with a temperature readout device which continuously monitors the temperature of the wedge.

(2) Extrusion Fillet Welding

Extrusion fillet welding consists of introducing a ribbon of molten resin along the edge of the seam overlap of the two (2) sheets to be welded. The molten polymer causes some of the material of each sheet to be liquefied resulting in a homogeneous bond between the molten weld bead and the surfaces of the sheets. The extrusion welder is equipped with gauges giving the temperature in the apparatus and the preheat temperature at the nozzle.

(d) Weather Conditions

The Flexible Membrane Liner Manufacturer/Installer will rely on the experience of the Flexible Membrane Liner Project Superintendent and the results of test seams to determine seaming restrictions by weather. Many factors, such as ambient temperature, humidity, wind, sunshine, etc., can effect the integrity of field seams and must be taken into account when deciding whether or not seaming should proceed. Responsibility for monitoring these conditions shall lie with the Flexible Membrane Liner Project Superintendent; however, the Engineer may suspend any seaming operation which is, in his opinion, at the risk of providing the Owner with a quality product. Test seams are required prior to daily production seaming to determine if the weather conditions will effect the Flexible Membrane Liner System's ability to produce quality seams. Additional non-destructive and destructive testing of production seams substantiate the decision made by the Flexible Membrane Liner Project Superintendent to seam on any given day.

(4) Seam Preparation

(a) Fusion Welding

- (1) Overlap the panels of geomembrane approximately four (4) inches.
- (2) Clean the seam area prior to seaming to assure the area is clean and free of moisture, dust, dirt, debris of any kind. No grinding is required for fusion welding.
- (3) Adjust the panels so that seams are aligned with the fewest possible number of wrinkles and "fishmouths".
- (4) A movable protective layer may be used, at the discretion of the Flexible Membrane Liner Project Superintendent, directly below the overlap of geomembrane that is to be seamed to prevent build-up of moisture between the panels.

(b) Extrusion Welding

- (1) Overlap the panels of geomembrane a minimum of three (3) inches.
- (2) Temporarily bond the panels of geomembrane to be welded taking care not to damage the geomembrane.
- (3) Grind seam overlap prior to welding within one (1) hour of welding operation in a manner that does not damage the geomembrane. Limit grinding to ¼" outside of the extrusion weld area.
- (4) Clean the seam area prior to seaming to assure the area is clean and free of moisture, dust, dirt, and debris of any kind.
- (5) Purge the extruder prior to beginning the seam to remove all heat-degraded extrudate from the barrel.
- (6) Keep welding rod clean and off the ground.

(5) Test Seams

Test seams shall be performed at the beginning of each seaming period and at least once each four (4) hours for each seaming apparatus used that day. Test seams shall be made on fragment pieces of the geomembrane liner and under the same conditions as actual seams.

(a) Test Seam Length

The test seam shall be at least three (3) feet long and should be made by joining two (2) pieces of geomembrane at least 9" in width.

(b) Sample Procedure

- (1) Visually inspect the seam for squeeze out, footprint, pressure and general appearance.
- (2) Two random samples one (1) inch wide shall be cut from the test seam.
- (3) The two (2), one (1) inch wide samples shall be tested in the field in a tensiometer that has a constant separation of 2.0 in/min for peel and shear. The passing destructive test requirements for a 40-mil liner seam is: minimum peel adhesion of 44 ppi for hot wedge and 50 ppi for extrusion fillet seams, minimum shear strength of

60 ppi or hot wedge and extrusion fillet seams, and a maximum of 25% peel separation of the seam. If a specimen fails, the entire procedure shall be repeated.

- (4) If any of the second set of specimens fail, the seaming apparatus shall not be accepted and shall not be used for seaming until the deficiencies are corrected and a passing test seam is achieved.
- (5) After completion of these tests, the remaining portion of test seam can be discarded. Documentation of the test seams will be maintained, listing seam identification number, welder's name, temperature control setting, and test results.
- (6) Passing test results records shall be maintained.

(6) General Seaming Procedures

- (a) Seaming shall extend to the outside edge of panels to be anchored. While welding a seam, monitor and maintain the proper overlap.
- (b) Inspect seam area to assure area is clean and free of moisture, dust, dirt, debris of any kind.
- (c) While welding a seam, monitor temperature gauges to assure proper settings are maintained and that the seaming apparatus is operating properly.
- (d) Align wrinkles at the seam overlap to allow welding through the wrinkle.
- (e) Fishmouths or wrinkles at seam and overlaps that cannot be welded through shall be cut along the ridge in order to achieve a flat overlap. The cut fishmouth or wrinkle shall be seamed. Any portion where the overlap is inadequate shall be patched with an oval or round patch of the same geomembrane extending a minimum of six (6) inches beyond the cut in all directions.
- (f) All cross/butt seams between two (2) rows of seamed panels shall be welded during the coolest time of the day to allow for contraction of the geomembrane.
- (g) All "T" joints shall have the overlap from the wedge welder seam trimmed back to allow an extrusion fillet weld. Then grind $\frac{1}{4}$ of an inch minimum on either side of the wedge seam, then extrusion weld all of the area prepared by grinding.

3.5 Closure Flexible Membrane Liner Tests

The installation crews will non-destructively test all field seams over their full length using air pressure testing, vacuum testing or other approved methods, to verify the continuity and integrity of the seams.

(a) Air Pressure Testing

The welded seam created by double hot-wedge fusion welding process is composed of two distinct welded seams separated by an unwelded channel approximately $\frac{3}{8}$ of an inch between the two welded seams permits the double hot-wedge fusion seams to be tested by inflating the sealed channel with air to a predetermined pressure, and observing the stability of the pressurized channel over time.

(1) Equipment for Air Testing

An air pump (manual or motor driven) capable of generating and sustaining a pressure between 25 to 30 psi.

A rubber hose with fittings and connections.

A sharp hollow needle, or other approved pressure feed device with a pressure gauge capable of reading and sustaining a pressure between 25 to 30 psi.

(2) Procedure for Air Testing

Seal both ends of the seam to be tested.

Insert needle or other approved pressure feed device into the sealed channel created by the fusion weld.

Inflate the test channel to a pressure between 25 to 30 psi, in accordance with the following schedule, close valve, and observe initial pressure after approximately 2 minutes.

INITIAL PRESSURE SCHEDULE *

<u>Material (Mil)</u>	<u>Min. Psi</u>	<u>Max. Psi</u>
40	25	30
60	27	30
80	30	30
100	30	30

* Initial pressure settings are read after a two minute "relaxing period". The purpose of this "relaxing period" is to permit the air temperature and pressure to stabilize.

Observe and record the air pressure five (5) minutes after "relaxing period" ends and when initial pressure setting is used. If loss of pressure exceeds the following or if the pressure does not stabilize, locate faulty area and repair.

**MAXIMUM PERMISSIBLE PRESSURE DIFFERENTIAL
AFTER 5 MINUTES - LLDPE**

<u>Material (Mil)</u>	<u>Pressure Diff.</u>
40	4 psi
60	3 psi
80	3 psi
100	3 psi

At the conclusion of the pressure test the end of the seam opposite the pressure gauge is cut. A decrease in gauge pressure must be observed or the air channel will be considered "blocked" and the test will have to be repeated after the blockage is corrected.

Remove needle or other approved pressure feed device and seal resulting hole by extrusion welding.

(3) In the event of a Non-Complying Air Pressure Test, the following procedure shall be followed:

Check seam end seals and retest seams.

If non-compliance with specified maximum pressure differential re-occurs, repair the seam. Capping or removal/re-seam of the non-complying seam are the only two (2) acceptable methods for repairing failed seams. Non-destruct test the entire length of the repaired seam.

Perform destructive peel tests on the samples using the field tensiometer.

If all samples pass destructive testing, remove the overlap left by the wedge welder and vacuum test the entire length of seam.

If a leak is located by the vacuum test, repair by extrusion welding. Test the repair by vacuum testing.

If no leak is discovered by vacuum testing, the seam will pass non-destructive testing.

If one or more samples fail the peel tests, additional samples will be taken.

When two (2) passing samples are located, the seam between these two (2) locations will be considered non-complying. Capping or removal of the non-complying seam, are the only two (2) acceptable methods for repairing failed seams. Non-destruct test the entire length of the repaired seam.

(b) Vacuum Testing

This test is used when the geometry of the weld makes air pressure testing impossible or impractical or when attempting to locate the precise location of a defect believed to exist after air pressure testing. The penetration will be tested using this method.

(1) Equipment for Vacuum Testing

Vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.

Vacuum pump assembly equipped with a pressure controller and pipe connection.

A rubber pressure/vacuum hose with fittings and connections.

A bucket and means to apply a soapy solution.

A soapy solution.

(2) Procedure for Vacuum Testing

Trim excess overlap from seam, if any.

Turn on the vacuum pump to reduce the vacuum box to approximately 5 inch of mercury, i.e., 5 psi gauge.

Apply a generous amount of a solution of strong liquid detergent and water to the area to be tested.

Place the vacuum box over the area to be tested and apply sufficient downward pressure to "seat" the seal strip against the liner.

Close the bleed valve and open the vacuum valve.

Apply a minimum of 5 in. Hg vacuum to the area as indicated by the gauge on the vacuum box.

Ensure that a leak tight seal is created.

For a period of not less than 30 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.

If no bubbles appear after 30 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 in. overlap, and repeat the process.

(3) Procedure for Non-Complying Test

Mark all areas where soap bubbles appear and repair the marked areas.

Retest repaired areas.

(c) Destructive Testing

(1) Concept

The purpose of destructive testing is to determine and evaluate seam strength. These tests require direct sampling and thus subsequent patching. Therefore destructive testing should be held to a minimum to reduce the amount of repairs to the geomembrane.

(2) Procedure for Destructive Testing

All Destructive tests will be done according to GRI test method GM19. Destructive test samples shall be marked and cut out randomly at a minimum average frequency of one test location every 500 feet of seam length.

Additional destructive tests may be taken in areas of contamination, offset welds, visible crystallinity or other potential cause of faulty welds at the discretion of the Flexible Membrane Liner Project Superintendent and Engineer.

Sample Size

The sample should be twelve (12) inches wide with a seam fourteen (14) inches long centered lengthwise in the sample. The sample may be increased in size to accommodate independent laboratory testing by the owner at the owner's request or by specific project specifications.

A one (1) inch sample shall be cut from each end of the test seam for field testing.

The two (2), one (1) inch wide samples shall be tested in the field in a tensiometer that has a constant separation of 2.0 in/min. for peel and shear. The passing destructive test requirements for a 40-mil LLDPE liner seam is: minimum peel strength of 50 ppi for hot wedge and 44 ppi for extrusion fillet seams, minimum shear strength of 60 ppi for hot wedge and extrusion fillet seams, and a maximum of 25% peel separation of the seam.

(3) Procedure in the event of Destructive Test Failure

Cut additional field samples for testing. In the case of a field production seam, the samples must lie a minimum of ten (10) feet in each direction from the location of the failed sample. Perform a field test for peel strength. If these field samples pass, then laboratory samples can be cut and forwarded to the laboratory for full testing.

If the laboratory samples pass then reconstruct the seam between the two (2) passing samples locations.

Heat tack the overlap along the length of the seam to be reconstructed and extrusion weld.

Vacuum test the extrusion weld.

If either of the samples fail, then additional samples are taken in accordance with the above procedure until two (2) passing samples are found to establish the zone in which the seam should be reconstructed.

All passing seams must be bounded by two (2) locations from which samples passing laboratory destructive tests have been taken.

In cases of reconstructed seams exceeding 150 feet, a destructive sample must be taken and pass destructive testing from within the zone in which the seam has been reconstructed.

All destructive seam samples sent to the independent laboratory chosen by the Engineer, shall be numbered.

(d) Quality Assurance Laboratory Testing

- (1) Destructive samples sent to the laboratory will be tested for shear/peel strength, elongation, and peel separation according to table 2(a) of GRI Test Method GM19. Five (5) specimens shall be tested for each test method with data recorded. Four (4) out of the five (5) specimens must pass and the fifth specimen must be 80% of the passing test values. The passing test values are as follows:

Hot Wedge Seams

- Shear Strength-60 ppi
- Shear elongation at break – 50%
- Peel Strength- 50 ppi
- Peel separation-25%

Extrusion Fillet Seams

- Shear Strength-60 ppi
- Shear Elongation at break-50%
- Peel Strength- 44 ppi
- Peel separation-25%

(2) Defects and Repairs

(a) The Flexible Membrane Liner Project Superintendent shall conduct a detailed walk through and visually check all seams and non-seam areas of the geomembrane for defects, holes, blisters and signs of damage during installation.

(b) All other installation personnel shall, at all times, be on the lookout for any damaged areas. Damaged areas shall be marked and repaired.

(c) Repair Procedures

Any portion of the geomembrane showing a flaw or failing a destructive or non-destructive test shall be repaired. Several procedures exist for repair and the decision as to the appropriate repair procedure shall be made by the Flexible Membrane Liner Project Superintendent. Repairs need to be made in a timely manner to protect the moist cohesive soil liner and flexible membrane liner. If inclement weather is approaching, steps need to be made to protect the cohesive soil cap such as a temporary cover. If cohesive soil cap is damaged, it must be reworked. Procedures available for liner repair:

Patching - used to repair large holes, tears and destructive sample locations. All patches shall extend at least six (6) inches beyond the edges of the defect and all corners of patches shall be rounded.

Reconstruction - used to repair seams bounded by passing destruct samples.

Grinding and welding - used to repair sections of extruded seams.

Spot welding or seaming - used to repair small tears, pinholes or other minor localized flaws.

Capping - used to repair lengths of failed extruded seams.

Removal of a bad seam and replacement with a strip of new material seamed into place.

(d) Verification of Repairs

Every repair shall be non-destructively tested. Repairs which pass the non-destructive test shall be deemed adequate. Large repairs may require a destructive test. Repair test results shall be logged. The repair location shall be recorded on an as-built drawing.

(e) Liner Acceptance

The constructed liner will be accepted when all non-destruct and destruct tests have passed their respective tests and the results have been verified by the Engineer.

3.6 Closure Protective Cover

(1) HPDE Geocomposite Drainage Netting manufactured by SKAPS Industries 330 mil, or approved equal. Q/C testing information/certification for each property on geocomposite will be provided by the contractor/manufacturer for the rolls delivered. The thickness, transmissivity and ply adhesion will be tested by the Engineer's third party laboratory for quality assurance. One roll from every 200,000 ft.² of material delivered to the site will be tested.

Otherwise, the deployed geonet is visually inspected to assure that the geotextile fabric has not been torn and is over lapping onto adjacent rolls so that it can and has been heat seamed. Damaged spots are repaired accordingly to assure that soil cannot get into the drainage net.

Transmissivity of Geocomposite Drainage Net

Skaps Transnet 330 with 8 oz. geotextile has a transmissivity of 9×10^{-4} m²/sec

$$1 \text{ m}^2/\text{sec} = 10.7639 \text{ ft}^2$$

$$\therefore 0.0009 \text{ m}^2/\text{sec} = 0.010 \text{ ft}^2/\text{sec} = T$$

$$\text{Transmissivity (T)} = \text{Permeability (K)} \times \text{thickness (b)}$$

$$b = 0.33 \text{ inch} = 0.0275 \text{ feet}$$

$$K = T \div b = 0.010 \text{ ft}^2/\text{sec} \div 0.0275 \text{ ft} = 0.363 \text{ ft}/\text{sec}$$

$$1 \text{ acre} = 43,560 \text{ ft}^2$$

1 acre of Transnet 330 discharges:

$$43,560 \text{ ft}^2 \times 0.363 \text{ ft}/\text{sec} = 15,838 \text{ ft}^3/\text{sec}$$

Based on HELP model from the 2004 Application the average annual discharge from top liner cap is 12 inches/acre which is:

$$43,560 \text{ ft}^3/\text{year} = 43,560 \text{ ft}^3 \div (60)(60)(24)(365) = 0.00138 \text{ ft}^3/\text{sec}.$$

The cap will have a drainage net that will flow 15,838 ft³/sec/acre and the expected discharge is 0.00138 ft³/sec.

\therefore The Transnet 330 is more than adequate to handle the flow from the vegetative layer onto the LLDPE Liner.

GEOCOMPOSITE PROPERTIES (SKAPS 330 mil)

Property	Test Method	Unit	Required Value		Qualifier
			with 6 oz.	with 8 oz.	
Geonet					
Thickness	ASTM D 5199	mil	330±30	330±30	Range
Carbon Black	ASTM D 4218	%	2 to 3	2 to 3	Range
Tensile Strength	ASTM D 7179	lb/in	95	95	Minimum
Melt Flow	ASTM D 1238 ³	g/10 min	1	1	Maximum
Density	ASTM D 1505	g/cm ³	0.94	0.94	Minimum
Transmissivity ¹	ASTM D 4716	m ² /sec	8x10 ⁻³	8x10 ⁻³	MARV ²
Composite					
Ply Adhesion (Minimum)	ASTM D 7005	lb/in	0.5	0.5	MARV
Ply Adhesion (Average)	ASTM D 7005	lb/in	1	1	MARV
Transmissivity ¹	ASTM D 4716	m ² /sec	9x10 ⁻⁴	9x10 ⁻⁴	MARV
GeoTextile					
Fabric Weight	ASTM D 5261	oz/yd ²	6	8	MARV
Grab Strength	ASTM D 4632	lbs	160	225	MARV
Grab Elongation	ASTM D 4632	%	50	50	MARV
Tear Strength	ASTM D 4533	lbs	65	90	MARV
Puncture Resistance	ASTM D 4833	gpm/ft ²	95	130	MARV
CBR Puncture	ASTM D 6241	lbs	475	650	MARV
Water Flow Rate	ASTM D 4491	gpm/ft ²	125	100	MARV
Permittivity	ASTM D 4491	sec ⁻¹	1.63	1.26	MARV
Permeability	ASTM D 4491	cm/sec	0.3	0.3	MARV
AOS	ASTM D 4751	US Sieve	70	80	MARV

Notes:

1. Transmissivity measured using water at 21 ± 2°C (70 ± 4°F) with a gradient of 0.1 and a confining pressure of 10000 psf between steel plates after 15 minutes. Values may vary between individual labs.
2. MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.
3. Condition 190/2.16

Delivery, Storage and Handling of all materials and equipment shall adhere to the following:

- A. Manufacturer labels must be on all rolls delivered to the project.
- B. A firmly affixed label attached to the selvage edge, shall clearly state the manufacturer's name, product identification, material thickness, roll type, roll dimensions and roll weight.
- C. The manufacturer protects the geocomposite from mud, dirt, dust, puncture, cutting or any other damaging deleterious conditions.
- D. Continuously and uniformly supported, rolls are stored away from high traffic areas on a smooth, level surface. Chocks keep the rolls secure when necessary.

Material Warranty shall adhere to the following:

Material manufacturer shall guarantee material against defects and premature aging from environmental conditions on a pro rata basis for a specified period of time acceptable to owner and manufacturer.

The geocomposite will be handled in such a manner as to ensure the geocomposite are not damaged in any way. On slopes, the geocomposite will be secured in the anchor trench and then rolled down the slope in such a manner as to continually keep the geocomposite sheet in tension. If necessary, the geocomposite will be positioned by hand after being unrolled to minimize wrinkles. Geocomposite can be placed in the horizontal direction (i.e., across the slope) in some special locations (e.g., where extra layers are required or where slope is less than 10:1).

Geocomposite will not be welded to the geomembrane. Geocomposite will be cut using approved cutters,(i.e., hook blade, scissors, etc.) Care should be taken to prevent damage to underlying layers. Care must be taken not to entrap dirt in the geocomposite that could cause clogging of the drainage system, and or stones that could damage the adjacent geomembrane.

Adjacent rolls of geocomposite will be overlapped by at least four inches and securely tied. Tying can be achieved by plastic fasteners. Tying devices will be white or yellow for easy inspection. Metallic devices are not allowed. Tying will be five to ten feet along the bottom of the slope. Tying will be every five feet along the slope, every two feet across the slope and at the top of the berm. Tying in the anchor trench will be done in one foot intervals. In the corners of the side slopes where overlaps between perpendicular geocomposite strips are required, an extra layer of geocomposite will be unrolled along the slope, on top of the previously installed geocomposite, from the top to bottom of the slope.

Any holes or tears in the geocomposite will be repaired by placing a patch, utilizing the same geocomposite material, extending two feet beyond edges of the hole or tear. The patch will be secured to the original geocomposite by tying every twelve inches. If the hole or tear width across the roll is more than 50% the width of the roll, the damaged area will be cut out and the two portions of the geocomposite will be joined.

The engineer will visually inspect the drainage layer before placement of the erosive layer, if any defects are detected they will be repaired before placement of erosive layer.

(2) Erosive Layer

The soil for the erosive layers shall consist of suitable site soil free of debris, roots, rocks and organics. The soil shall contain no particles or objects greater than 3/4 inch in largest dimension, which has been screened, with fines passing the 200 sieve less than 50%, but no greater than 12%. There will not be soils used in the erosive layer that has fines greater than 50%. A sieve analysis, according to ASTM D-422 will be done on every 3500 cubic yards of soil used for the erosive layer. No other tests will be done because the erosive layer is not compacted.

Installation of the protective cover shall be the responsibility of the contractor. Before proceeding with placement of the protective cover over the liner, the Contractor shall furnish to the Engineer with the manufacturer's certification that the lining has been satisfactorily installed in accordance with the manufacturer's recommendations.

The erosive layer shall be composed of 24" of select backfill. The cover shall be installed using low ground pressure equipment such as a Caterpillar D6H LGP, or approved equal, with ground pressure not exceeding 4.71 psi until the depth of cover exceeds three feet.

The depth of the erosive layer will be verified based on the 50 ft. grid and the difference in elevation from the top of the cohesive soil to the top of the erosive layer.

- (a) A minimum of twelve inches (12") of cover between low ground pressure equipment and the liner is required at all times. Roadways for entering and for transporting material over slopes and capped/lined areas shall have a minimum depth of four feet (4').
- (b) Avoid undue stress on the liner at all times. Cover material must be pushed up slopes, never down to help minimize wrinkles. Material must be placed to minimize wrinkles, wrinkles in excess of two feet in height are unacceptable. If a wrinkle is more than two feet in height, soil will be placed on top of the wrinkle to decrease the height. Fold over of the liner will not be allowed. A worker must walk along side earth moving equipment and remove all rocks, stones, roots or other debris that could cause damage to the liner. Equipment operators must avoid sharp turns or quick stops that could pinch and tear the liner.
- (c) If damage does occur, report it to the Project Manager immediately so that repairs can be performed without needless delay. All repairs to any component of the liner system will be done and tested according to the required repairs and testing for that component.
- (d) Do not work wet cover material that cannot support equipment.
- (e) Equipment operators and all other personnel must be qualified and must exercise good judgment and common sense at all times.

(3) Vegetative Layer

Native vegetation will be used as approved by the Erosion Control Plan.

3.7 Closure Gas Venting System

The existing gas collection system and any future expansions of the system, shall remain in service until collection of gas is no longer functional. The wells will then be converted to methane vents and the gas collection laterals shall remain in place and be capped.

The well heads shall be removed and replaced with a methane vent turndown and the opening shall be covered with a stainless steel screen.

NC.D.O.T. No.5 stone, Geotextile fabric, and 8" and 10" plastic pipes will be used in the construction of the Gas venting system.

(1) Stone in Trenches and Surrounding Perforated Collection Piping

Stone for methane collection system shall meet the requirements of NC DOT aggregate, standard size No. 5 and shall contain no fines. Stone must pass the sieve analysis test for No. 5 stone performed at the quarry.

(2) Geotextile Fabric

Geotextile fabric surrounding the stone/piping shall be non-woven needle punched fabric with the following minimum properties:

1)	Weight	8.0 oz/yd ²	ASTM D-3776
2)	Grab Strength	205 lbs.	ASTM D-4632
3)	Grab Elongation	50%	ASTM D-4632
4)	Trapezoidal Tear Strength	85 lbs.	ASTM D-4533
5)	Puncture Strength	100 lbs.	ASTM D-4833
6)	Mullen Burst Strength	320 psi	ASTM D-3786
7)	Permittivity	1.4 sec ⁻¹	ASTM D-4491

Geotextile fabric shall be manufactured by Polyfelt , TNS Advanced Technologies, or approved equal.

(3) Plastic Pipe

Plastic gravity sewer pipe and fittings used for methane vent shall be unplasticized polyvinyl chloride (PVC) and conform to the requirements of ASTM Designation D-3034 on ASTM F679, Type PSM, Class 12454-B, SDR-35 with elastomeric gasket joints. PVC pipe and fittings shall be as manufactured by J-M Pipe, Certainteed, H&W Industries or equal. The methane riser pipe shall be a 10 inch solid wall PVC pipe.

3.8 Closure Construction Quality Assurance (CQA)

At the completion of the closure, it is the Engineer's responsibility to provide to the Owner and eventually to the Division of Waste Management the following:

1. All parties involved in the landfill construction including name and contact information and responsibilities'.
2. As-built drawings of the existing surface, the top of cohesive soil liner, and the top of the vegetative /protective cover, gas vents, etc. provided by NC Professional Land Surveyor.
3. Documentation of all cohesive soil liner standard Proctor tests.
4. Documentation of all cohesive soil liner tests including test pads, permeability, standard Proctor and Atterberg limits.
5. Documentation of all destructive and non-destructive tests, methods and results and repairs.
6. Geomembrane panel layout with test locations and repairs illustrated.
7. Completed and signed meeting minutes including pre-construction, progress and any trouble shooting.
8. Summary of all construction activities from the Engineer.
9. Provide color photographs of major construction features.
10. Any other pertinent documentation.

The CQA report shall be sealed by the Engineer and a certification that construction was completed in accordance with the CQA plan, Conditions of the permit to construct, the requirements of rule .1624 Construction Requirements for MSWLF Facilities, and acceptable engineering practices.

Shop Drawings

Contractor is required to submit to the Engineer a descriptive detail and any shop and setting drawings. On composite liner system, such submission shall include the following:

- (1) Flexible Membrane Liner Panel Layout Drawings,
- (2) Flexible Membrane Liner Penetration Details,
- (3) Flexible Membrane Liner Anchoring Detail,
- (4) Flexible Membrane Liner Seaming Detail,
- (5) Single Flexible Membrane Liner Anchoring to Structure Detail,
- (6) Flexible Membrane Liner Extension Detail, and
- (7) Certified experience records for manufacturer, fabricator and installer, listing installations of Flexible Membrane Liners.

3.9 Closure Costs

The largest area to be closed within the permitted life will be Phase 1, 2, and 3 (65 Ac.). The estimated costs shown below are only for Phase 1, 2 and 3. Post Closure will be 30 years after closure.

Closure Costs:

Closure will consist of the following which costs are estimated as being done by a third party.

1. 18" of 1×10^{-5} cm/sec. soil cover
2. 40 Mil LLDPE Liner and Drainage net
3. Erosion Control Devices
4. 24" Erosive layer
5. Seeding and Mulching
6. Mobilization/Demobilization
7. Labor Costs
8. Stone for gas venting
9. Geotextile for gas venting
10. Vent pipes for gas venting
11. Engineering Costs and QA/QC of the Composite liner and certification of closure

Estimate of Probable Costs:

1. 18" of 1×10^{-5} cm/sec. soil cover for 65 acres:
Total yardage + 15% = 180,895 yd³ @ a cost of \$9.00/yd³
∴ Cost = \$1,628,055
2. 40 Mil LLDPE Liner and Drainage net for 65 acres
Total Footage + 15% = 3,256,110 ft² @ a cost of \$0.85/ft²
∴ Cost = \$2,767,694
3. Erosion Control devices
Estimated costs @ \$75,000
∴ Cost = \$75,000
4. 24" Erosive soil layer for 65 acres.
Total yardage + 15% = 241,194 yd³ @ a cost of \$4.38/yd³
∴ Cost = \$1,056,430
5. Seeding and Mulching for 65 acres.
Estimated cost of \$2,000/acre
∴ Cost = \$130,000
6. Mobilization/Demobilization.
Estimated cost of \$200,000
7. Labor Costs.
Estimated cost of \$700,000

8. Vent pipes for methane gas collection.
 Estimated cost @ \$600.00 each (62).
 ∴ Cost = \$37,200

9. Engineering Costs and QA/QC of the Composite liner and certification of closure.
 Estimated cost = \$700,000

Total of Estimated Phase 1, 2 and 3 Closure Costs:

1.	\$ 1,628,055
2.	\$ 2,767,694
3.	\$ 75,000
4.	\$ 1,056,430
5.	\$ 130,000
6.	\$ 200,000
7.	\$ 700,000
8.	\$ 37,200
9.	<u>\$ 700,000</u>
Total:	\$ 7,294,379

SECTION 4.0

**POST-CLOSURE
PLAN**

4.1 Introduction

CONTACTS: Name: Tim Rogers
Title: Solid Waste Director
Phone No.: (919) 689-2994
Address: 460 B. S. Landfill Rd.
Dudley, NC 28333

DESCRIPTION OF USE:

The County has no future use planned for their landfill at this time. However, should the County decide to use the site for any other purpose, the owner or operator shall submit such request to the Division of Waste Management for approval. Post-Closure use of the property will not disturb the integrity of the cap system, base liner system or any other components of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements of the section

DESCRIPTION OF MAINTENANCE ACTIVITIES:

The landfill will be monitored quarterly for evidence of settlement, subsidence, ponding in the cap system, leachate seepages, and any erosion. The quarterly inspection will also include observation and necessary repair of the security fence, entrance sign, access roads to the methane and groundwater monitoring points, the actual ground water monitoring wells and methane probes, accumulated silt in the sediment basins, all inspection, operation & maintenance of the on-site above ground leachate storage tanks, pumps and edge of waste markers. Annually in the spring, the vegetative cover will be monitored to assure a good stand of vegetation, and where needed, it will be reseeded. Semi-annually the cap vegetation will be mowed and any saplings removed. These maintenance activities will take place over the entire post closure period of thirty years.

The pumps in the sumps will be monitored quarterly to assure that they are operating properly by manually operating each pump. The flow pumped from each sump for the quarter will be documented. The pumps at the lagoon will also be manually operated to assure that they are working properly and the flow to the Waste Water Treatment Plant documented for the quarter. If for any reason a pump is not operating, it will be repaired or replaced within two weeks of the inspection.

Any repairs to the cap system will be done according to the approved closure plan and documented according to the approved quality assurance plan. Damages that require repairs shall be reported to the NC Solid Waste Section within 3 days of inspection/observation.

The leachate collection system will be videoed every five years and power washed if necessary. The pump risers will be vacuum cleaned every five years. Leachate will be collected and treated until the generation of leachate has stopped due to capping.

All quarterly inspections/observations will be documented and become part of the landfill's operating record. All repairs/maintenance will be documented and also become part of the landfill's operating record. Data collected from all pumps will also become part of the operating record.

DESCRIPTION OF MONITORING ACTIVITIES:

The County will monitor and analyze ground and surface water semi-annually according to the approved monitoring plan for a period of thirty years. The County will also monitor methane gas at landfill structures and the boundary quarterly according to the approved methane monitoring plan for the thirty-year period. All reports and records required by the approved monitoring plans will become part of the landfill's operating record.

COMPLETION OF POST-CLOSURE CARE

Following completion of the post-closure care period for each MSWLF unit, the owner or operator will notify the Division of Waste Management that a certification, signed by a registered professional engineer, verifying that

post-closure care has been completed in accordance with the post-closure plan, has been placed in the operating record.

CLOSURE OF LEACHATE STORAGE FACILITIES

The County will close the leachate lagoon within 180 days after liquid collection has ceased. The plan for closure of the lagoon shall be approved by the Division of Waste Management prior to commencing closure activities.

At closure, all solid waste will be removed from the leachate lagoon, connecting sewer lines, and manholes. All solid waste removed will be properly handled and disposed of according to federal and State requirements. All connecting lines will be disconnected and securely capped or plugged.

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

All waste residues, contaminated system components (composite liner system), contaminated subsoils, structures and equipment contaminated with waste will be removed and appropriately disposed.

4.2 Post Closure Costs

The largest closed area to be monitored within the post closure life will be Phase 1, 2 and 3 (65 Ac.).

Post Closure Costs:

Methane and/or hydrogen sulfide (H₂S) gas, ground water and surface water will be monitored for 30 years after closure. The cap will also have to be monitored for the 30 year period. All costs include reports, data analysis, and certifications.

1. Ground and Surface Water monitoring semi-annually for 30 years for Subtitle D Appendix I constituents and statistical analysis.
Estimated cost/sample = \$840.00/sample
Total annual samples = 2(16 wells + 4 surface) = 40 samples/year
Estimated cost = 30 years x 40 samples/year x \$840.00/sample

∴ Cost = \$1,008,000
2. Methane Gas monitoring quarterly for 30 years.
Estimate \$600.00/quarter = \$2,400.00/year
Estimated cost = 30 year x \$2,400.00

∴ Cost = \$72,000.00
3. Closure of sedimentation and erosion control devices.
Estimate \$24,000 for closure

∴ Cost = \$24,000
4. Leachate Management including pumping data.
Estimate \$400,000 for the 30 years.

∴ Cost = \$400,000
5. Closure of leachate lagoon.
Estimate \$30,000
6. Maintenance of gas vents, monitoring wells, pumps, access roads, fencing, signage, EOW markers, vegetation and mowing, etc.
Estimate \$520,000
7. Decommissioning of LGCCS System.
Estimated cost/well head = \$500.00
62 well heads x 500.00 = \$31,000

∴ Cost = \$31,000
8. Cap Monitoring and repairing any problems.
Estimate \$100,000 for the 30 years.

∴ Cost = \$100,000

Total of Estimated Phase 1, 2 and 3 Post Closure Costs:

1.	\$1,008,000
2.	\$ 72,000
3.	\$ 24,000
4.	\$ 400,000
5.	\$ 30,000
6.	\$ 520,000
7.	\$ 31,000
8.	\$ 100,000
Total:	\$2,185,000

4.3 Potential Assessment and Corrective Action (PACA) Estimate

Approved PACA Cost Estimate = **\$2,000,000**

SECTION 5.0

**FINANCIAL
ASSURANCES**

(TO BE SUBMITTED AT A LATER DATE)

PART 2 (C&DLF and LCID):

SECTION 1.0

ENGINEERING PLAN

1.1 Analysis of the Facility Design and Landfill Capacity (C&DLF)

Introduction

Wayne County will continue to operate a Construction and Demolition (C&D) landfill on the 112 acre property owned by the County (Deed Book 832, Page 161). Prior to operating as a C&D landfill, the site operated as a Municipal Solid Waste (MSW) unlined sanitary landfill that consisted of two units. The first unit was closed prior to October 1991, with a 24-inch final soil cover. The second unit was closed by December 31, 1998, with an 18-inch thick cohesive soil cap with a permeability of 1×10^{-5} cm/sec, and 18 inches of erosive layer. The C&D landfill is operating on top of the second MSW unit.

General

The existing C&DLF unit is located a minimum of 50' from the property lines, 500' from existing wells, and 50' from any stream, river or lake, and the post settlement subbase elevation was prepared a minimum of four feet above the seasonal high groundwater table and bedrock.

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches bridging material (temporary cover), 18 inches of soil liner with permeability no greater than 1×10^{-5} cm/sec, and 18 inches of protective/erosive layer.

The cap contains gas venting system consisting of a series of washed stone trenches below the soil liner that will be vented through pipes that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices.

The C&D facility has a permitted air space capacity of 2,736,883 cubic yards. The existing closed MSW footprint is approximately 40 acres in size.

Landfill Capacity

The Life Expectancy calculations were calculated for Phases 2-7 of development with a vertical expansion being included when a Phase is constructed adjacent to the previous Phase. Each successive phase will vary in size due to being able to expand onto the previously filled areas. The Operation Plan of the Engineering Report will delineate this more clearly. The airspace is a net volume excluding the capping requirements.

LIFE EXPECTANCY CALCULATIONS PHASES 2-7

Given: Life expectancy is based on annual tonnage reported to the Division of Waste Management for FY 2007-2008, the county received 36,067 tons (55,488 cy/yr). We used this number for the first year and an annual increase of 0.83% for each year thereafter.

$$\frac{[36,067 \text{ tons}(2000 \text{ lbs./ton})]}{1300 \text{ lbs/cy compaction}} = 55,488 \text{ cy/yr}$$

<u>Phases</u>	<u>Airspace Available</u>	<u>Years of Life</u>
Phase 3	= 284,019 cubic yards	= 5.12 years
Phase 4	= 307,651 cubic yards	= 5.00 years
Phase 5	= 323,518 cubic yards	= 4.74 years
Phase 6	= 329,624 cubic yards	= 4.73 years
Phase 7	= <u>299,067 cubic yards</u>	= <u>4.20 years</u>
	1,543,879 cubic yards	23.78 years

Soil requirements for construction, daily cover and final caps for Phases 2-7
(Assume 10:1 trash to soil ratio)

Soil needed for Daily Cover	= 140,262 cubic yards
Soil needed for Closure	= 258,134 cubic yards
Overall Soil Requirements	= 398,396 cubic yards (soil needed for closure and daily cover)

The County also owns property which it will utilize for borrow material as needed. There should be enough borrow material available to complete the landfill. If the need arises the County will purchase additional land to borrow from.

C & D - ACTIVE/INACTIVE PHASING TABLE

C&D PHASE	WASTE FOOTPRINT (ACRE)	GROSS CAPACITY (CUBIC YARDS)	STATUS
1 & 2	40	1,193,004	ACTIVE AND PERMITTED
3	VERTICAL EXPANSION	284,019	NEW PTO REQUESTED
4	VERTICAL EXPANSION	307,651	TO BE DEVELOPED
5	VERTICAL EXPANSION	323,518	TO BE DEVELOPED
6	VERTICAL EXPANSION	329,624	TO BE DEVELOPED
7	VERTICAL EXPANSION	299,067	TO BE DEVELOPED
TOTAL	40	2,736,883	

Note: All air space and soil calculation were determined by Autodesk Land Development computer program.

The estimate of maximum inventory of C&D wastes on-site over the life to date of the landfill facility is 539,001 tons.

Estimated schedule of closure will be approximately 24 years (Phases 1-7).

1.1.1 Location Coordinates and Survey Control

Survey control coordinates are shown on the drawings and any additional information will be furnished upon request.

The thickness and grade of the soil liner and the erosive layer will be verified by the surveyor. The soil liner and the erosive soil layer will be surveyed at 100 foot grid points where the elevations of the top of landfill will be checked with the top of soil cap to verify 1.5 feet of erosive soil layer. The grade will then be verified with the surveyed information. The survey will be performed by North Carolina Professional Land Surveyor.

1.1.2 Sedimentation and Erosion Control Plan

The Sedimentation and Erosion control plan has been completed for the 24-hour, 25-year storm.

1.1.3 Cap System Standards

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches of intermediate cover, 18 inches of cohesive soil with a permeability no greater than 1.0×10^{-5} cm/sec, and 18 inches of erosive layer. All depths shall be measured perpendicular to the slope surface. The cap contains a gas venting system that consists of a series of washed stone trenches below the soil liner that will be vented through pipes (1 per acre) that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices.

Prior to beginning closure, the County will notify the Division of Waste Management that a notice of the intent to close the unit has been placed in the operating record. The County will begin closure activities no later than thirty (30) days after the date on which the landfill receives the final wastes or if the landfill has remaining capacity and there is a reasonable likelihood that the landfill will receive additional wastes, no later than one year after the most recent receipt of wastes. Extensions beyond the one-year deadline for beginning closure may be granted by the Division of Waste Management if the County demonstrates that the landfill has the capacity to receive additional waste and the County has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the closed landfill.

The County will complete closure activities in accordance with the closure plan within 180 days following the final receipt of waste. Extensions of the closure period may be granted by the Division of Waste Management if the County demonstrates that closure will, of necessity, take longer than one hundred

eighty (180) days and the County has taken and will continue to take all steps to prevent threats of human health and environment from the enclosed landfill.

Following closure of the landfill, the County will record a notation on the deed to the landfill property and notify the Division of Waste Management that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed will in perpetuity notify any potential purchaser of the property that the land has been used as a landfill and its use is restricted under the closure plan approved by the Division of Waste Management. The County may request permission from the Division to remove the notation from the deed if all waste is removed from the landfill.

1.2 Analysis of the Facility Design and Landfill Capacity (LCID)

Introduction

Wayne County will operate a Land Clearing and Inert Debris (LCID) landfill on the 28.40 acre property owned by the County (Deed Book 1927, Page 382).

General

The existing LCID Landfill unit is located northeast of the Closed MSW Landfill, within the existing landfill facility. The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of a 24 inch erosive layer.

Life Expectancy

The Life Expectancy calculations were calculated for Phases 1-6 of development with a vertical expansion being included when a phase is constructed adjacent to the previous phase. Each successive phase will vary in size due to being able to expand onto the previously filled areas. The airspace is a net volume excluding the capping requirements.

LIFE EXPECTANCY CALCULATIONS PHASES 1-6

Given: Life expectancy based on an approximate tonnage of 2 tons per day. The facility is open 5days per week, therefore approximately 520 tons per year. We used 1,040 cy/yr for the first year and an annual increase of 0.83% for each year thereafter.

$$\frac{[520\text{tons}(2000 \text{ lbs./ton})]}{1000 \text{ lbs/cy compaction}} = 1,040 \text{ cy/yr}$$

<u>Phases</u>	<u>Airspace Available</u>	<u>Years of Life</u>
Phase 2	= 6,550 cubic yards	= 6.30 years
Phase 3	= 5,973 cubic yards	= 5.51 years
Phase 4	= 5,120 cubic yards	= 4.53 years
Phase 5	= 5,630 cubic yards	= 4.78 years
Phase 6	= <u>6,124 cubic yards</u>	= <u>4.99 years</u>
	29,397 cubic yards	26.11 years

Soil requirements for construction, daily cover and final cap for Phases 1-6:
(Assume 20:1 Trash to soil ratio)

Soil needed for Daily Cover	= 1,470 cubic yards
Soil needed for Closure	= 6,453 cubic yards (2 acres)
Overall Soil Requirements	= 7,923cubic yards (soil needed for closure and daily cover)

SECTION 2.0

OPERATION PLANS

2.1 Construction and Demolition Landfill Facility (C&DLF)

Introduction

The Wayne County landfill is located at 460 S. Landfill Road (SR 1129), Dudley, Wayne County, North Carolina. The Wayne County Construction and Demolition (C&D) landfill operates under permit #96-01. Prior to operating as a C&D landfill, the site operated as a Municipal Solid Waste (MSW) unlined sanitary landfill that consisted of two units. The first unit was closed prior to October 1991, with a 24-inch final soil cover. The second unit was closed by December 31, 1998, with an 18-inch thick cohesive soil cap with a permeability of 1×10^{-5} cm/sec, and 18 inches of erosive layer. The C&D landfill was constructed and is operating on top of the second MSW unit. Adjacent to the C&D landfill is the existing Subtitle D MSW landfill, which operates under permit #96-06.

The County Landfill will only accept Construction and Demolition(C&D) wastes from Wayne County. Phase 3 will be a lateral expansion.

The County will implement a program at the landfill for detecting and preventing the disposal of hazardous and liquid wastes. The program consists of random inspection of incoming loads at a minimum of 1% of the weekly traffic. Landfill personnel will be trained to recognize hazardous and liquid wastes. Records will be kept on the training and the inspections. [See Part 1 (MSWLF): Section 2.3].

The County will monitor all areas of C&D filling for possible leachate break-outs. The County will implement a program for corrective actions for leachate break-outs. [See Part 1 (MSWLF): Section 2.8].

The County will monitor for explosive gases at landfill structures and the perimeter of the landfill. There are two (2) existing methane monitoring probes at the MSWLF and three(3) existing methane probes at the C&DLF. [See Part 1(MSWLF): Section 2.5].

The concentration of methane gases generated by the landfill cannot exceed 25 percent of the lower explosive limit for methane in the structures, and it cannot exceed 100 percent of the lower explosive limit for methane of the landfill property boundary. If methane gas is found to exceed the acceptable limits at either the property boundary or landfill structures, it is the County's responsibility to do the following:

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

Off-site and on-site erosion will be controlled through erosion control structures and devices. Provisions for a vegetative ground cover sufficient to restrain erosion will be accomplished within 30 working days or 120 calendar days upon completion of any phase of landfill development.

The County will record and retain at the landfill an operating record of the following information:

- (1) Inspection records, waste determination records, and training procedures;
- (2) Amounts by weight of solid waste received at the landfill;
- (3) Gas monitoring results and any remediation plans;
- (4) Any demonstration, certification, findings, monitoring, testing or analytical data required for surface and groundwater monitoring;
- (5) Any monitoring, testing or analytical data required for closure or post-closure;
- (6) Any cost estimates and financial assurance documentation.

All information contained in the operating record will be furnished upon request to the Division or be made available at all reasonable times for inspection by the Division.

Ground and surface water will be sampled and analyzed according to 40 CFR, Part 258, Appendix I detection monitoring requirements. The monitoring frequency for all Appendix I detection monitoring constituents will be at least semiannual during the life of the facility (including closure) and the post-closure period. A minimum of four independent samples from each well (background and downgradient) will be collected and analyzed for the Appendix I constituents during the first semiannual sampling event. At least one sample from each well (background and downgradient) will be collected and analyzed during subsequent semiannual sampling events. [See Part 1 (MSWLF): Section 2.7]

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

2.2 Operational Requirements

1. Waste Acceptance and Disposal Requirements
 - a. The C&DLF will only accept those solid wastes which it is permitted to receive. The County will notify the Division within 24 hours of attempted disposal of any waste the landfill is not permitted to receive.
 - b. Asbestos waste will be managed in accordance with 40 CFR 61. The regulated asbestos waste will be covered immediately with soil in a manner that will not cause airborne conditions and will be disposed of separate and apart from other solid waste, as:
 - i. in a defined isolated area within the foot print of the landfill, or
 - ii. in an area not contiguous with other disposal areas. Separate areas will be designated so that asbestos will not be exposed by future land- disturbing activities.
 - c. Wastewater treatment sludges may be accepted, with the approval of the Division, either as a soil conditioner incorporated into or applied onto vegetative growth layer. The wastewater treatment sludge will neither be applied at greater than agronomic rates nor to a depth greater than six inches.
 - d. Asphalt in accordance with G.S. 130-294(m) will be accepted;
 - e. Inert debris from any source that is defined as solid waste which consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil will be accepted;
 - f. Construction materials, that could or would be part of any construction, remodeling, repair or demolition of pavement, buildings or other structures, from solid waste that is generated by mobile or modular home manufacturers and asphalt shingle manufacturers in Wayne County. The waste must be source separated at the manufacturing site and must exclude municipal solid waste, hazardous wastes, and other wastes prohibited from disposal in a C&DLF. It must be transported to Wayne County C&DLF in a shipment or container that consists solely of the

separated waste to be disposed of. Wayne County C&DLF will not except this waste if it has not been separated or transported as specified.

- g. Wooden pallets generated only from C&D activities.
- h. The following wastes are prohibited from disposal at the C&DLF:
 - i. Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure that no liquid, hazardous or municipal solid waste is contained therein.
 - ii. Garbage as defined in G.S. 130A-290(a)(7).
 - iii. Hazardous waste as defined in G.S. 130A-290(a)(8), to also include hazardous waste from conditionally exempt small quantity generators.
 - iv. Industrial solid waste unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A).
 - v. Liquid wastes.
 - vi. Medical waste as defined in G.S. 130A-290(a)(18)
 - vii. Municipal solid waste as defined in G.S. 130A-290(a)(18a)
 - viii. Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761
 - ix. Radioactive waste as defined in G.S. 104E-5(14)
 - x. Septage as defined in G.S. 130A-290(a)(32)
 - xi. Sludge as defined in G.S. 130A-290(a)(34)
 - xii. Special waste as defined in G.S. 130A-290(a)(40)
 - xiii. White goods as defined in G.S. 130A-290(a)(44)
 - xiv. Yard trash as defined in G.S. 130A-290(a)(45)
 - xv. Wooden Pallets generated by means other than C&D activities
- i. The following waste will not be received if separate from C&DLF waste: lamps or light bulbs including but not limited to halogen, incandescent, neon or fluorescent; lighting ballast or fixtures; thermostats and light switches; batteries including but not limited to those from exit and emergency lights and smoke detectors; lead pipes; lead roof flashing; transformers; capacitors; and copper chrome arsenate (CCA) and creosote treated woods.
- j. Waste accepted for disposal in the C&DLF unit shall be readily identifiable as C&D waste and must not have been shredded, pulverized, or processed to such an extent that the composition of the original waste cannot be readily ascertained except in the case where the waste has come from a permitted recycling and reuse facility.
- k. The County will not knowingly dispose any type or form of C&D waste that is generated within the boundaries of a unit of local government that by ordinance:
 - i. Prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste.
 - ii. Requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

- I. Any recyclables received on site including yard wastes, white goods, used tires, and etc., shall be segregated and stockpiled in designated areas within the permitted landfill property.
2. Cover material requirements.
 - a. Except as in Subparagraph (c), the County must cover the solid waste with six inches of earthen material when the waste disposal area exceeds one-half acre and at least once weekly. Cover must be placed at more frequent intervals if necessary to control disease vectors, fires, odors, blowing litter and scavenging. A notation of the date and time of the cover placement must be recorded in the operating record, as specified in Paragraph 10 in this section.
 - b. Except as in Subparagraph (c), areas which will not have additional wastes placed on them for three months or more, but where final termination of disposal operations has not occurred, will be covered and stabilized with vegetative ground cover or other stabilizing material.
 - c. Alternative material or an alternative thickness of cover may be used, if the County demonstrates that the alternative material or thickness controls disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment, and is approved by the Division.
 3. Spreading and compacting requirements.
 - a. C&DLF units will restrict solid waste to the smallest area feasible.
 - b. Solid waste will be compacted as densely as practical into cells.
 - c. Fencing and/or diking will be provided within the area to confine solid waste which is subject to be blown by the wind. At the conclusion of each operating day, all windblown material resulting from the operation will be collected and disposed of by the County.
 4. Explosive gases control
 - a. The County must ensure that:
 - i. The concentration of methane and hydrogen sulfide (H₂S) gases generated by the landfill does not exceed 25 percent of the lower explosive limit for methane and hydrogen sulfide (H₂S) in landfill structures (excluding gas control or recovery system components); and
 - ii. The concentration of methane and hydrogen sulfide (H₂S) gas does not exceed 100 percent of the lower explosive limit for methane and hydrogen sulfide (H₂S) at the landfill property boundary.
 - b. The County will continue a routine gas monitoring program to ensure that the standards of 4 (a) are met. (Section 2.5-Appendix III-Explosive Gas Monitoring Plan)
 - i. The type and frequency of monitoring must be determined based on the following factors:
 - (i) Soil conditions;
 - (ii) The hydrogeologic conditions surrounding the facility;
 - (iii) The hydraulic conditions surrounding the facility;
 - (iv) The location of facility structures and property boundaries.
 - ii. The minimum frequency of monitoring will be quarterly.
 - c. If methane and hydrogen sulfide (H₂S) gas levels exceeding the limits specified in 4 (a) are detected, the owner or operator will:

- i. Immediately take all necessary steps to ensure protection of human health, i.e. no smoking, temporarily abandon the structure and notify the Division of Waste Management.
 - ii. Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
 - iii. Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the Division of Waste Management that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.
 - d. "Lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25° C and atmospheric pressure.
5. Disease vector control
- a. The County will prevent or control on-site populations of disease vectors using techniques appropriate for protection of human health and the environment.
 - b. "Disease vectors" means any rodents, flies, mosquitoes, or other animals, including insects, capable of transmitting disease to humans.
6. Air Criteria and Fire Control
- a. The County will ensure that the landfill does not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the US EPA Administrator pursuant to Section 110 of the Clean Air Act, as amended.
 - b. Open burning of solid waste, except for the infrequent burning of land clearing debris generated on site or debris from emergency clean-up operations, is prohibited. Any such infrequent burning will be approved by the Division of Waste Management, NC Division of Air Quality and the local fire department or fire marshal.
 - c. In the event of an emergency the operator(s) will call 911. Earth moving equipment will be provided to control accidental fires. Arrangements have been made with the local fire department to provide actual fire protection. The site will be served by the Thoroughfare Volunteer Fire Department. This Fire Department is located within 2 miles of the landfill. Should the need arise Grantham Volunteer Fire Department and Arrington Volunteer Fire Department are also located with 7 miles of the landfill. This Fire department has access at all times to the landfill to provide fire fighting services when needed. Fire extinguishers are located in all buildings and on all equipment. Dirt piles are also on site to use in emergency situations. Landfill personnel can use soil to isolate the fire so it will not spread any further but actual fighting of the fire should be the responsibility of the trained fire department.
 - d. Fires that occur at the landfill will be reported to the Division of Waste Management within 24 hours and written notification will be submitted within 15 days. Written Notification may be submitted by using NCDENR - Fire Occurrence Form. (Section 2.9-Appendix VII)
7. Access and safety requirements
- a. The C&DLF will be adequately secured by means of gates, chains, beams, fences and other security measures approved by the Division of Waste Management to prevent unauthorized entry.
 - b. An attendant will be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.

- c. The access road to the site and monitoring locations will be of all-weather construction and maintained in good condition.
 - d. Dust control measures will be implemented when necessary. If dust problems should arise, the County will use any reasonable means necessary to reduce it. At a minimum the County will spray water on necessary areas.
 - e. Signs providing information on tipping or disposal procedures, the hours during which the site is open for public use, the permit number and other pertinent information will be posted at the site entrance.
 - f. Signs will be posted stating that no hazardous or liquid waste can be received.
 - g. Traffic signs or markers will be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.
 - h. The removal of solid waste from the C&DLF will be prohibited unless the County has included in its operational plan a recycling program which has been approved by the Division. The general public is prohibited from removal activities on the working face.
8. Erosion and Sedimentation Control Requirements
- a. Adequate sediment control measures (structures or devices), will be utilized to prevent silt from leaving the landfill.
 - b. Adequate sediment control measures (structures or devices), will be utilized to prevent excessive on-site erosion.
 - c. Provisions for a vegetative ground cover sufficient to restrain erosion will be accomplished within **30 working days** or **120 calendar days** upon completion of any phase of landfill development.
9. Drainage Control and Water Protection Requirements
- a. Surface water will be diverted from the operational area and will not be impounded over waste.
 - b. Solid waste will not be disposed of in water.
 - c. Leachate will be contained on site and properly treated prior to discharge.
 - d. The landfill will not:
 - (i) Cause a discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements pursuant to Section 402.
 - (ii) Cause the discharge of a nonpoint source of pollution to waters of the United States, including wetlands, that violates any requirements of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.
 - e. The County will inspect the exterior slopes of the landfill at least weekly to determine if there are any breakouts of leachate in the slopes. If any are discovered, they will be contained immediately to assure that they will not leave the site. The containment can consist but not be limited to an earthen berm, sand bags, erosion control logs and/or anything that will contain the leachate on the slope.

The repair of the breakout will require excavating into the cover soil on the slope down to the waste and into the waste to determine what is causing the leachate to come to the surface. Normally it is another layer of soil that has been used as cover and the leachate is flowing along that layer to the slope and surfacing on the slope. The lower layer of cover needs to be removed at the breakout so that the leachate that is flowing along this cover has a point where it will go vertically into the landfill instead of flowing along the soil boundary that was once either daily cover or an intermediate cover.

Once this soil layer has been breached, the excavation can be filled back with stone, clean waste or any material, other than soil, that will allow the leachate to flow vertically instead of horizontally. Once the excavation has been filled with this material, the surface can be covered with soil so that surface water does not intrude into the excavation. Vegetative cover will be reestablished over the excavated area.

10. Survey for Compliance

Within 60 days of a permittee's receipt of the Division's written request, the permittee will have a survey conducted of active and/or closed portions of the unit(s) at the facility in order to determine whether operations are being conducted in accordance with the approved design and operation plans. The permittee must report the results of the survey, including a map produced by the survey, to the Division within 90 days of receipt of the Division's request.

- a. A survey shall be required by the Division:
 - (i) If there is reason to believe that the operations are being conducted in a manner that deviates from the plan listed in the effective permit, or
 - (ii) As verification that operations are being conducted in accordance with the plan listed in the effective permit.
- b. Any survey pursuant to this Paragraph must be performed by a professional land surveyor duly authorized under North Carolina law to conduct such activities.

11. Record keeping Requirements

- a. The County will record and retain at the facility, or an alternative location near the facility approved by the Division, in an operating record the following information as it becomes available.
 - (i) Inspection records, waste determination records, and training procedures;
 - (ii) Amounts by weight of solid waste received at the landfill to include source of generation.
 - (iii) Any demonstration, certification, findings, monitoring, testing or analytical data required for surface, groundwater and gas monitoring;
 - (iv) Any monitoring, testing, or analytical data required for closure or post-closure;
 - (v) Any cost estimates and financial assurance documentation;
 - (vi) Notation of date and time of placement of cover material; and,
 - (vii) All audit records, compliance records and inspection reports.
 - (viii) Notation of approval date and the name of the Division personnel who approved the type of the open burning; and
 - (ix) Approved monitoring plan and corrective action plans.

- b. All information contained in the operating record will be furnished to the Division of Waste Management according to the permit or upon request, or be made available for inspection by the Division.
- c. The operating record will also include a copy of the approved operation plan and all required permits.

2.3 Engineering/Operation Drawings – C&D [see Part 1 (MSWLF), Section 2.10]

2.4 Land Clearing and Inert Debris Landfill Facility (LCID)

Introduction

Wayne County will operate a Land Clearing and Inert Debris (LCID) landfill on the 28.40 acre property owned by the County (Deed Book 1927, Page 382).

The LCID landfill will have a waste footprint of no greater than two (2) acres and have 3 (horizontal) to 1(vertical) final side slopes. There is no projected use for the land after closure.

The landfill will accept land clearing waste, inert debris, untreated wood and yard trash from within Wayne County.

2.5 Operational Requirements

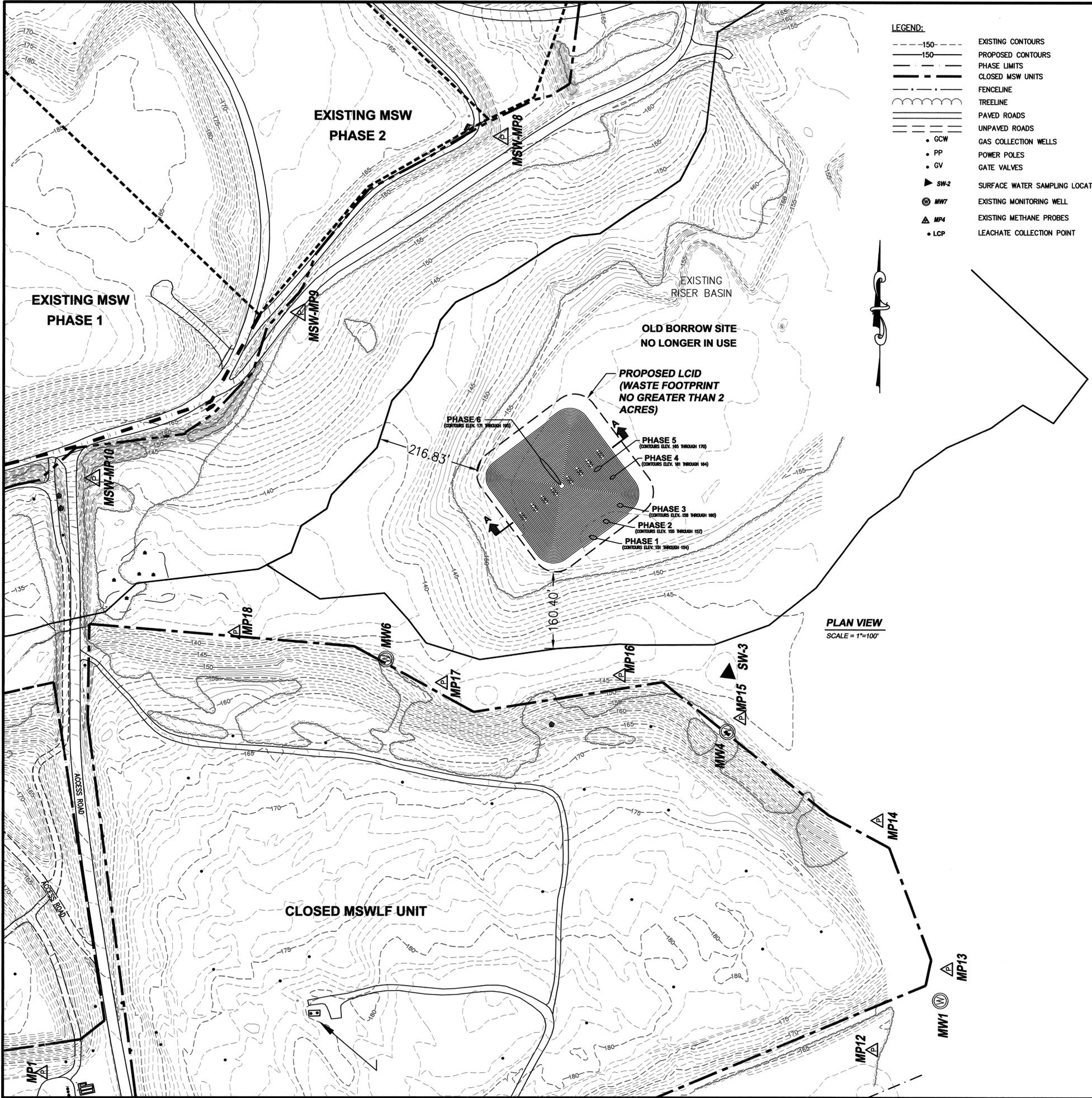
The owner/operator will maintain and operate the site in conformance with the following practices, unless otherwise specified in the permit:

- (1) The approved plans will be followed.
- (2) The facility will only accept those solid wastes which it is permitted to receive. The facility will only except wastes from within Wayne County.
- (3) Solid waste will be restricted to the smallest area feasible and compacted as densely as practical into cells.
- (4) Adequate soil cover will be applied monthly. Or when the active area reaches one acre in size, whichever occurs first.
- (5) Within 120 calendar days after completion of any phase of disposal operations or upon revocation of permit, the disposal area will be cover with a minimum of one foot of suitable soil cover sloped to allow surface water to runoff in a controlled manner. The Division may require further action in order to correct any condition which is or may become injurious to the public health, or a nuisance to the community.
- (6) Adequate erosion control measures, structures, or devices will be utilized to prevent silt from leaving the site and to prevent excessive on site erosion.
- (7) Groundcover sufficient to restrain erosion will be accomplished within 30 working days or 120 calendar days upon completion of any phase of landfill development.
- (8) The facility will be adequately secured by means of gates, chains, berms, fences, etc. to prevent unauthorized access except when an operator is on duty. An attendant shall be on duty at all times while the landfill is open for public use to assure compliance with operational requirements and to prevent acceptance of unauthorized wastes.
- (9) Access roads are of all-weather construction and will be properly maintained.
- (10) Surface water will be diverted from the working face and will not be impounded over waste.
- (11) Solid Waste will not be disposed of in water.

- (12) Open burning of solid waste is prohibited.
- (13) The concentration of explosive gases generated by the facility will not exceed the following:
 - (a) Twenty five percent of the lower explosive limit for the gases in facility structures.
 - (b) The lower explosive limit for the gases at the property boundary.
- (14) Leachate will be contained on site and properly treated prior to discharge.
- (15) Should the Division deem it necessary, ground water and/or surface water monitoring, or both, may be require as provided for under Rules .0601 and .0602.
- (16) A sign will be posted at the facility entrance showing the contact name and number, in case of an emergency, and the Landfill Permit Number.
- (17) Vegetative requirements are as follows:
 - (a) Within six months after final termination of disposal operations at the site or a major part thereof or upon revocation of permit, the area will be stabilized with native grasses.
 - (b) Temporary seeding will be utilized as necessary to stabilize the site.

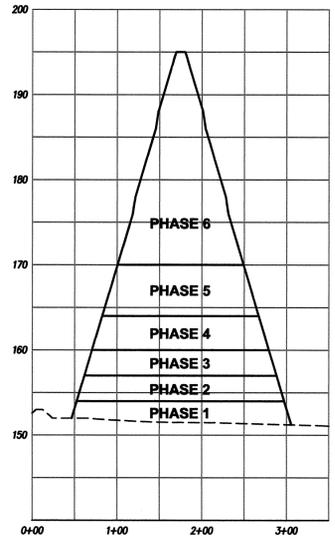
2.6 Engineering/Operation Drawings-LCID

2.6.1 LCID Landfill - Fill Plan and Cross-Section



- LEGEND:**
- 150 --- EXISTING CONTOURS
 - 150 --- PROPOSED CONTOURS
 - - - - - PHASE LIMITS
 - --- CLOSED MSW UNITS
 - --- FENCELINE
 - --- TREELINE
 - --- PAVED ROADS
 - --- UNPAVED ROADS
 - GCW GAS COLLECTION WELLS
 - PP POWER POLES
 - GV GATE VALVES
 - ▲ SW-2 SURFACE WATER SAMPLING LOCATION
 - ⊙ MW7 EXISTING MONITORING WELL
 - ▲ MP4 EXISTING METHANE PROBES
 - LCP LEACHATE COLLECTION POINT

PLAN VIEW
SCALE = 1"=100'



SECTION A
SCALE: HORIZ. = 1"=100'
VERT. = 1"=10'

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

Municipal Services
Engineering Company, P.A.
P.O. BOX 97, GARNER, N.C. 27528
(919) 772-5393
P.O. BOX 349 BOONE, N.C. 28607
(828) 262-1767
LICENSE NUMBER: C-0281

DATE	BY	REV.	DESCRIPTION
			LCID LANDFILL FILL PLAN AND CROSS SECTION
SCALE: AS SHOWN			
DATE: 12/20/2015			
DRWN. BY: L. CRAWFORD			
CHKD. BY: S. GANDY			
PROJECT NUMBER G15124			
DRAWING NO. LCID1	SHEET NO. 1 OF 1		



1/12/16

P:\SolidWaste\G15124-Wayne Co. MSW & CD Permit Renewal\dwg\Eng-09_LCID1.dwg, 1/8/2016 10:04:39 AM, lhc

SECTION 3.0

**CLOSURE
PLAN**

3.1 Introduction

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches of intermediate cover, 18 inches of cohesive soil with a permeability no greater than 1.0×10^{-5} cm/sec, and 18 inches of erosive layer. The cap contains gas venting system consisting of a series of washed stone trenches below the soil liner that will be vented through 10" diameter PVC pipes that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices.

Estimated schedule of closure will be approximately 25 years (see C&D Air Space calculations in Appendix A).

The Division requires that the Engineer certifies that the constructed cap is built according to approved plans and specifications. The Engineer that will accomplish this task is the one who did the planning and has written the Closure Plan specifications.

Before construction can begin, a pre-construction meeting will be held and the responsibilities and duties of each party will be discussed.

The Contractor is responsible for following and meeting the requirements set forth in the contract documents. The Contractors will provide to the Owner of the landfill and the Engineer a completed landfill constructed by Division's approved plans and specifications. The Contractor will give the Engineer a schedule for completion of the landfill including dates for expected construction of the cohesive soil test pad, cohesive soil cap, erosive layer, and estimated time for project completion. The Contractor is responsible for providing a foreman to remain on site at all times during construction, provide qualified personnel to conduct quality control, scheduling and coordinating the subcontractors, provide progress reports and as-built drawings, and coordinating construction activities with the Engineer. The foreman is responsible for supervising and coordinating with his crew, subcontractors, quality control personnel, attending all meetings and notifying the Engineer's Construction Observer when any discrepancies occur. The Contractor will meet with the Construction Observer on a daily basis to discuss the days construction activities. The results of all tests and any change in schedule shall be given to the Construction Observer as soon they are known by the Contractor. The Contractor must be registered in the State of North Carolina.

The Engineer is responsible for providing the engineering design, drawings and specifications, contract documents and Construction Quality Assurance (CQA) needed for construction of the landfill. The Engineer is responsible for conducting the pre-construction meeting, which will lay out the foundation for the project. The Engineer will approve any design changes and certify to the Division that the cap was constructed according to the requirements of Rule .0541 Construction Quality Assurance Plan and .0540 Construction requirements for C&D Facilities, and Division approved plans and specifications. This will be accomplished by on-site observation and independent laboratory soil testing to test site-specific soil properties including permeability. The Engineer will provide Quality Assurance by spot testing along side the Contractor, who will be providing the Quality Control. The Engineer will certify that the construction was completed in accordance with the CQA manual. The Engineer must be a professional engineer registered in North Carolina.

The Construction Observer (CO) is the Engineer's representative on-site. It is the CO's responsibility to know and interpret the plans and specifications of the project. On a daily basis the CO will coordinate with the Foreman to help ensure a quality product for the Owner. The CO will keep a daily log on the activities of the Contractor, keep notes on all meetings, and handle all quality assurance activities indicated in this document. The CO will keep a log of all material delivered on site and ensure the materials meets or exceeds the specifications indicated in this report. If the need arises, additional meetings will be scheduled as determined by the CO.

The estimate of maximum inventory of C&D wastes on-site over the life to date of the landfill facility is 539,001 tons.

Prior to beginning closure, the County shall notify the Division that a "Notice of the Intent to Close" the unit has been placed in the operating record. The County shall begin closure activities no later than thirty (30) days after the date on which the landfill receives the final wastes, or if the landfill has remaining capacity and there is a

reasonable likelihood that the landfill will receive additional wastes, no later than one year after the most recent receipt of wastes. Extensions beyond the one-year deadline for beginning closure may be granted by the Division if the County demonstrates that the landfill has the capacity to receive additional waste and the County has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the closed landfill.

The County shall complete closure activities in accordance with the Closure Plan within 180 days following the final receipt of waste. Extensions of the closure period may be granted by the Division if the County demonstrates that closure will, of necessity, take longer than one hundred eighty (180) days and the County has taken and will continue to take all steps to prevent threats of human health and environment from the enclosed landfill.

Following closure of the landfill, the County shall notify the Division that a certification, signed by the Project Engineer verifying that closure has been completed in accordance with the Closure Plan, and has been placed in the operating record. The County shall record a notation on the deed to the landfill property and notify the Division that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed shall in perpetuity notify any potential purchaser of the property that the land has been used as a landfill and its use is restricted under the Closure Plan approved by the Division. The County may request permission from the Division to remove the notation from the deed if all waste is removed from the landfill.

3.2 Closure Cap System

The County will cap their landfill within 180 days after the final receipt of solid waste. The cap system will consist of 12 inches of intermediate cover, 18 inches of cohesive soil with a permeability no greater than 1.0×10^{-5} cm/sec, and 18 inches of erosive layer. All depths shall be measured perpendicular to the slope surface. The cap will contain a gas venting system consisting of a series of washed stone trenches below the soil liner that will be vented through 10" diameter PVC pipes that penetrate the cap. The cap system will also include the proper seeding and mulching of the erosive layer and other erosion control devices. The largest area currently requiring a cap system will be 9 acres.

3.3 Closure Cohesive Soil Cap

All materials and equipment shall be furnished by an established and reputable manufacturer or supplier. All materials and equipment shall be new and shall be of first class ingredients and construction, designed and guaranteed to perform the service required and shall conform with the following standard specifications or shall be the product of the listed manufacturers or similar and equal thereto as approved by the Engineer.

Cohesive Soil Cap Borrow Material

Test Name	Test Method	Contractor/Engineer Frequency
Moisture/Density	ASTM D698/D1557	1 per 5000 c.y.
Remolded Permeability	ASTM D5084	1 per 5000 c.y.
Atterberg Limits	ASTM D4318	1 per 5000 c.y.
Visual Classification	ASTM D2488	1 per 5000 c.y.
Grain Size Distribution	ASTM D422	1 per 5000 c.y.

Cohesive Soil Cap Test Pad

Test Name	Test Method	Contractor/Engineer Frequency
Field Moisture/Density	ASTM D1556 (sand cone) ASTM D2922/D3017 (nuclear gauge) ASTM D2937 (drive cylinder)	3 per lift
Permeability	ASTM D5084	1 per lift
Remolded Permeability	ASTM D5084	1 per lift
Atterberg Limits	ASTM D4318	1 per lift
Visual Classification	ASTM D2488	1 per lift
Grain Size Distribution	ASTM D422	1 per lift

In-Place Cohesive Soil Cap

Test Name	Test Method	Contractor/Engineer Frequency
Field Moisture/Density	ASTM D1556 (sand cone) ASTM D2922/D3017 (nuclear gauge) ASTM D2937 (drive cylinder)	1 per lift per acre
Permeability	ASTM D5084	1 per lift per acre
Atterberg Limits	ASTM D4318	1 per lift per acre
Visual Classification	ASTM D2488	1 per lift per acre
Grain Size Distribution	ASTM D422	1 per lift per acre

(a) Suitable on-site and/or off-site soils may be used as cohesive soil cap if it can achieve an in-place permeability of 1.0×10^{-5} cm/sec or less and meets all testing requirements indicated in the material testing paragraph in this section. Wyoming bentonite or an approved equivalent may be blended with the soil to lower the soil's permeability.

(b) A permeability "window" shall be developed for each type of soil from the borrow material that will be used for construction of the cohesive soil cap. The window shall be plotted on a semi-log plot with moisture content versus density. Laboratory testing to develop the window shall include a series of remolded samples compacted to various dry densities and moisture contents utilizing the same compactive effort (ASTM D 698 or D 1557). The remolded samples shall be tested for permeability to determine whether or not the particular soil type will provide the maximum permeability (1.0×10^{-5} cm/sec) at various dry densities and moisture contents. The window is then developed from the accepted remolded samples and moisture contents from the semi-log plot. A straight line is typically drawn between the acceptable points on the moisture-density curve to indicate a range of probable acceptable permeability results. The window will be used in the construction of the test strip to verify the laboratory remolded permeability results.

(c) Atterberg Limits (ASTM D4318) and grain size distribution (ASTM D422) and visual classification (ASTM D2488) shall also be conducted on the bulk samples used to prepare the permeability window. These tests can be used as indices on random samples collected from the borrow site during construction to verify the soil type is the same as was used to develop the "window". As a minimum, sufficient visual classifications and Atterberg Limits shall be conducted in association with each permeability test to verify that the construction materials meet specifications.

(d) A test strip of compacted cohesive soil cap shall be prepared to verify the permeability "window" prior to general installation of the cohesive soil cap. The test strip will be used to verify the results from the remolded permeabilities from the borrow site utilizing the permeability window(s) for each soil type that is going to be used for construction of the cohesive soil cap. At a minimum, the verification will consist of three moisture density tests, one Atterberg limits test, one grain size distribution test (ASTM D2488, D4318, and D422), and one Shelby Tube sample for each lift constructed in the test pad. Laboratory permeability tests shall be performed on tube (Shelby or drive tubes) samples of the cohesive soil cap after placement and compaction. The permeability must be a maximum of 1.0×10^{-5} cm/sec. Tests shall be performed in accordance with the ASTM D5084. The test strip shall be approximately 2,500 sq. ft. in surface area and constructed to conform geometrically to the site topography with a minimum lateral dimension in any direction of 25 ft. The test strip shall consist of at least three compacted 6 inch lifts of cohesive soil cap. Placement and testing of the test strip shall be in conformance with the construction specifications and requirements for general installation of the cohesive soil cap. Test results from the test strip shall be used to guide placement and achievement of the required maximum permeability of 1.0×10^{-5} cm/sec of the cohesive soil cap. The test strip may be used as an integral part of the overall cohesive soil cap if it meets the required specification for the cap. All results shall be given to the Construction Observer.

(e) The soils shall be placed to the total thickness shown on the plans in maximum 8-inch thick loose lifts resulting in a maximum 6" lift compacted preferably at a moisture content between 0 to 3% above optimum moisture content to 95% (Standard Proctor) maximum dry density (ASTM D698). A

sheepsfoot roller or approved alternative may be used to compact the soil cap provided the compaction and permeability requirements can be achieved. Each lift shall be tested for permeability, moisture content, particle size distribution analysis, Atterberg Limits, moisture-density-permeability relation, and if needed, percent bentonite admixed with soil, prior to the placement of the succeeding lift. Each lift shall also be visually inspected to confirm that all soil clods have been broken and that the surface is sufficiently scarified so that adequate bonding can be achieved. Soils for cohesive soil cap shall be screened, disked, or prepared using any other approved method as necessary to obtain a homogeneous cohesive soil with clod sizes in a soil matrix no larger than approximately 1.5 inches in maximum diameter. After each lift, the surface shall be scarified prior to the placement of the next lift to provide good bonding from one lift to the next.

(f) The cohesive soil cap shall be tested in the field to evaluate the coefficient of permeability. The coefficient of permeability of the soil cap shall be equal to or less than 1.0×10^{-5} cm/sec after placement and compaction. The soil cap must be a minimum of 1.5 feet thick (measured perpendicular to slope).

(g) Laboratory permeability tests shall be performed on tube (Shelby or drive tubes) samples of the cohesive soil cap after placement and compaction. The permeability must be a maximum of 1.0×10^{-5} cm/sec. Tests shall be performed in accordance with ASTM D5084. All laboratory permeability tests shall be performed at a confining pressure of 10 psi and at a hydraulic gradient of 20.

(h) The soil cap shall be tested a minimum of one soil sample per lift per acre for laboratory permeability. All permeability testing will be on random samples judged by the Engineer to be representative of the most permeable soil conditions for the area being tested. The project engineer shall certify that the materials used in construction were tested according to the Division approved plans. If after placement of the soil cap it fails the required tests, the material will either be reworked or replaced and then retested for permeability. The soil cap must remain moist at all times. If any section becomes dry, rework the dry area and moisten.

(i) A minimum of two (2) inches of soil shall be removed prior to securing each sample for permeability testing. The sampling tube shall be advanced vertically into the soil with as little soil disturbance as possible and should be pushed using a uniform pressure. The sampling tube (Shelby tube), when extracted, shall be free of dents, and the ends shall not be distorted. A backhoe or approved alternative should be used to advance the sampling tube (Shelby tube) as long as disturbance is minimized. Drive tube samples of the cap may be obtained for permeability testings. If the Engineer judges the sample to be too disturbed, another sample shall be taken. Once an acceptable sample has been secured and properly prepared, all sample excavations or other holes created by survey stakes, etc. shall be backfilled to grade with a 50% mixture of bentonite and similar soils in maximum 3-inch loose lifts and hand tamped with a blunt tool to achieve a tight seal equivalent to the original density.

(j) No additional construction shall proceed on the soil layers at the area being tested until the Engineer has reviewed the results of the tests and judged the desired permeability is being achieved.

(k) As a minimum, sufficient visual classifications (ASTM D2487), Gradation analyses (ASTM D422) and Atterberg limits (ASTM D4318) shall be conducted in association with each permeability test to verify that the construction materials meet specifications. The minimum number of tests will be one per lift per acre.

(l) If the soil for the cohesive soil cap is incapable of achieving the required permeability when compacted, bentonite or approved alternative may be mixed with the soils to decrease the permeability. The amount of additive required must be determined in the laboratory and mixed in the field using either a pug mill or a soil stabilizer. Where additives are required, the soil shall be placed in maximum 8-inch thick loose lifts and compacted preferably between 0 to +3% optimum moisture content to 95% standard Proctor maximum dry density (ASTM Test Designation D698) for the soil-additive mixture. All other compaction procedures for the soil apply.

(m) The Contractor shall protect the cohesive soil cap from desiccation, flooding and freezing. Protection, if required, may consist of a thin plastic protective cover, (or other material as approved by the engineer) installed over the completed cohesive soil cap until such time as the placement of flexible membrane liner begins. Areas found to have any desiccation cracks or which exhibit swelling, heaving or other similar conditions shall be replaced or reworked and retested by the contractor to remove these defects.

(n) The thickness and grade of the soil cap will be verified by the surveyor. The soil cap will be surveyed at 100 foot grid points and any grade change (top of slopes, bottom of slopes, breaks in slopes, etc.) where the elevations of the top of landfill will be checked with the top of soil cap to verify 1.5 feet (measured perpendicular to slope) of soil cap. The grade will then be verified with the surveyed information. The survey will be performed by North Carolina Professional Land Surveyor.

3.4 Closure Erosive Layer

The soil for the 18-inch thick erosive layer shall consist of any soils suitable of supporting vegetative growth.

- (a) Native vegetation will be used as recommended in the NC Erosion and Sediment Control Planning and Design Manual and as shown in the Closure Plan drawings in Appendix A.
- (b) The thickness and grade of the erosive layer will be verified by the surveyor. The erosive soil layer will be surveyed at 100 foot grid points and any grade change (top of slopes, bottom of slopes, breaks in slopes, etc.) where the elevations of the top of landfill will be checked with the top of soil cap to verify 1.5 feet (measured perpendicular to slope) of erosive soil layer. The grade will then be verified with the surveyed information. The survey will be performed by North Carolina Professional Land Surveyor.

3.5 Closure Gas Venting System

The cap contains gas venting system consisting of a series of washed stone trenches below the soil liner at that will be vented through pipes with membrane boots that penetrate the cap.

NC.D.O.T. No.5 stone, Geotextile fabric, and 8" and 10" plastic pipes will be used in the construction of the Gas venting system.

(1) Stone in Trenches and Surrounding Perforated Collection Piping

Stone for methane collection system shall meet the requirements of NC DOT aggregate, Standard Size No. 5 and shall contain no fines. Stone must pass the sieve analysis test for No. 5 stone performed at the quarry.

(2) Geotextile Fabric

Geotextile fabric surrounding the stone/piping shall be non-woven needle punched fabric with the following minimum properties:

1) Weight	8.0 oz/yd ²	ASTM D-3776
2) Grab Strength	205 lbs.	ASTM D-4632
3) Grab Elongation	50%	ASTM D-4632
4) Trapezoidal Tear Strength	85 lbs.	ASTM D-4533
5) Puncture Strength	100 lbs.	ASTM D-4833
6) Mullen Burst Strength	320 psi	ASTM D-3786
7) Permittivity	1.4 sec ⁻¹	ASTM D-4491

Geotextile fabric shall be manufactured by Polyfelt , TNS Advanced Technologies, or approved equal.

(3) Plastic Pipe

Plastic gravity sewer pipe and fittings used for methane vent shall be unplasticized polyvinyl chloride (PVC) and conform to the requirements of ASTM Designation D-3034 on ASTM F679, Type PSM, Class 12454-B, SDR-35 with elastomeric gasket joints. PVC pipe and fittings shall be as manufactured by J-M Pipe, Certainteed, H&W Industries or equal. The methane riser pipe shall be a 10-inch solid wall PVC pipe.

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

3.6 Closure Construction Quality Assurance (CQA)

At the completion of the closure, it is the Engineer's responsibility to provide to the Owner and eventually to the Division of Waste Management the following:

1. All parties involved in the landfill construction including name and contact information and responsibilities'.
2. As-built drawings of the existing surface, the top of cohesive soil liner, and the top of the vegetative /protective cover, gas vents, etc. provided by NC Professional Land Surveyor.
3. Documentation of all cohesive soil liner standard Proctor tests.
4. Documentation of all cohesive soil liner tests including test pads, permeability, standard Proctor and Atterberg limits.
5. Completed and signed meeting minutes including pre-construction, progress and any trouble shooting.
6. Summary of all construction activities from the Engineer.
7. Provide color photographs of major construction features.
8. Any other pertinent documentation.

The CQA report shall be sealed by the Engineer and a certification that construction was completed in accordance with the CQA plan, Conditions of the permit to construct, the requirements of rule .540 Construction Requirements for C&DLF Facilities, and acceptable engineering practices.

Shop Drawings

Contractor is required to submit to the Engineer a descriptive detail and any shop and setting drawings.

3.7 Closure Costs

The largest area to be closed within the permitted life will be 40 acres. Post Closure will be 30 years after closure.

Closure Costs:

Closure will consist of the following which costs are estimated as being done by a third party.

1. 18" of 1×10^{-5} cm/sec. cohesive soil cap;
2. Erosion Control Devices;
3. 18" Erosive layer;
4. Seeding and Mulching;
5. Mobilization/Demobilization;
6. Labor Costs; and
7. Engineering Costs and QA/QC of the Composite liner and certification of closure.

Estimate of Probable Costs:

1. 18" of 1×10^{-5} cm/sec. cohesive soil cap for 40 acres:
(including surface preparation)
 $40 \times 43,560 = 1,742,400 \times 1.5 = 2,613,600 / 27 = 96,800$ cy
Total yardage + 15% = $111,320 \text{ yd}^3$ @ a cost of $\$9.00/\text{yd}^3$
∴ Cost = $\$1,001,800$
2. Erosion Control devices

Estimated costs @ $\$75,000$
∴ Cost = $\$75,000$
3. 18" erosive soil layer for 40 acres.
 $40 \times 43,560 = 1,742,400 \times 1.5 = 2,613,600 / 27 = 96,800$ cy
Total yardage + 15% = $111,320 \text{ yd}^3$ @ a cost of $\$4.38/\text{yd}^3$
∴ Cost = $\$487,582$
4. Seeding and Mulching for 40 acres.

Estimated cost of $\$2,000/\text{acre}$
∴ Cost = $\$80,000$
5. Mobilization/Demobilization.
(including Machine/Equipment costs and fuel costs)

Estimated cost of $\$200,000$
6. Labor Costs.

Estimated cost of $\$310,000$
∴ Cost = $\$310,000$
7. Vent pipes for methane gas collection.

Estimated cost @ $\$600.00$ each (22 vents).
∴ Cost = $\$13,200$

8. Engineering Costs and QA/QC of the Composite liner and certification of closure.
(including CQA field monitoring and lab testing, CQA reporting and certification,
construction administration, construction documentation and bidding, Survey as-builts
and recordation fees)

Estimated cost = \$200,000

∴ Cost = \$200,000

Total of Estimated Closure Costs:

1.	\$ 1,001,800
2.	\$ 75,000
3.	\$ 487,582
4.	\$ 80,000
5.	\$ 200,000
6.	\$ 310,000
7.	\$ 13,200
8.	\$ 200,000
Total:	\$ 2,367,582

SECTION 4.0

**POST-CLOSURE
PLAN**

4.1 Introduction

CONTACTS:

Name:	Tim Rogers
Title:	Solid Waste Director
Phone No.:	(919) 689-2994
Address:	460 B. S. Landfill Rd. Dudley, NC 28333

DESCRIPTION OF USE:

The County has no future use planned for their landfill at this time. However, any future use of the landfill shall not disturb the integrity of the cap system, base line system or any other components of the containment system or the functioning of the monitoring systems.

DESCRIPTION OF MAINTENANCE ACTIVITIES:

The County Landfill will be monitored quarterly for evidence of settlement, subsidence and ponding in the cap system. The entire site will be monitored quarterly for evidence and effects of erosion. The erosion control plan will be preserved. The quarterly inspection will also include observation and necessary repair of the security fence, entrance sign, access roads to the methane and groundwater monitoring points, the actual ground water monitoring wells and methane probes, accumulated silt in the sediment basins, and edge of waste markers. Annually in the Spring, the vegetative cover will be monitored to assure a good stand of vegetation, and where needed, it will be reseeded. Semi-annually the cap vegetation will be mowed and any saplings removed. These maintenance activities will take place over the entire post closure period of thirty years.

Any repairs to the cap system will be done according to the approved closure plan and documented according to the approved quality assurance plan. Damages that require repairs shall be reported to the NC Solid Waste Section within 3 days of inspection/observation.

All quarterly inspections/observations will be documented and become part of the landfill's operating record. All repairs/maintenance will be documented and also become part of the landfill's operating record.

DESCRIPTION OF MONITORING ACTIVITIES:

The County will monitor and analyze ground and surface water semi-annually according to the approved monitoring plan for a period of thirty years. The County will also monitor methane gas at landfill structures and the boundary quarterly according to the approved methane monitoring plan for the thirty-year period. All reports and records required by the approved monitoring plans will become part of the landfill's operating record.

The County will inspect the exterior slopes of the landfill at least weekly to determine if there are any breakouts of leachate in the slopes. If any are discovered, they will be contained immediately to assure that they will not leave the site. The containment can consist but not be limited to an earthen berm, sand bags, erosion control logs and/or anything that will contain the leachate on the slope.

The repair of the breakout will require excavating into the cover soil on the slope down to the waste and into the waste to determine what is causing the leachate to come to the surface. Normally it is another layer of soil that has been used as cover and the leachate is flowing along that layer to the slope and surfacing on the slope. The lower layer of cover needs to be removed at the breakout so that the leachate that is flowing along this cover has a point where it will go vertically into the landfill instead of flowing along the soil boundary that was once either daily cover or an intermediate cover.

Once this soil layer has been breached, the excavation can be filled back with stone, clean waste or any material, other than soil, that will allow the leachate to flow vertically instead of horizontally. Once the excavation has been filled with this material, the surface can be cover with soil so that surface water does not intrude into the excavation. Vegetative cover will be reestablished over the excavated area.

COMPLETION OF POST-CLOSURE CARE

Following completion of the post-closure care period for each unit, the owner or operator will notify the Division of Waste Management that a certification, signed by a registered professional engineer, verifying that post-closure care has been completed in accordance with the post-closure plan, has been placed in the operating record.

4.2 Post Closure Costs

The largest closed area to be monitored within the post closure life will 40 acres.

Post Closure Costs:

Methane gas, ground water and surface water will be monitored for 30 years after closure. The cap will also have to be monitored for the 30 year period. All costs include reports, data analysis, and certifications.

1. Ground and Surface Water monitoring semi-annually for 30 years for appendix I constituents and statistical analysis.
Estimated cost/sample = \$840.00/sample
Total annual samples = 2(11 wells + 3 surface) = 28 samples/year
Estimated cost = 30 years x 28 samples/year x \$840.00/sample =
$$\therefore \text{Cost} = \$705,600$$
2. Methane Gas monitoring quarterly for 30 years.
Estimate \$600.00/quarter = \$2,400.00/year
Estimated cost = 30 year x \$2,400.00 = \$72,000.00
$$\therefore \text{Cost} = \$72,000$$
3. Cap Monitoring and repairing (including maintenance of all gates, fencing, access roads and signs, mowing and re-vegetation)
Estimate \$300,000 for the 30 years.
$$\therefore \text{Cost} = \$300,000$$
4. Closure of sedimentation and erosion control devices.
Estimate \$24,000.00 for closure
$$\therefore \text{Cost} = \$24,000$$
5. Maintenance of gas extraction system.
Estimated cost/year = \$3,000.00/year
$$\therefore \text{Cost} = \$90,000$$
6. Decommissioning of LGCCS System.
Estimated cost/well head = \$500.00
22 well heads x 500.00 = \$11,000
$$\therefore \text{Cost} = \$11,000$$
7. Administration/Record keeping
Estimate \$4,000.00/year for 30 years
$$\therefore \text{Cost} = \$120,000$$

Total of Estimated Post Closure Costs:

	1. \$	705,600
	2. \$	72,000
	3. \$	300,000
	4. \$	24,000
	5. \$	90,000
	6. \$	11,000
	7. \$	<u>120,000</u>
Total:		\$1,322,600

SECTION 5.0

**FINANCIAL
ASSURANCES**

(TO BE SUBMITTED AT A LATER DATE)

APPENDIX A

AIRSPACE CALCULATIONS

REVISED FACILITY DRAWINGS

Air Space	MESCO's #'s	14-15 survey	Wayne-MS
101,959		3 518,328	5.08
102,805		4 540,199	5.08
103,659		5 562,992	5.08
104,519		6 586,748	5.08
5 105,386	518,328 561,630 phase 4	7 611,505	5.08
106,261		8 637,307	5.08
107,143		9 664,198	5.08
108,032		10 692,224	5.08
108,929		11 721,432	5.08
5 109,833	540,199 575,270 phase 5	12 751,873	5.08
110,745		13 783,598	5.08
111,664		14 816,661	5.08
112,591		7,887,065 61.00	
113,525			
5 114,468	562,992 625,214 phase 6		
115,418			
116,376			
117,341			
118,315			
5 119,297	586,748 649,015 phase 7	4 561,630	5.51
120,288		5 575,270	5.41
121,286		6 625,214	5.65
122,293		7 649,015	5.62
123,308		8 415,885	3.46
5 124,331	611,505 415,885 phase 8	9 0	0.00
125,363		10 0	0.00
126,404		11 0	0.00
127,453		12 0	0.00
128,511		13 0	0.00
5 129,577	637,307 phase 9	14 0	0.00
130,653		15 0	0.00
131,737		2,827,014 25.65	
132,831			
133,933			
5 135,045	664,198 phase 10		
136,166			
137,296			
138,435			
139,584			
5 140,743	692,224 phase 11		
141,911			
143,089			
144,277			
145,474			
5 146,681	721,432 phase 12		
147,899			
149,127			
150,364			
151,612			
5 152,871	751,873 phase 13		

Air Space	MESCO's #'s				Wayne-CD
55,488			3	289,340	5.21
56,653			4	321,024	5.21
57,843			5	356,177	5.21
59,058					
5	289,340	284,019	Phase 3		
61,564					
62,857					
64,177					
65,525				966,540	15.64
5	321,024	307,651	Phase 4		
66,901					
68,306					
69,740					
71,205					
72,700					
5	356,177	323,518	Phase 5		
74,227					
75,785					
77,377					
79,002					
80,661					
5	395,179	329,624	Phase 6		
82,355					
84,084					
85,850					
87,653					
89,493					
5	438,453	299,067	Phase 7		
91,373					
				1,543,879	23.78

MESCO's #'s
CY'S YRS/REMAIN

WAYNE COUNTY MUNICIPAL SOLID WASTE LANDFILL FACILITY

REVISED FACILITY PLAN

Permit Number: 9606-MSWLF-1998 and 9601-CDLF-1997

Site Location: 460 B South Landfill Road
Dudley, NC 28333

Applicant: Wayne County

Applicant's Address: 224 E. Walnut St., 3rd Floor
Goldsboro, NC 27530

BOARD OF COMMISSIONERS

Joe Daughtery - Chairman
Bill Pate - Vice-Chairman
George Wayne Aycock
Edward Cromartie
John M. Bell
E. Ray Mayo
A. Joe Gurley, III

COUNTY MANAGER

George Wood

SOLID WASTE DIRECTOR

Tim Rogers

Engineer
Municipal Engineering Services Company, P.A.
Garner, NC - Boone, NC

by 1/12/16
Professional Engineer
(Garner Office)



SCALE:	T:1
DATE:	12/10/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	S. GANDY
PROJECT NUMBER	G15124
DRAWING NO.	T1
SHEET NO.	1 OF 8

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TOPOGRAPHY IS FROM AERIAL PHOTOGRAPHY FLOWN AND A TOPOGRAPHIC MAP WAS PROVIDED BY DARREL S. MILLER, PLS ON 8/17/2007 AND SUPPLEMENTED WITH FIELD SURVEYS BY MUNICIPAL ENGINEERING SERVICES COMPANY, PA.

- LEGEND**
- EXISTING CONTOURS
 - PROPERTY LINE
 - EXISTING UNPAVED ROAD
 - EXISTING CREEK, STREAM, ETC.
 - EXISTING DIVERSION DITCHES
 - CLOSED MSWLF SANITARY UNIT
 - 300' BUFFER ZONE
 - MSWLF PHASE LIMITS
 - EXISTING CHAINLINK FENCE
 - TREE LINE (AERIAL MAPPING)
 - TREE LINE (SURVEYED)
 - TRESSES/SHRUBS
 - GAS COLLECTION SUMP
 - EXISTING GAS COLLECTION WELL
 - ▲ EXISTING METHANE PROBES
 - POWER POLE



1/2/16

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION
REVISED FACILITY PLAN - MSW AND C&D EXISTING CONDITIONS			
SCALE: 1" = 300'			
DATE: 12/10/2015			
DRWN. BY: L. CRAWFORD			
CHKD. BY: S. GANDY			
PROJECT NUMBER: G15124			
DRAWING NO. F1	SHEET NO. 3 OF 8		

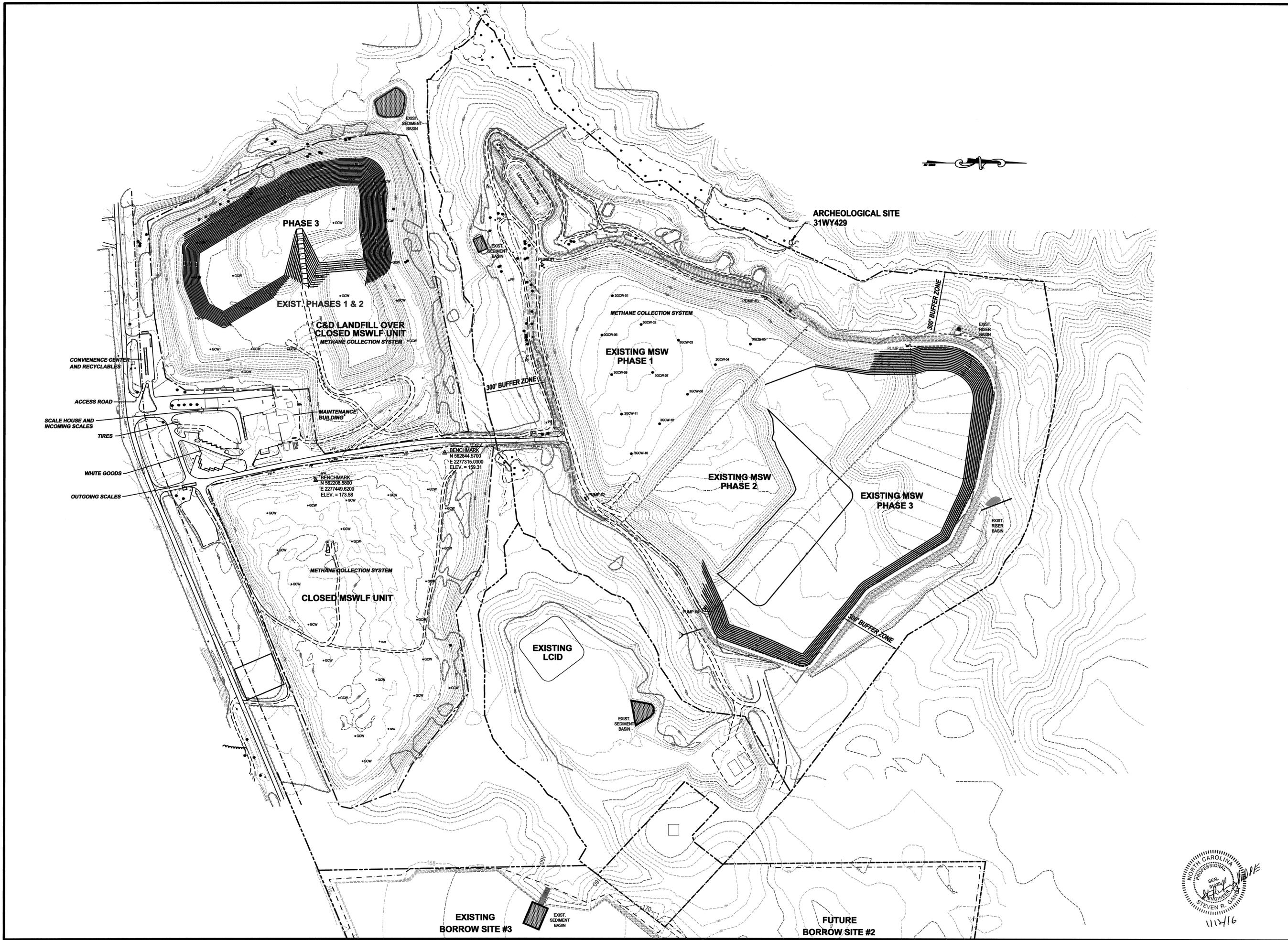
Municipal Services
Engineering Company, P.A.

P.O. BOX 87 GARNER, N.C. 27528
(919) 772-5983

P.O. BOX 348 BOONE, N.C. 28607
(828) 262-1787

LICENSE NUMBER: C-0281

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Municipal Services

Engineering Company, P.A.

P.O. BOX 87 GARNER, N.C. 27529
(919) 772-5383
LICENSE NUMBER: C-0281

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

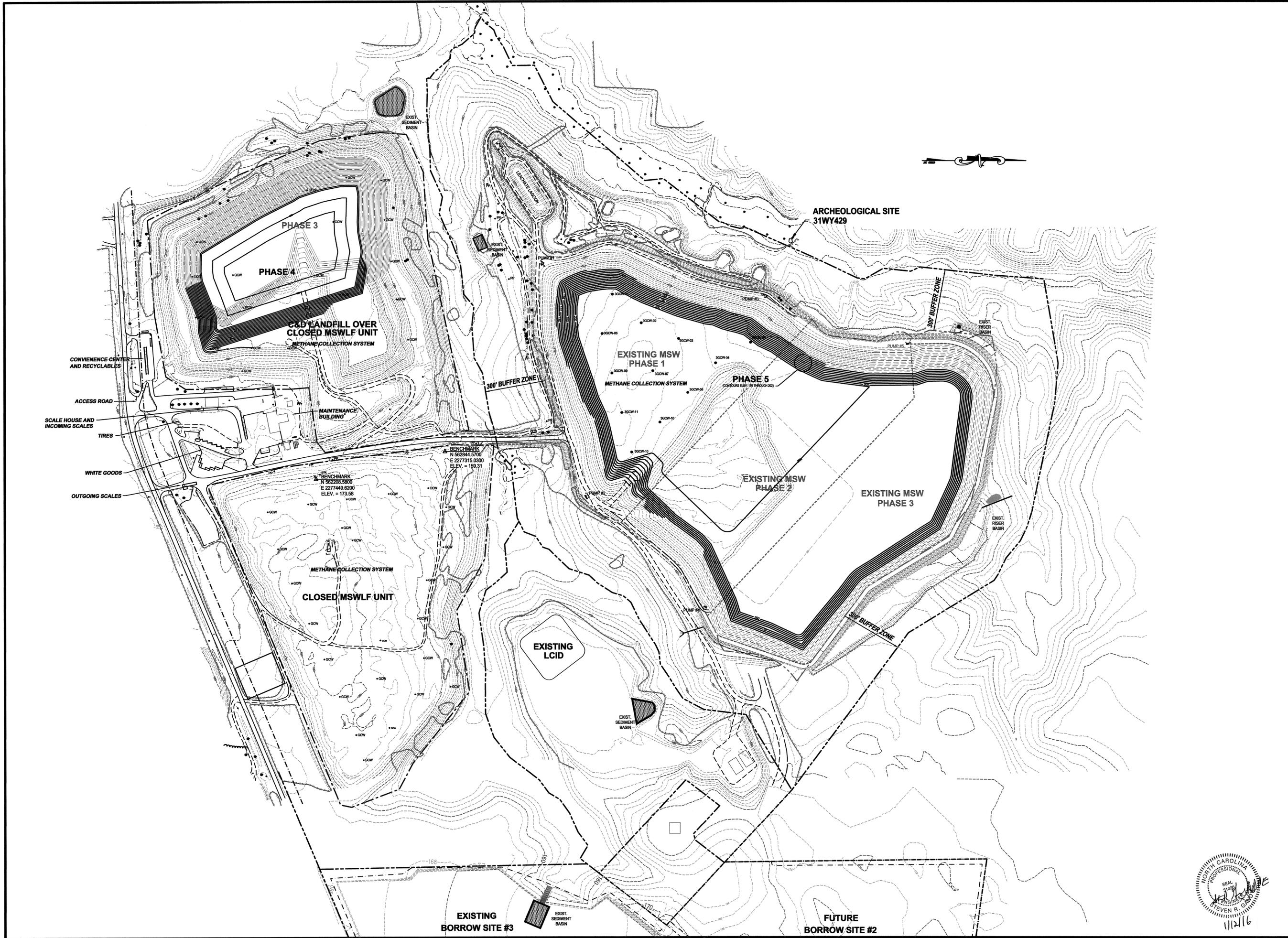
DATE	BY	REV.	DESCRIPTION

REVISED FACILITY PLAN - MSW AND C&D
FILL PLAN - PHASE 4 (MSW), AND PHASE 3 (C&D)

SCALE: 1" = 300'
DATE: 12/10/2015
DRWN. BY: L. CRAWFORD
CHKD. BY: S. GANDY
PROJECT NUMBER: G15124
DRAWING NO. 4 OF 8



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Municipal Engineering Company, P.A.

Municipal Services

P.O. BOX 87 GARNER, N.C. 27529
(919) 772-5383
LICENSE NUMBER: C-0281

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION

**REVISED FACILITY PLAN— MSW AND C&D
FILL PLAN—PHASE 5 (MSW), AND PHASE 4 (C&D)**

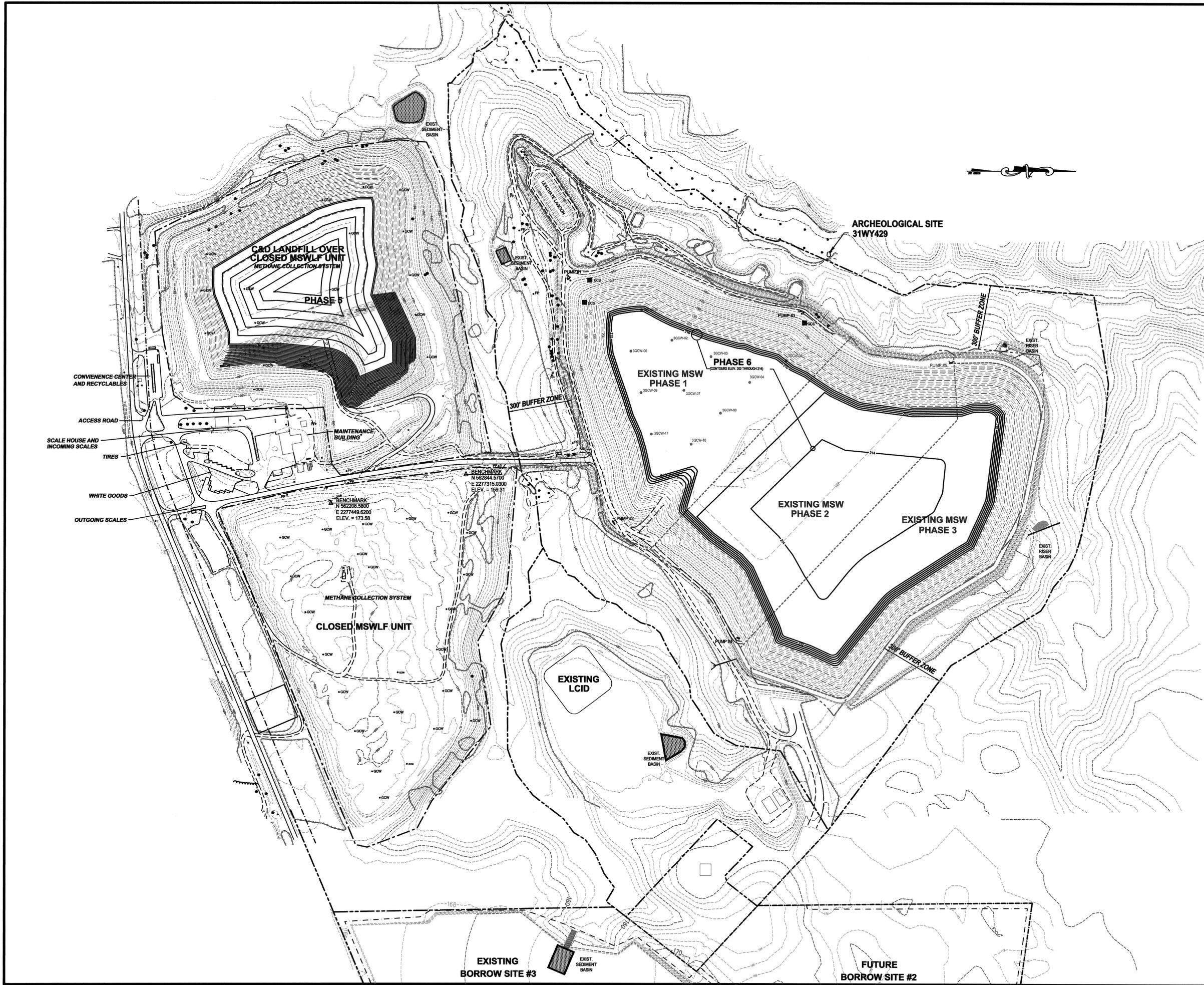
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DATE: 12/10/2015
DRWN. BY: L. GRAINFORD
CHKD. BY: S. GANDY

PROJECT NUMBER: **G15124**

DRAWING NO. **F3** SHEET NO. **5 OF 8**



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**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

REVISED FACILITY PLAN - MSW AND C&D
FILL PLAN - PHASE 6 (MSW), AND PHASE 5 (C&D)

SCALE:	1" = 200'
DATE:	12/10/2015
DRWN. BY:	L. CRAWFORD
CHKD. BY:	S. GANDY
PROJECT NUMBER:	G15124
DRAWING NO.:	F4
SHEET NO.:	6 OF 8

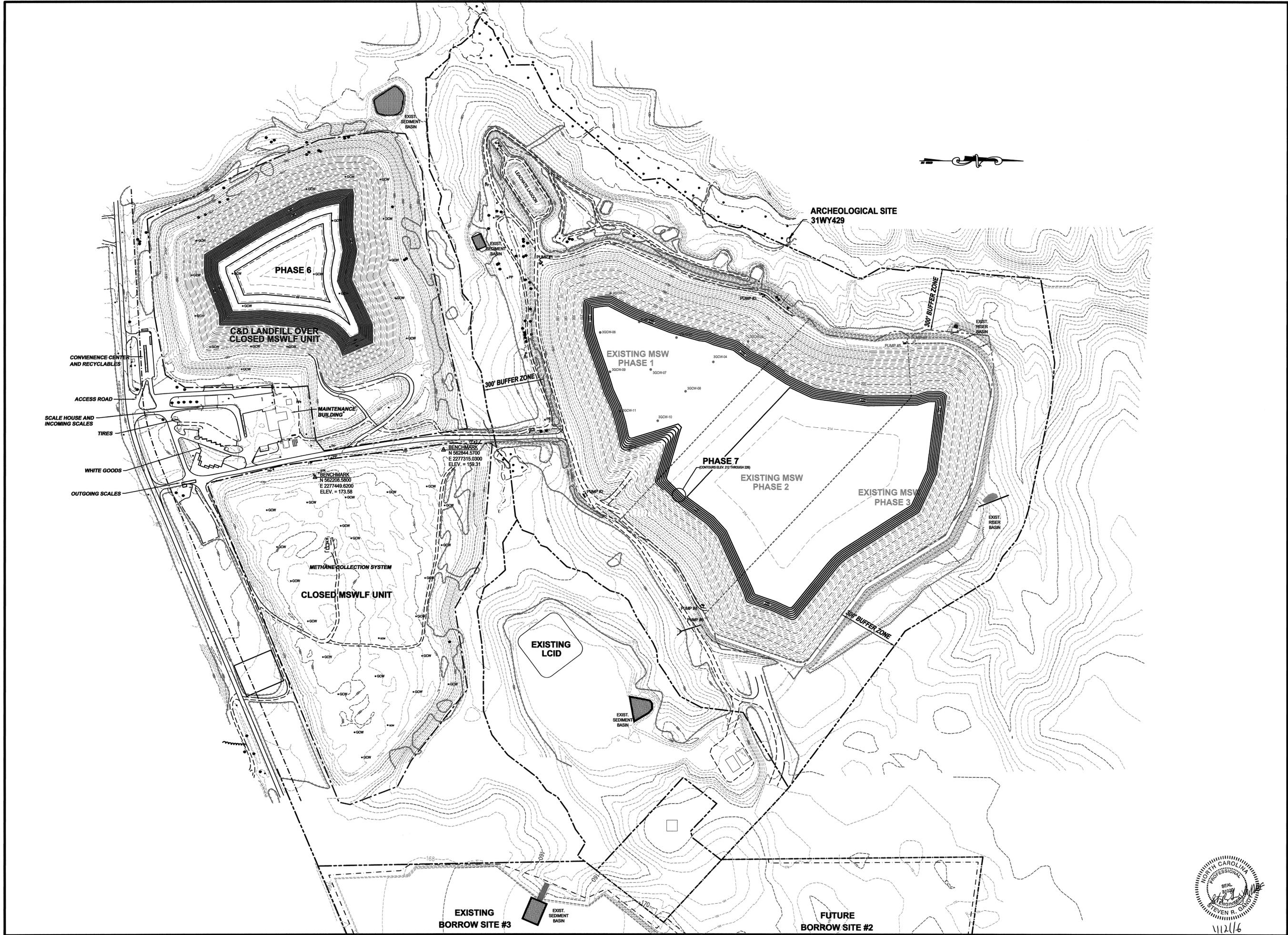
Municipal Services
Engineering Company, P.A.

P.O. BOX 97 GARNER, N.C. 27533
(919) 772-5383

P.O. BOX 346 BOONE, N.C. 28607
(828) 282-1787

LICENSE NUMBER: C-0281

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P.O. BOX 87 GARNER, N.C. 27525
(919) 772-5393

P.O. BOX 348 BOONE, N.C. 28607
(828) 262-1767

LICENSE NUMBER: C-0281

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

DATE	BY	REV.	DESCRIPTION

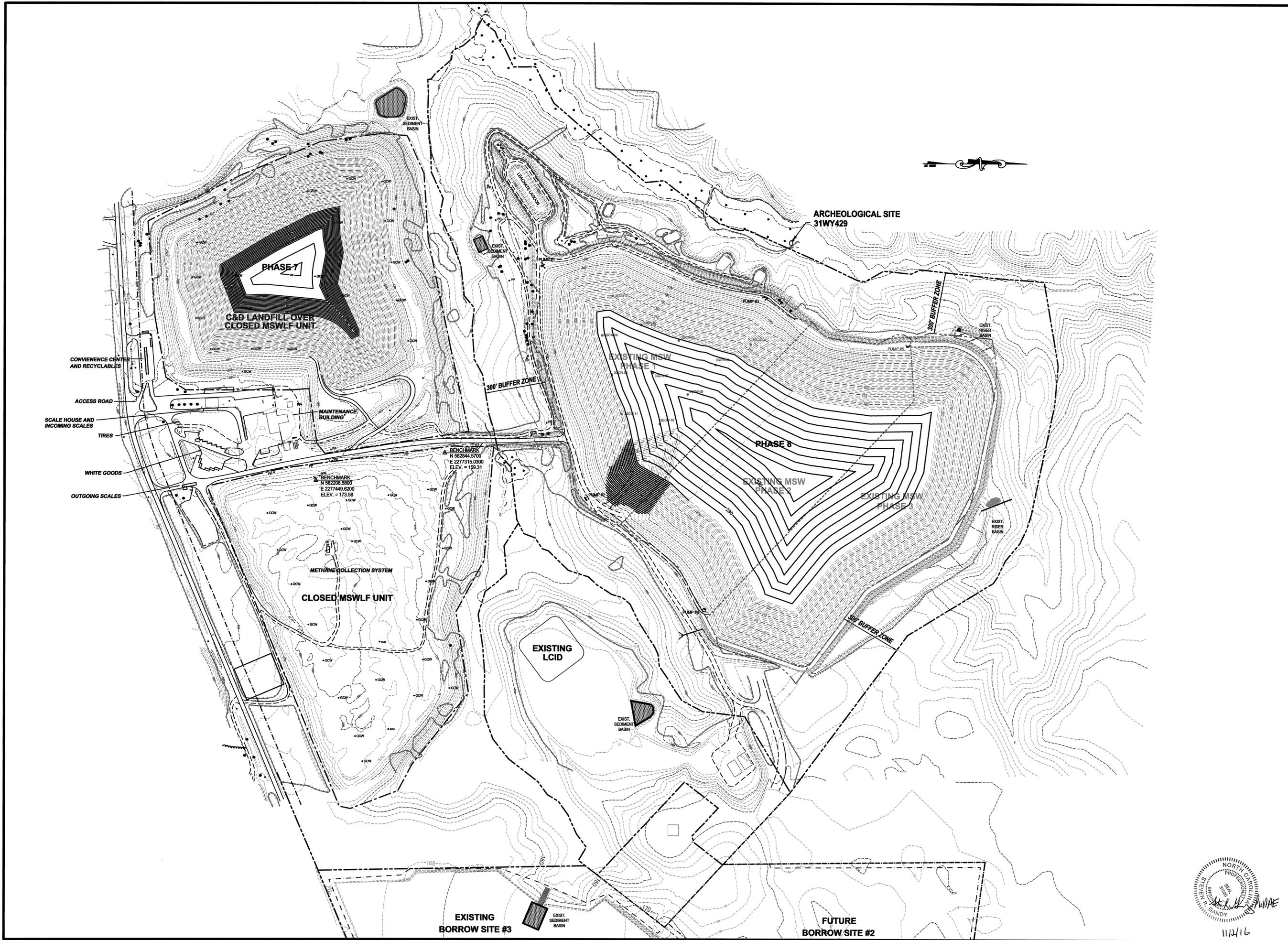
**REVISED FACILITY PLAN - MSW AND C&D
FILL PLAN - PHASE 7 (MSW), AND PHASE 6 (C&D)**

SCALE: 1" = 200'
DATE: 12/10/2015
DRWN. BY: L. CRAWFORD
CHKD. BY: S. GANDY
PROJECT NUMBER: G15124
DRAWING NO. F5 SHEET NO. 7 OF 8



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Municipal Services

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P.O. BOX 97 GARNER, N.C. 27529
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P.O. BOX 549 BOONE, N.C. 28607
(828) 262-1787

LICENSE NUMBER: C-0281

**MUNICIPAL SOLID WASTE
LANDFILL FACILITY
WAYNE COUNTY
NORTH CAROLINA**

				DESCRIPTION
DATE	BY	REV.		
REVISED FACILITY PLAN - MSW AND C&D FILL PLAN - PHASE 8 (MSW) AND PHASE 7 (C&D)				
SCALE: 1" = 300'				
DATE: 12/10/2015				
DRWN. BY: L. CRAMFORD				
CHKD. BY: S. GANDY				
PROJECT NUMBER				
G15124				
DRAWING NO.		SHEET NO.		
F6		8 OF 8		



11/2/16

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