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Johnston Co

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
425 N. Boylan Avenue
Raleigh, North Carolina 27603

RECEIVED
AUG 29 2002
DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

Design Modification Memorandum No. 2

To: **Mike Keen, Johnston County** Date: **August 27, 2002**

From: **Pieter K. Scheer, P.E.** Project No: **JOHNSTON-14**

Facility Name: **Johnston County MSW Landfill**

Phase/Cell: **Phase 4A - Cell 1**

AUG 2002
Received

Pertinent Drawing Reference:

Drawing Nos: **N/A** Sheet Nos: **N/A**

Detail Nos: **N/A**

Description of Modification:

Modify requirements for Geonet Drainage Media and Type 1 gravel columns (see attached memo).

Reason for Modification:

Geonet Drainage Media: To allow supplied materials to be used so as to not impact construction schedule.
Gravel Columns: To provide for easier placement of protective cover up adjacent side slopes.

Remarks:

See attached memorandum for a detailed description of the modified requirements.

Regulatory Agency Notification: **Yes. See below.**

Approval: Pieter K. Scheer

Designer: **Pieter K. Scheer, P.E.** Title: **Project Manager**

cc: **David Page, ES&J** Attachments: **Memo**

Jim Barber, NCDWM

S. Smith/B. Hackney, GNRA

NOTES: This modification is a revision of a previously approved permit feature.

PLEASE CALL WITH ANY QUESTIONS/COMMENTS REGARDING THIS MODIFICATION

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services

MEMORANDUM

TO: Mike Keen, Johnston County

FROM: Pieter K. Scheer, P.E. PKS
G.N. Richardson & Associates

DATE: August 27, 2002

SUBJECT: **Johnston County**
Johnston County MSW Landfill - Phase 4A - Cell 1
Design Modification No. 2

The following modifications have been made to the project requirements.

1. Geonet Drainage Media (Specification Section 02712):

   Transmissivity: Change minimum required transmissivity from 4.1×10^{-4} $m^3/m/sec$ to 2.5×10^{-4} $m^3/m/sec$ to reflect the minimum value determined during conformance testing. The attached calculations demonstrate the acceptability of this change (Pipe Spacing Calcs. - Leachate Collection System; Leak Detection System Calcs.). Note that only one conformance test was below the originally specified requirement and the average transmissivity was about two times the originally specified requirement. Thus, the attached calculations are very conservative.

2. Project Drawings:

   Change the detail for Type 1 gravel columns (Detail C/G4) to the attached. This change will make protective cover placement up the side slopes easier and will not alter the function of the drain during operations. Note also the leachate collection pipe has been moved over the leak detection trench as this point tended to be slightly lower than the toe of slope where the pipe had been located previously.

Attachments (Leachate Collection/Leak Detection System Calcs.; Rev. Gravel Column Detail)

cc: David Page, ES&J
Jim Barber, NCDWM
Stacey Smith, GNRA
Byron Hackney, GNRA

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PROJECT Johnston County MSW Landfill - Phase 4A

SUBJECT Des. Mod. 2 - Leachate Collection Pipe Spacing

SHEET 1 OF 3
JOB NO. JOHNSTON-14
DATE 8/22/02
COMPUTED BY PKS
CHECKED BY SAS

Objective

To evaluate the required leachate collection pipe spacing which will maintain at most 1 foot of head on the geomembrane under Normal Operating Conditions. Analysis will calculate the maximum head using required values for permeability (leachate collection media) or transmissivity (geonet drainage media). If the selected pipe spacing indicates an acceptable head, then the selected pipe spacing is acceptable.

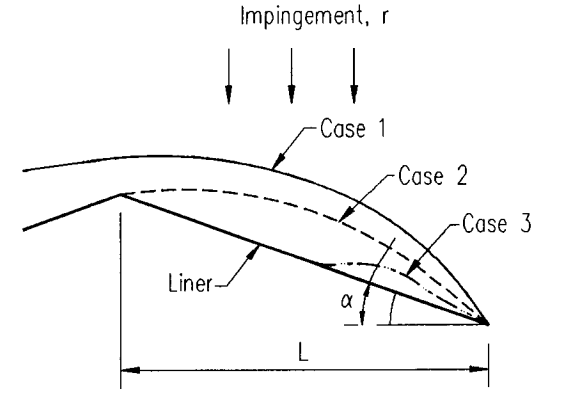
References

McEnroe, Bruce (1993), "Maximum Saturated Depth Over Landfill Liners," Journal of Environmental Engineering, Vol. 119, No. 2, pp. 262-270.

Richardson, G.N. and Zhao, A. (2000), Design Manual of Lateral Drainage Systems for Landfills, 2nd Ed., Tenax Corp., Baltimore, pp. 28-40.

Analysis

The McEnroe equations require the input of an impingement rate, a drainage media permeability, pipe spacing, and a liner slope. This information is used to find the maximum head on the liner. The McEnroe solution is for three cases (see figure below). Case 1 is for a saw-tooth bottom, with the liquid mound overtopping the peak. Case 2 has the liquid mound starting at the peak of the saw-tooth. Case three has the mound starting below the peak of the tooth. Cases two and three are appropriate for modeling a liner on an infinite slope with collector pipes uniformly spaced down the slope.



PIPESPACE.WPD

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Engineering and Geological Services
425 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

Step 1: Input the necessary physical factors: slope, permeability and impingement rate.

Step 2: The controlling value R is calculated

$$R=\frac{r}{ksin^2\alpha}$$

Where:
- r = impingement rate (for normal operating conditions, conservatively use average daily flow for the active case (1,200 gpad) - see leachate generation calculations)
- k = permeability of the drainage media (for Geonet Drainage Media, k = transmissivity/thickness)
- α = slope angle of the liner (Slope S = tanα)

Step 3: The maximum head is calculated, using a formula dependent on the value of R:

For R > 1/4 (Case 1):

$$h_{max}=SL(R-RS+R^2S^2)^{1/2}\exp[\frac{1}{B}\arctan(\frac{2RS-1}{B})-\frac{1}{B}\arctan(\frac{2R-1}{B})]$$

For R = 1/4 (Case 2):

$$h_{max}=SL\frac{R(1-2RS)}{1-2R}\exp[\frac{2R(S-1)}{(1-2RS)(1-2R)}]$$

For R < 1/4 (Case 3):

$$h_{max}=SL(R-RS+R^2S^2)^{1/2}[\frac{(1-A-2R)(1+A-2RS)}{(1+A-2R)(1-A-2RS)}]^{\frac{1}{2A}}$$

Where:
- h_{max} = maximum head
- L = horizontal length of pipe spacing or distance to peak (see figure above)
- S = liner slope
- A = $(1 - 4R)^{0.5}$
- B = $(4R - 1)^{0.5}$

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Telephone: (919) 828-0577

G.N. Richardson & Associates

ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 3/3
JOB #: JOHNSTON-14
DATE: 8/22/02
BY: PKS
CHKD BY: SAB

Johnston County MSW Landfill - Phase 4A
Design Mod. 2 - Leachate Collection Pipe Spacing

Input Parameters:

Max. Head on Liner (h_{max}):	1.0	ft	(Regulatory Maximum)
Impingement (r):	1.3E-06	cm/sec	(Average Daily Flow from HELP Model - Active Case)
Leachate Collection Media Permeability (k):	0.1000	cm/sec	(Specified Minimum)
Reduction Factor for Natural Drainage Media in LCS:	8		(Per Richardson, Zhao, & Giroud - Includes Overall FS of 2)
Design Collection Media Permeability (k):	1.3E-02	cm/sec	
Geonet Drainage Media Transmissivity (Theta):	2.5E-04	$m^3/m/sec$	(Specified Minimum) — Rev.
Reduction Factor for Geocomposites in LCS:	20		(Per Richardson, Zhao, & Giroud - Includes Overall FS of 2)
Design Geonet Drainage Media Transmissivity (Theta):	1.3E-05	$m^3/m/sec$	
Geonet Drainage Media Thickness:	0.25	inches	(Specified Minimum)

Note: Spreadsheet Converts Units as Required.

Leachate Collection Media:

(User Input) Slope (%)	Slope (Deg.)	R	(User Input) Pipe Spacing (ft)	Pipe Spacing (m)	S	A	B	R < 0.25	hmax (ft) R = 0.25	R > 0.25	Comment
2	1.15	0.260	200	61.0	0.020	ERR	0.201	N/A	N/A	0.760	O.K.
3	1.72	0.116	200	61.0	0.030	0.733	ERR	0.570	N/A	N/A	O.K.
4	2.29	0.065	200	61.0	0.040	0.860	ERR	0.454	N/A	N/A	O.K.
5	2.86	0.042	200	61.0	0.050	0.913	ERR	0.376	N/A	N/A	O.K.
6	3.43	0.029	200	61.0	0.060	0.940	ERR	0.321	N/A	N/A	O.K.
7	4.00	0.021	200	61.0	0.070	0.956	ERR	0.280	N/A	N/A	O.K.
8	4.57	0.016	200	61.0	0.080	0.967	ERR	0.248	N/A	N/A	O.K.

Geonet Drainage Media:

Geonet Drainage Media Permeability (k): 0.2 cm/sec cm/sec

(User Input) Slope (%)	Slope (Deg.)	R	(User Input) Pipe Spacing (ft)	Pipe Spacing (m)	S	A	B	R < 0.25	hmax (ft) R = 0.25	R > 0.25	Comment
20	11.31	0.000	200	61.0	0.200	1.000	ERR	0.007	N/A	N/A	O.K.
25	14.04	0.000	200	61.0	0.250	1.000	ERR	0.006	N/A	N/A	O.K.
33	18.26	0.000	200	61.0	0.330	1.000	ERR	0.004	N/A	N/A	O.K.

<< Thickness of Geocomposite
∴ O.K.

PIPESPACE.WB3

PROJECT Johnston County MSW Landfill - Phase 4A

SUBJECT Des. Mod. 2 - Leak Detection System Calcs.

SHEET 1 OF 4
JOB NO. JOHNSTON-14
DATE 8/22/02
COMPUTED BY PKS
CHECKED BY SMS

Objective

To determine the performance of a layer of geonet drainage media (GDM) in the leak detection system (LDS) and select an Action Leakage Rate (ALR) based on predicted GDM performance.

Reference

Richardson, G.N. "Design of Waste Containment Liner and Final Cover Systems" - Course Notes, American Society of Civil Engineers, pp. 2-64 - 2-68, 3-78 - 3-91.

Richardson, G.N., Zhao, A, and Giroud, J.P. (2000), Design Manual of Lateral Drainage Systems for Landfills, 2nd Ed., Tenax Corp., Baltimore, pp. 52-57.

Assumptions

- GDM minimum transmissivity = 4.1×10^{-4} $m^3/m/sec$ at a hydraulic gradient of 0.25 and a compressive load of 7,000 psf (≈ 100' waste @ 70 pcf or, more realistically, ≈ 134' waste @ 52 pcf (1,400 pcy)) (per project specifications). Apply a reduction factor of 10 as recommended by Richardson, Zhao, and Giroud to this value in the calculations. This will yield a conservatively long detection time and a conservatively low ALR in that most areas will have less than 100 feet of overlying waste and most slopes are less than 25% (lower gradients typically yield higher transmissivity values in GDM).

- The maximum allowable head in the GDM is 0.25 inches (= minimum specified thickness).

- Leakage is uniform over the entire landfill.

- Darcy's Law is valid for all flow conditions considered.

- For detection time calculations, time for flow in collection piping is minimal.

Analysis

Based on the minimum required transmissivity for the GDM to be used, use Darcy's Law to determine the travel (detection) time along the longest flow path. For selecting the ALR, again use Darcy's Law to calculate the maximum saturated flow in the GDM to each collection point.

LEAKDETECTION2.WPD

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Engineering and Geological Services
425 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

Equations

Darcy's Law:

$$Q = kiA = \theta iw$$

where:
- Q = Flow (m^3/s)
- k = Hydraulic conductivity of GDM (m/sec)
- i = Flow gradient or slope (m/m)
- A = Area of flow = $t \times w$ (m^2)
- t = Thickness of GDM (m)
- w = Unit width of GDM (m)
- θ = GDM transmissivity ($m^3/m/s$) = Specified Transmissivity/Reduction Factor of 10.

Detection Time:

In that continuity must exist:

$$Q = VA$$

where:
- V = Flow velocity = length (l)/time (m/s)
- A = Area of flow = $t \times w$ (m^2).

thus: (l/time) ($t \times w$) = θiw

therefore: $$DetectionTime = \frac{lt}{\theta i}$$

For hazardous waste (Subtitle C) landfills the recommended maximum detection time is 24 hours. However, detection times of several days is an adequate detection time for MSW landfills.

Action Leakage Rate (ALR):

$$ALR = Q = \theta iw$$

where:
- i = Slope of GDM into collection point (m/m)
- w = Width of GDM along collection point (m).

G.N. Richardson & Associates
ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 3 / 4
JOB #: JOHNSTON-14
DATE: 8/22/02
BY: PKS
CHKD BY: JAG

Johnston County MSW Landfill - Phase 4A
Design Mod. 2 - Leak Detection System Calculations

Input Parameters:

Geonet Drainage Media Thickness (t) =	0.25	in	(User Input)
	0.006	m	
Geonet Drainage Media Transmissivity (Theta) =	2.5E-04	m^3/m/s	(User Input)
Reduction Factor for Geocomposites in LDS:	10		(Per Richardson, Zhao, & Giroud)
Design Geonet Drainage Media Transmissivity (Theta):	2.5E-05	$m^3/m/sec$	

Note: Spreadsheet Converts Units as Required.

Leak Detection Trench	Maximum Flow Length (ft)	Slope of GDM To LD Trench	Width of LD Trench (ft)	Detection Time (days)		Q (m^3/day)	ALR (Gallons/Day)	
1	245	0.07	1600	3.1	W/in ± 1 week O.K.	74	19478	
2	225	0.07	1540	2.9		71	18748	
3	220	0.07	1280	2.8		59	15582	
4	400	0.05	1270	7.2		42	11043	
Sump	300	0.04	75	6.7		2	522	(Only Serves About 1Ac.)

WILL BE MUCH LESS DUE TO C&D CHANGE

Σ = 65373 gal/day

LEAKDETECTION2.WB3

ALR Previously set conservatively @ 3,000 gallons/day → ∴ O.K.

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

June 17, 2002

Ms. Joan A. Smyth, P.G.
G.N. Richardson & Associates
425 N. Boylan Avenue
Raleigh, NC 27603

Re: Wood Fiber for Alternate Daily Cover and Final Cover Material, Johnston County Landfill, Permit Number 51-03.

Dear Ms. Smyth,

Sometime ago you contacted the Solid Waste Section (Section) with respect to using some wood fiber material, from International Paper, as alternate daily cover and as a soil amendment in the final cover at the Johnston County Landfill. In May of 2002 you faxed me a copy of your correspondence. I apologize for the delay in responding to your request.

The Section has dealt with this material and similar requests from other MSWLF's in the past. While you submitted some old TCLP data indicating non-detectable results, you should be aware that analysis do exist that indicate that some trace metals and small amounts of formaldehyde exist in the material that has been tested to date. This is an extremely large pile of material and International Paper has been working with both Region IV EPA and the North Carolina Superfund Section, for years, to determine how best to handle this material and any cleanup of the site that may be necessary. Agronomic data on the material also indicates that the material may require significant additional soil preparation, such as lime and extra nitrogen addition, to ensure that an adequate vegetative cover can be established at closure.

These disclosures being made, the Section would consider further processing of your request should you so desire. The material could be used at the facility and stockpiled either in the cell, on intermediate cover, or at an alternate location away from groundwater monitoring wells, that you would propose to the section. Proper sedimentation and erosion control of the pile would be needed as well as possible dust suppression measures.

The material that the Section has seen indicates that it is mostly wood fibers. Its use as an alternate daily cover would need to be tested in a pilot for at least 90 days. The purpose of the trial would be to determine the optimum ratio of material to native soil to use as alternate daily cover. Recent history at landfills that have used mulch, from hurricane debris, as alternate daily cover have shown it to be inadequate to suppress fires equivalent to that of a six inch soil cover. Consequently the Section is reevaluating the use of the material, particularly with respect to the amount and frequency of traditional soil cover.

The Section would approve incorporation of the material into a final cover. The county would need to provide more specifics as to the amount of the material to be added to the required vegetative layer of the final cover, and how it is proposed to be blended and placed in the final cover, prior to its use. Pending the results of more frequent laboratory testing of the material, particularly from the middle and bottom of the pile, the use of the material outside the limits of the liner system is not approved.

If you desire to proceed with a trial demonstration of this material as ADC then you should contact your Waste Management Specialist, Ben Barnes, to conduct and monitor the trial. If you have any further questions regarding the approval for use of the wood fibers, or the conditions set forth in this letter, please contact the Section. The phone number is 919.733.0692 ext 343. Mr. Barnes may be reached at the Raleigh Regional Office of DENR. His number is 919.571.4700.

Sincerely,

Edward Mussler, P.E.
Environmental Engineer
Solid Waste Section

cc:(via email)
Haywood Phthisic, Johnston County
Pieter Scheer, GNRA
Jim Barber, DWM
Mark Fry, DWM
Ben Barnes, DWM

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
425 N. Boylan Avenue
Raleigh, North Carolina 27603

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Design Clarification Memorandum No. 1

To: **Mike Keen, Johnston County** Date: **June 3, 2002**

From: **Pieter K. Scheer, P.E.** Project No: **JOHNSTON-14**

Facility Name: **Johnston County MSW Landfill**

Phase/Cell: **Phase 4A - Cell 1**

Pertinent Drawing Reference:

Drawing Nos: **N/A** Sheet Nos: **N/A**

Detail Nos: **N/A**

Description of Clarification:

Clarify that up to 5% by weight recycled material reworked during the manufacturing process is acceptable in the production of both HDPE and LLDPE geomembranes to be provided. See attached certification from material manufacturer (GSE Lining Technology).

Reason for Clarification:

To clarify the amount of reworked material which may be allowed in the manufacture of both HDPE and LLDPE geomembranes.

Remarks:

Note that this is industry standard practice.

Regulatory Agency Notification: **Yes. See below.**

Approval:

Designer: **Pieter K. Scheer, P.E.** (Title) **Project Manager**

cc: **David Page, ES&J** Attachments: **GSE Certification**

Jim Barber, NCDWM

S. Smith/B. Hackney, GNRA

PLEASE CALL WITH ANY QUESTIONS/COMMENTS REGARDING THIS CLARIFICATION

REC'D JUN 03 2002

GSE®
GSE Lining Technology, Inc.

19103 Gundle Road
Houston, Texas 77073
800-435-2008
713-443-8564
Fax: 281 - 230 - 8663

31 MAY 2002

PETER SCHEER
GN RICHARDSON
425 N. BOYLAN AVENUE
RALEIGH, NORTH CAROLINA 27603

RE: JOHNSTON COUNTY LANDFILL
GSE PROJECT NO. 509631

CERTIFICATION

The undersigned, being qualified and authorized to do so, hereby certifies that standard GSE 40 mil average UltraFlex Textured™ LLDPE geomembrane and 60 mil average HD Textured™ HDPE geomembrane will meet or exceed the following specified property values:

- GSE certifies that no reclaimed polymer will be used in the production of materials for the referenced project. Recycled material reworked from GSE's manufacturing process may be added, but will not exceed five percent (5%) by weight of the material.

Sincerely,

John David Griffin
GSE Technical Supervisor

cc: Eva Pena, GSE Lining Technology, Inc.

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

April 3, 2002

Mr. Haywood Phthisic
Director of Public Utilities
Johnston County
P.O. Box 2263
Smithfield, NC 27577

RE: Permit 51-03, Johnson County Landfill-New Facility Permit, Permit to Construct Cells 1 and 2 of Phase 4A

Dear Mr. Phthisic,

Enclosed please find the new facility permit, permit to construct, for Phase 4A of the Johnston County Landfill, and the Phase 4A limited vertical expansion of Construction and Demolition Debris over the unlined unit 4 of the old permit 51-01 landfill unit. Please review the permit carefully. According to 15A NCAC 13B .0203(d), by beginning construction and receiving waste in the cells, the applicant shall be considered to have accepted the conditions of the permit. If there are any questions regarding the permit or the conditions contained therein, please contact us.

Please note the permit pre-construction conditions of Conditions 1 and 9, and pre-operative conditions of Conditions 13 and 14. If there are any questions either about the permit or its conditions or questions which arise during construction, please contact us. The Field Engineer for review of the construction quality assurance is Jim Barber, and the Waste Management Specialist for the facility is Ben Barnes. Mr. Barber be reached at the Winston-Salem regional office at 336.771.4608. Mr. Barnes is based at the Raleigh Regional Office and his phone number is 919.571.4700.If there are any questions concerning this approval, please contact Ed Mussler of our office. Our number is 919.733.0692, extension 343.

Sincerely

James C. Coffey

James C. Coffey
Section Chief
Solid Waste Section

cc: File
Mark Fry DWM Ben Barnes, DWM
Jim Barber, DWM Ed Mussler, DWM
Pieter Scheer, GNRA

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

FACILITY PERMIT NO: 51-03
Part 1- Permit to Construct
Date of Issue: April 3, 2002

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
1646 MAIL SERVICE CENTER, RALEIGH, NC 27699

MUNICIPAL SOLID WASTE LANDFILL FACILITY PERMIT

JOHNSTON COUNTY, OWNER and
OPERATOR, is hereby issued a PERMIT to CONSTRUCT a
MUNICIPAL SOLID WASTE LANDFILL UNIT,
PHASE 4A, CELLS 1 and 2 ,
and CONSTRUCTION AND DEMOLITION DEBRIS CELL 4A

located on NCSR 1503, Johnston County, North Carolina in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The facility is located and described by the property map contained within the approved application and recorded in the Johnston County Register of Deeds Office, Book 59, Page 437.

James C Coffey

James C. Coffey, Section Chief
Solid Waste Section

ATTACHMENT 1

Approved Documents

PART I: GENERAL FACILITY CONDITIONS

1. Permit Number 51-01, Johnston County Landfill
2. Permit Number 51-02, Johnston County , Permit to Construct, December 22, 1995

PART II: MUNICIPAL SOLID WASTE LANDFILL CONDITIONS

1. *Permit to Construct Application. Johnston County MSW Landfill-Phase 4A. Johnston County, North Carolina.* Prepared For: Johnston County Department of Public Utilities, 204 E. Second Street. Smithfield, North Carolina, 27577. Prepared By: G.N. Richardson & Associates, Inc. 425 N. Boylan Avenue, Raleigh, North Carolina 27603. April 2000. Revised December 2001. Volume 1 of 2, Design Engineering. Volume 2 of 2, Design Hydrogeologic Report, revised January 2002.

2. *Johnston County MSW Landfill-Phase 4A. Permit Drawings.* Prepared For: Johnston County Department of Public Utilities. Prepared By: G.N. Richardson & Associates, Inc. 425 N. Boylan Avenue, Raleigh, North Carolina 27603. April 2000. Revised December 2001. 38 Sheets.

PART III: CONSTRUCTION AND DEMOLITION LANDFILL CONDITIONS

1. *Johnston County C&D Landfill Vertical Expansion.* Prepared For: Johnston County Department of Public Utilities. Prepared By: G.N. Richardson & Associates, Inc. 425 N. Boylan Avenue, Raleigh, North Carolina 27603. December 1998. (Modification #1 to Permit 51-01)

2. Cap Closure Certification Letter for the Johnston County Landfill dated 21 December 1998 by G.N. Richardson & Associates and received 22 December 1998 and incorporated into the approved application.

3. *Permit Modification Application. Johnston County C&D Landfill Vertical Expansion. Johnston County, North Carolina.* Prepared For: Johnston County Department of Public Utilities, 204 E. Second Street. Smithfield, North Carolina, 27577. Prepared By: G.N. Richardson & Associates, Inc. 425 N. Boylan Avenue, Raleigh, North Carolina 27603. January 2002. (Amendment #2, Area 4A Permit 51-01)

PART IV: LAND CLEARING AND INERT DEBRIS LANDFILL CONDITIONS
(NOT APPLICABLE)

PART V: YARD WASTE CONDITIONS
(NOT APPLICABLE)

PART VI: MISCELLANEOUS TREATMENT AND PROCESSING FACILITIES CONDITIONS
(NOT APPLICABLE)

ATTACHMENT 2

PART I:
GENERAL FACILITY CONDITIONS

1. This permit shall be effective upon compliance with 15A NCAC 13B .0204 and when the certified copy with the page, book number, date of recording, and Register's seal is returned to the Solid Waste Section (Section).

2. This permit approves the Facility Plan which, in accordance with 15 NCAC 13B .1619, defines the comprehensive development of the facility including the total municipal solid waste landfill capacity, the municipal solid waste stream, all onsite solid waste management facilities and related facility infrastructure.

   The approved plans are described in Attachment 1,"Approved Documents". Where discrepancies may exist, the most recent approved submittal and Conditions of Permit shall govern.

3. Facility 51-03 has unlined municipal solid waste units (MSW), of unknown volume, identified in facility permit 51-01 as units 1,2,3 and 4. A lined MSW cell, identified as Phase 4A is piggy-backed to the unlined MSW units 3 and 4, and has a permitted net total municipal solid waste disposal capacity of 2,155,000 cubic yards consistent with the approved final contours as described in Attachment 1,"Approved Documents", Part II, Document 1. This permit approves the construction of Cell 1 and Cell 2 of Phase 4A. Construction of Cell 3 will require written permission of the Solid Waste Section.

   The new landfill facility, a combination of permits 51-01 and 51-02, is permitted for a net MSW disposal volume of approximately 5,660,000 cubic yards as described in Attachment 1, "Approved Documents", Part II, Documents 1 and 2. The landfill units will be developed in multiple construction sequences. Development of Phases VI through VIII will be in accordance with the Division approved plans.

   This permit approves the vertical expansion of a Construction and Demolition Debris unit on the closed portion of Cell 4. This vertical expansion has a total permitted gross volume of 354,200 cubic yards for disposal of construction and demolition debris, and other items as identified in the permit to operate and the approved plans, Attachment 1, Part III, Document 3.

4. The landfill is permitted to receive solid waste generated from within Johnston County, North Carolina, consistent with local government waste management plan(s), and as defined in NCGS 130A-290(a)(18a), except where prohibited by North Carolina General Statutes Article 9 of Chapter 130A, and rules adopted by the Commission for Health Services.

The owner or operator of the landfill facility shall not knowingly dispose of municipal solid waste that is generated within the boundaries of a unit of local government that by ordinance:

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

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

5. This facility is subject to the requirements of all applicable sections of the most recent version of the North Carolina Solid Waste Management Rules, 15A NCAC 13B and the specific conditions contained herein.

6. This facility shall conform to the specific conditions set forth in this permit and the provisions of 15A NCAC 13B .1604(b)(2).

7. This facility permit is issued under the criteria set forth in 15A NCAC 13B.1603(a)(1)(E). Any facility changes that effect these criteria may require a new permit.

8. Johnston County shall submit an amendment to this permit pursuant to 15A NCAC 13B.1603(a)(2) for any subsequent phase of development.

FACILITY CONSTRUCTION CONDITIONS

9. Johnston County shall conduct a preconstruction meeting, on site, prior to initiating construction of any unit/cell at the site and shall notify the Solid Waste Section 10 days prior to said meeting.

10. Construction of all solid waste management units within this facility shall be in accordance with the pertinent approved plans and only for those phases of development approved for construction as described in Attachment 1, Part II, Documents 1 and 2, and Part III, Documents 1 and 3, "Approved Documents".

11. Additional conditions and revisions of the approved documents or changes during construction of any landfill unit/cell require approval by the North Carolina Solid Waste Section.

12. Any modifications in sedimentation and erosion control activities require approval by the Land Quality Section. The Section shall be notified of any sedimentation and erosion control modifications.

FACILITY PRE-OPERATIVE CONDITIONS

13. Prior to receiving waste at any cell or subcell of this facility, a Permit to Operate, must be obtained from the Solid Waste Section in accordance with 15A NCAC 13B .0201(b).

14. The following requirements shall be met prior to waste disposal for any cell or subcell of this facility:

    a. Site preparation shall be in accordance with the approved plans, and the conditions specified herein.
    b. Site inspection shall be made by a representative of the Solid Waste Section.
    c. Prior to waste disposal for any cell, a pre-operative meeting shall be held on-site with key landfill personnel and representatives of the Solid Waste Section.

PART II:
MUNICIPAL LANDFILL UNIT SPECIFIC CONDITIONS

PRE-OPERATIONAL CONDITIONS

1. Ground water monitoring wells and surface water sampling locations shall be sampled for the Appendix I constituent list prior to issuing the Permit to Operate.

CONSTRUCTION CONDITIONS

2. The owner's geologist shall examine the cell excavation and note any pertinent geologic features exposed during the construction process and shall notify the Solid Waste Section Hydrogeologist of these findings prior to the placement of any liner materials.

3. The owner's geologist shall be in the field to supervise all well installations. Any modifications to the approved water quality monitoring plan require approval by the Section Hydrogeologist. Documentation of all changes to the approved plan shall be submitted with the well construction records.

4. For each monitoring well constructed, a well construction record, well schematic, boring log and a description of well development activities shall be submitted to the Section within 30 days upon well completion.

PART III:
CONSTRUCTION AND DEMOLITION DEBRIS UNIT SPECIFIC CONDITIONS

1. This permit is for development of the Johnston County Landfill Construction and Demolition Unit, Phase 4A expansion, in accordance with the submittal dated 17 January 2002 from G.N. Richardson & Ass. along with the approved plan dated 10 December 1998.

2. All sedimentation/erosion control activities will be conducted in accordance with the Sedimentation Control Act codified at 15 NCAC 4. Native vegetation shall be established on the completed landfill.

3. Closure certification and documentation shall be submitted to the Solid Waste Section and approved by the Section prior to receiving C&D waste in the proposed unit(s). This information is provided by letter dated 21 December 1998 in the revised application

prepared by G.N. Richardson & Assoc.. Partial closure of units will be accepted with certification and documentation of partial unit closure submitted for approval. Seeding and stabilization of cover soils shall be performed prior to receiving C&D waste.

4. The **SOUTH** and **EAST** limits of Phase 4A shall be staked/flagged in the field for visual operating reference and shall be maintained.

PART IV:
LAND CLEARING AND INERT DEBRIS UNIT SPECIFIC CONDITIONS
(NOT APPLICABLE)

PART V:
YARD WASTE UNIT SPECIFIC CONDITIONS

1. Yard Waste shall be managed within the facility in the area identified on Sheets 2 and 3 of Document 2 of Appendix 1, Part II. Management of Yard Waste in areas of the facility other than that referenced above, require written permission of the Solid Waste Section.

PART VI:
MISCELLANEOUS TREATMENT AND PROCESSING UNIT SPECIFIC CONDITIONS (Specify Unit Type) (NOT APPLICABLE)

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

April 3, 2002

Mr. Haywood Phthisic
Director of Public Utilities
Johnston County
P.O. Box 2263
Smithfield, NC 27577

P70

RE: Permit 51-03, Johnson County Landfill-New Facility Permit, Permit to Operate, Phase 5 and Construction and Demolition Debris Vertical Expansion 4A

Dear Mr. Phthisic,

Enclosed please find the new facility permit, permit to operate for Phase V of the Johnston County Landfill, and the Phase 4A limited vertical expansion of Construction and Demolition Debris over the unlined unit 4 of the old permit 51-01 landfill unit. Please review the permit carefully. According to 15A NCAC 13B .0203(d), by beginning construction and receiving waste in the cells, the applicant shall be considered to have accepted the conditions of the permit. If there are any questions regarding the permit or the conditions contained therein, please contact us.

Please note this permit if for continued operation of existing units and activities at the landfill and is issued as result of the new facility designation which arose when permits 51-01 and 51-02 were combined into new permit 51-03. Operation of Cells within the Phase 4A expansion will require written permission of the Section. If there are any questions either about the permit or its conditions or questions which arise during operation of the facility please contact us. The Waste Management Specialist for the facility is Ben Barnes. Mr. Barnes is based at the Raleigh Regional Office and his phone number is 919.571.4700.If there are any questions concerning this approval, please contact Ed Mussler of our office. Our number is 919.733.0692, extension 343.

Sincerely

James C Coffey

James C. Coffey
Section Chief
Solid Waste Section

cc: File
Mark Fry DWM Ben Barnes, DWM
Jim Barber, DWM Ed Mussler, DWM
Pieter Scheer, GNRA

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
1646 MAIL SERVICE CENTER, RALEIGH NC 27699

MUNICIPAL SOLID WASTE LANDFILL FACILITY PERMIT

JOHNSTON COUNTY

is hereby issued a PERMIT TO OPERATE a

MUNICIPAL SOLID WASTE LANDFILL FACILITY,

MUNICIPAL SOLID WASTE LANDFILL UNIT, PHASE 4A, CELL 1 AND

CONSTRUCTION AND DEMOLITION DEBRIS UNIT, PHASE 4A

located on N.C.S.R. 1503, Johnston County, North Carolina, in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

James C Coffey

James C. Coffey, Section Chief
Solid Waste Section

ATTACHMENT 3

Approved Documents

PART I: GENERAL FACILITY CONDITIONS

1. Permit to Operate 51-02, issued August 6, 1997, modified March 27, 2001
2. Permit to Operate 51-01, Amended January 22,2002
3. Permit to Construct 51-02 December 22, 1995

PART II: MUNICIPAL SOLID WASTE LANDFILL CONDITIONS

1. *Johnston County Subtitle D Landfill Phase 5, Permit 51-02, Construction Quality Assurance and As-Built Certification for Permit-to-Operate.* Prepared by: McKim & Creed Engineers, P.A., Cary, North Carolina. McKim & Creed Project No.0358-0060.OR. March 1997. 3 Volumes.
2. *Johnston County Subtitle D Landfill CQA, AS-BUILT, and Revised Engineering Plan.* Prepared by: McKim & Creed Engineers, P.A., Cary, North Carolina. McKim & Creed Project No.0358-0060.OR. March 1997. 14 sheets.
3. *Johnston County Landfill, Phase 5, Permit 51-02, Johnston County, North Carolina, Survey and As-Built Plans.* Prepared and Certified By: F. Donald Lawerence, NCRLS No. L-1290, Monroe, N.C., Provided by: Ground Improvement Techniques, Inc., Contractor, Submitted by: McKim & Creed. March 1997. 7 sheets.
4. Letter Grimes to Fry, Requesting approval of Alternative Daily Cover, Tarpomatic. Includes Brochure. July 27, 1998
5. *Leachate Recirculation Plan. Johnston County MSW Landfill- Phase 5. Johnston County, North Carolina.* Prepared for: Johnston County Department of Public Utilities. 204 S. Second Street, Smithfield, NC 27577. Prepared by: G.N. Richardson & Associates, Inc. Raleigh, NC. May 2000 as amended through February 2001.
6. *Construction Quality Assurance Report. Johnston County MSW Landfill- Phase 4A- Cell .1. Johnston County, North Carolina.* Prepared for: Johnston County Department of Public Utilities. 309 E. Market Street, Smithfield, NC 27577. Prepared by: G.N. Richardson & Associates, Inc. Raleigh, NC. December 2002. 2 volumes

PART III: CONSTRUCTION AND DEMOLITION LANDFILL CONDITIONS

1. *Permit Modification Application. Johnston County C&D Landfill Vertical Expansion. Johnston County, North Carolina.* Prepared For: Johnston County Department of Public Utilities, 204 E. Second Street. Smithfield, North Carolina,

27577. Prepared By: G.N. Richardson & Associates, Inc. 425 N. Boylan Avenue, Raleigh, North Carolina 27603. January 2002. (Amendment #2, Area 4A Permit 51-01)

PART IV: LAND CLEARING AND INERT DEBRIS LANDFILL CONDITIONS
(NOT APPLICABLE)

PART V: YARD WASTE CONDITIONS
(NOT APPLICABLE)

PART VI: MISCELLANEOUS TREATMENT AND PROCESSING FACILITIES CONDITIONS

1. Division of Water Quality Permit NO. WQ0019631, Johnston County, Conjunctive Use at the Johnston County Landfill, Reclaimed Water Utilization System, SRF Project Number CS370560-07. March 27, 2002

ATTACHMENT 4

Conditions of Permit to Operate

PART I:
GENERAL FACILITY CONDITIONS

1. This permit shall be reviewed, pursuant to 15A NCAC 13B.0201(e). This permit expires five (5) years from the original issuance date of this permit, on December 20, 2007. No later than September 2, 2007, Johnston County shall submit to the Solid Waste Section, for review, an amendment to the permit prepared in accordance with 15A NCAC 13B .1603(a)(2), or a permit modification prepared in accordance with 15A NCAC 13B .1603(a)(3), as applicable.

   Operation of the Construction and Demolition Debris Vertical Expansion will be subject to review on or before 22 December 2003, as per 15A NCAC 13B .0201. Modifications to the unit or its operation may be required in accordance with rules in effect at the time of review.

2. In the event of conflicts between this Permit to Operate and previously issued conditions, the conditions of this Permit to Operate shall supersede previously issued conditions.

3. The solid waste management units within this facility shall conform to all operating procedures described in the approved plans, 15A NCAC 13B, and the conditions specified herein.

4. Additional conditions and revision of the approved documents or changes during the operation of the landfill require approval by the North Carolina Solid Waste Section.

5. On or before August 1 of each year, the Johnston County shall report the amount of waste received (in tons) at this facility and disposed of in the landfill units to the Solid Waste Section, on forms prescribed by the Section. The reporting period shall be for the previous year, beginning July 1 and ending on June 30. This report shall include the following information:

   a. The tons of waste received and disposed of, compiled on a monthly basis by county, city, or transfer station of origin and by specific waste type if diverted to a specific unit within the permitted facility.

   b. A physical survey of the volume utilized in all of the lined MSW cells shall be performed during the second quarter of the calender year. The date and volume,

in cubic yards, shall be included in the report.

c. The amount of waste, in tons, from scale records, disposed of in the lined MSW cells since August 6, 1997 ; and

d. The completed report shall be forwarded to the Regional Waste Management Specialist for the facility. A copy of the completed report shall be forwarded to the County Manager of each county from which waste was received.

6. Ground water quality at this facility is subject to the "Classifications and Water Quality Standards Applicable To The Groundwater of North Carolina", 15A NCAC 2L. This includes, but is not limited to, provisions for detection monitoring, assessment, and corrective action.

PART II:
MUNICIPAL LANDFILL UNIT SPECIFIC CONDITIONS

GENERAL CONDITIONS

1. This permit approves the operation of Cell 1 of Phase 4A of the municipal solid waste landfill unit as well as the on-site environmental management and protection facilities as described in the approved plans. Operation of future Phases or Cells will require written permission from the Division and will be subject to the conditions of the Part 1- Permit to Construct 51-03, issued April 3, 2002.

2. This operation permit is for Phase 4A's operational approval of a five year permitted gross disposal capacity of approximately 1,051,850 cubic yards, consistent with the final contours as shown on sheet 34 of Document 2, Part II, Attachment 1. This capacity is based on an average annual disposal rate of approximately 78,000 tons (approximately 250 tons per day based on 312 operating days per year) facility total as set forth in Part II, Document 1, Attachment 1.

MONITORING AND REPORTING

3. Ground water monitoring at this unit shall be as prescribed by the appropriate requirements of 15A NCAC 13B .1630-.1637 and the approved monitoring plan.

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

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

6. Records of all ground-water, surface water and leachate analytical data shall be kept as part of the permanent facility record.

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

8. Reports of the analytical data for each water quality sampling event shall be submitted to the Section within 60 days of the respective sampling event. Analytical data shall be submitted in a manner prescribed by the Section.

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

10. Untreated leachate shall be sampled and analyzed at least semi-annually concurrently with the ground and surface water sampling. The leachate shall be analyzed for all Appendix I constituents, pH, specific conductance, BOD, COD, sulfates, nitrates, and phosphates. Test results shall be submitted to the Section along with ground and surface water test results.
    a. Leachate is approved for recirculation in Phase V. Additional leachate sampling shall be in accordance with the plan approved in Document 5, Part II, Attachment 3.

OPERATIONAL CONDITIONS

11. The landfill unit shall conform to all operating requirements described in the approved plans, 15A NCAC 13B .1626, and the conditions specified herein.

12. The use of tarps and the "Tarpomatic" system as an alternative daily cover is approved. Its use shall be in accordance with Document 5 of Part 2, Attachment 3. Soil cover shall be applied at a minimum of one time per week in accordance with Rule .1626 (2). Soil shall be applied more frequently, if needed, to control nuisance, odor or vectors
    a. The use of other or different alternate daily cover requires approval, prior to implementation, by the Solid Waste Section. Requests for alternative daily cover approval must include a comprehensive use and demonstration of the effectiveness

plan developed according to Section guidelines and consistent with the approved plan. Plans which are approved by the Section will be incorporated into, and made a part of, the approved documents found in Attachment 3.

13. A leachate recirculation demonstration project is approved in Phase 5. Leachate may recirculated in accordance with the plan as identified in Attachment 3, Part II, Document 5. Upon completion of a 120 day trial period, a report shall be submitted in accordance with the approved plan. The trial period shall commence when leachate is first recirculated. The 120 day trial period does not include planning and construction time prior to the introduction of leachate into the cell. Recirculation may continue during the report preparation and review phase, unless otherwise directed by the division.
    a. The use of leachate recirculation as a leachate management tool during the Post-Closure care period requires approval, by the Solid Waste Section, prior to implementation. Additional engineering demonstrations and operational plans may be necessary. Such demonstrations and plans shall be developed, incorporated into the final Closure and Post-Closure plan, and submitted to the Solid Waste Section for approval prior to implementation. Plans which are approved by the Section will be incorporated into, and made a part of, the approved documents found in Attachment 3.

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

15. Closure or partial closure of any MSWLF unit shall be in accordance with the Closure Plans described in the approved plans and 15A NCAC 13B .1629. Final Closure Plans shall be submitted to the Division at least 90 days prior to implementation. Closure and Post-closure financial instruments shall be updated annually pursuant to 15A NCAC 13B .1628.

PART III:
CONSTRUCTION AND DEMOLITION DEBRIS UNIT SPECIFIC CONDITIONS

1. The Phase 4A C&D unit vertical expansion is approved for a disposal capacity of approximately 354,200 cubic yards consistent with the approved contours as shown by Document 1, Part III, Attachment 3. This capacity is based on an average disposal rate of approximately 75 tons per day, increasing 25 tons per day annually.

2. Operation of the C& D unit shall be in accordance with 15A NCAC 13B .0505, the approved plan, and the following specific conditions:

c. Waste Acceptance and Disposal:

The C&D unit is permitted to receive the following waste types:

A. Land Clearing Debris as defined in G.S. 130A-290, specifically, solid waste which is generated solely from land-clearing activities, such as stumps, trees, etc.;

B. Inert Debris defined as solid waste which consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil;

C. Asphalt in accordance with G.S. 130A-294(m); and

D. Construction and Demolition Debris defined as solid waste resulting solely from construction, remodeling, repair or demolition operations on pavement, buildings or other structures.

E. C&D like waste that are similar to wastes typically found in the land clearing-inert debris and C&D waste streams consisting of wastes at this time: roofing shingle waste from the manufacturer, waste building materials from mobile home/modular home manufacturer and wooden pallets. Other wastes **MAY** be approved by the Division upon receipt of a written request with the specific waste type, how its generated, how much is generated; along with any additional information the Division may request to render a final decision on the disposal options for the waste.

Yard trash as defined in G.S. 130A-290, shall not be disposed in the landfill area. However, yard trash, along with land-clearing debris, may be accepted for processing in the Yard Waste Composting Area.

b. Cover Material Requirements:

Waste shall be covered with six inches (6) of suitable cover at least once per week, or when the active working area reaches one-half acre (½) in size, or more often as necessitated by the nature of the waste, so as to prevent the site from becoming a visual nuisance and to prevent fire, windblown materials, vectors or water infiltration. Areas which will not receive additional waste on them for twelve months or more, but where final elevations have not been reached, shall be covered with one (1) foot of soil cover.

c. Monitoring Requirements:

Groundwater and surface water sampling and analysis shall conform to the specifications found in the approved plan. The existing groundwater monitoring

system will be utilized for ground water monitoring for the C&D unit(s) in accordance with .1630 thru .1633. Assessment monitoring shall continue in accordance with Solid Waste Management Rules and any additional requirements set forth by Solid Waste Section Hydrogeologist.

3. Closure Requirements- The C& D unit shall be closed in accordance with the approved plan and the requirements of the Solid Waste Section at the time of closure. A final closure plan shall be submitted for review at least ninety (90) days prior to closure of any phase of the C&D landfill unit.

PART IV:
LAND CLEARING AND INERT DEBRIS UNIT SPECIFIC CONDITIONS
(NOT APPLICABLE)

PART V:
YARD WASTE UNIT SPECIFIC CONDITIONS

1. Yard waste operations shall be confined to the area identified by Sheet 3, Document 2, Part II Attachment 1. Relocation of yard waste areas will require written permission of the Solid Waste Section.
2. Operations shall conform to the requirements of Rules .1402 and .1406 of 15A NCAC 13 B.

PART VI:
MISCELLANEOUS TREATMENT AND PROCESSING UNIT SPECIFIC CONDITIONS (Specify Unit Type)
SPRAY IRRIGATION UNIT-

1. Operation of the spray irrigation system at the landfill will be in accordance with the approved solid waste management operation plan, Document 1, Part II, Attachment 1.

2. Operation of the spray irrigation system will be in accordance with Water Quality Permit Number WQ0019631, Document 1, Part VI, Attachment 3.

G.N. RICHARDSON & ASSOCIATES, INC.

Engineering and Geological Services

TRANSMITTAL FORM

If enclosures are not as noted or
if you require additional information,
please notify us immediately

February 8, 2002

Mr. Ed Mussler, P.E.
NC DENR Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, NC 27605
(919) 733-0692

SUBJECT: **Johnston County Landfill - Response to Comments**

GNRA PROJECT NO: **JOHNSTON-9**

We are sending you the following items:

COPIES	ITEM	DESCRIPTION
2	Letter	Response to Comments Letter (Final Version)
1	Manual	Revised Operations Manual (Extra Copy)

These are transmitted as checked below:

[X] **For Information**
[ ] As Requested
[ ] For Review and Comments
[ ] For Revision
[ ] For Approval
[ ] Approved
[ ] Approved as Noted
[ ] Approved as Noted-Revise and Resubmit
[ ] Not Approved-Revise and Resubmit
[ ] For Record and File
[ ] Submittal
[ ] For Recording

REMARKS: Ed: Note that the legal description you needed is attached to the response letter.

cc:

Pieter K. Scheer, P.E.

425 N. BOYLAN AVENUE • RALEIGH, NORTH CAROLINA 27603 • TEL. 919-828-0577 • FAX. 919-828-3899

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services

February 8, 2002

Mr. Edward F. Mussler, P.E.
NC DENR Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

RE: Permit to Construct Application
Johnston County MSW Landfill - Phase 4A
Smithfield, North Carolina
Response to Comments

Dear Ed:

G.N. Richardson & Associates (GNRA) has reviewed the comments addressed in your letter dated January 25, 2002 related to the Johnston County Permit to Construct application for Phase 4A. Your comments are repeated below in *italics* and our response follows in **bold**. Note that the revised sections (see attachment list at the end of this letter), which are provided as attachments, are dated January, 2002.

FACILITY PLAN

1. *Johnston County will need to provide a legal description of the property or properties that make up the facility, sufficient to record the permit against. Typically this is the deed with meets and bounds. If several properties have been previously consolidated and recorded, then that instrument may suffice.*

   Please see the attached legal description of the landfill property.

2. *2.6.3 Leak Detection System. Are the pumps equipped to automatically pump the leak detection system, or is this a manual operation? If it is not automatic, what is the plan or procedure to check this system? How is the liquid removed measured? The removed liquid measurement should be recorded and included in the facility records that are kept. (See also operations plan/record keeping and Section 4 of the Facility Plan)*

   The pumps for the leak detection system both in the sump and in the leak detection pump station are set up as an automatic system. A flowmeter will be installed to record total flow from the leak detection pump station. Please see Details A/G5 and C/G7 for the location of this flowmeter.

3. *4.4 Leachate Discharge and Storage System- Are the pumps automatic? How is the leachate volume measured? The removed liquid measurement should be recorded and included in the facility records that are kept. (See also operations plan/record keeping)*

   The pumps for the leachate discharge system are set up as an automatic system. A flowmeter will be installed to record total flow from these pumps. Please see Details A/G5 and C/G7 for the location of this flowmeter.

OPERATIONS MANUAL

4. *The Solid Waste Section has modified Johnston County's landfill permit to provide for leachate recirculation in Phase 5, use of alternate daily cover, and to provide a procedure to spray irrigate reclaimed wastewater at the facility. Please consolidate the appropriate portions of the respective plans into one operations manual. The manual should also include the operation requirements for the C&D disposal area.*

Please refer to the attached revised Operations Manual, which includes consolidated operations information for leachate recirculation (Appendix D), spray irrigation of reclaimed wastewater (Appendix E), and the C&D landfill unit (worked in throughout the text). Additional information is also provided for the operation of the yard waste processing area and the convenience center. Note that some sections have been reorganized and/or renumbered to better integrate this new information.

5. *1.6.1 Fire Control- This Section should be expanded for the benefit of the owner/operator.*

Please refer to Section 1.6.1 of the attached revised Operations Manual, which has been expanded to include additional methods for extinguishing landfill fires as well as notification requirements in the event of a fire.

6. *2.4 Waste Screening- Is the number of vehicles inspected sufficient, such that it meets recommendations that 1-2% of the waste stream be routinely, randomly, inspected? What types of trucks are targeted for inspection? How is the random truck chosen?*

Please refer to Section 2.4 of the attached revised Operations Manual, which has been revised to address the above comment.

7. *2.5.3-Cell Activation- It is recommended that a notation be placed in the facility operating record that the GT-S separator textile has been removed from the gravel columns, prior to activating the cell or subcell.*

Please refer to Section 2.5.2.2 (note revised section number) and Appendix C of the attached revised Operations Manual, which references and includes a form for documenting the activation of an area of the landfill.

8. *2.7-Height Monitoring- How is this done or measured?*

Typically this is done with a level. Also, landfill compactors and dozers are equipped with slope indicators to monitor grades on side slopes. Please refer to Section 2.5.7 (note revised section number) of the attached revised Operations Manual.

9. *3.3.1.3- What is the allowable discharge to the sewer treatment plant? Is a procedure needed to ensure that adequate draw down is performed in a timely manner in the advent of a hurricane or other tropical disturbance?*

The current allowable discharge is 25,000 gallons per day (average) with a peak allowable

rate of 75,000 gallons per day. Based on the past couple of years of operations, the County only discharges to the WWTP during wetter portions of the year due to the large surface area of the existing pond which allows much evaporation. A notation has been added to Section 3.3.1.3 of the attached revised Operations Manual to call for a draw down of the leachate storage lagoon prior to an impending threat of large quantities of precipitation.

10. *3.3.3-Leachate Quality Sampling- Leachate must be analyzed for the listed parameters as well as Appendix I constituents (I assume that is what the metals and volatile scan refers to, please clarify) sulfates and nitrates. Leachate recirculation in Phase V requires more frequent leachate analysis. A plan should also be presented to the Section which contains a provision to collect samples from the leachate removal risers and not as a grab sample from the lagoon. Leachate data provided to the section, that has been drawn from the large volume storage facility, is not representative of leachate quality. All facilities are being required to upgrade their leachate sampling plans.*

Please refer to Section 3.3.3 of the attached revised Operations Manual, which includes revised information on leachate sampling and analysis to address the above comment.

11. *3.3.4 Record Keeping - What records are kept and at what frequency?*

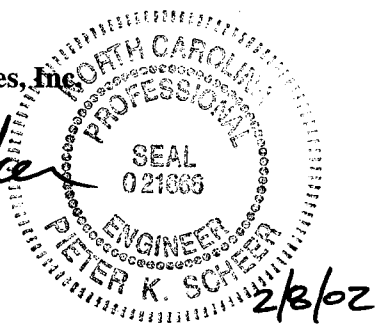
Please refer to Section 3.3.4 of the attached revised Operations Manual, which includes more detailed information on record keeping requirements.

12. *3.3.5- The Section should be notified in advance of any plan to store leachate in the landfill unit.*

Please refer to Section 3.3.5 of the attached revised Operations Manual, which includes a notification requirement in the unlikely event that leachate needs to be stored in the landfill unit.

Should you have any further questions or comments on this submittal, please contact us at your earliest convenience.

Sincerely,
G.N. Richardson & Associates, Inc.



Pieter K. Scheer, P.E.
Project Engineer

Attachments: Legal Description of Landfill Property
Revised Report Section: Attachment D Operations Manual

cc: Haywood Phthisic, Johnston County
Tim Broome, P.E., Johnston County
Rick Proctor, Johnston County

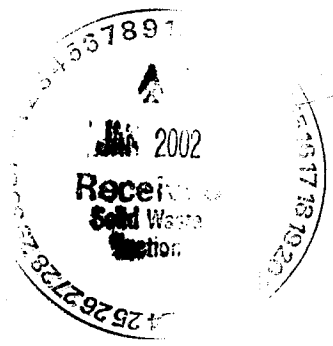
PROPERTY DESCRIPTION
JOHNSTON COUNTY - COUNTY HOME ROAD

Beginning at a PK nail in the center of County Home Road (SR 1503) being located from a PK nail in the center of the intersection of County Home Rd with NC Hwy 210 the following courses: North 03 deg 21 min 20 sec East 521.13 feet to a PK nail, North 03 deg 02 min 35 sec East 1516.87 feet to a PK nail, and North 02 deg 45 min 30 sec East 357.87 feet to the beginning point; and runs thence North 87 deg 05 min 59 sec West 30.05 feet to a concrete monument; thence running with the line of Edwin Hugh Johnson North 52 deg 44 min 36 sec West 234.25 feet to an iron stake; thence running with the line of Braxton Langdon North 52 deg 44 min 36 sec West 522.01 feet to a concrete monument; thence running North 68 deg 23 min 20 sec West 1905.38 feet to a concrete mon. on the east bank of a canal the northwest corner of Braxton Langdon; thence running along the canal, also Nettie W. Johnson property, North 06 deg 51 min 37 sec West 129.53 feet to an iron stake, North 17 deg 20 min 40 sec East 44.83 feet to an iron stake, North 01 deg 02 min 01 sec West 208.58 feet to an iron stake, and North 21 deg 35 min 21 sec West 208.21 feet to an iron stake at an old ditch; thence running along the old ditch North 11 deg 40 min 04 sec West 485.29 feet to a concrete monument, a corner with Nettie W. Johnson; thence running with Nettie W. Johnson North 69 deg 41 min 32 sec West 147.18 feet to an iron stake in the run of Mirey Branch; thence running with Nettie W. Johnson and the run of Mirey Branch the following courses: North 31 deg 24 min 07 sec West 208.54 feet to an iron stake, North 22 deg 37 min 47 sec West 270.22 feet to an iron stake, North 50 deg 31 min 42 sec West 266.38 feet to an iron stake, North 26 deg 15 min 02 sec West 113.34 feet to an iron stake, North 65 deg 36 min 13 sec East 294.78 feet to an iron stake, North 37 deg 08 min 18 sec East 145.76 feet to an iron stake, North 49 deg 31 min 24 sec East 109.69 feet to an iron stake, North 00 deg 23 min 08 sec East 85.04 feet to an iron stake, North 21 deg 48 min 02 sec West 67.43 feet to an iron stake, and North 58 deg 35 min 52 sec East 111.71 feet to an iron stake on the bank of Middle Creek at the intersection of Mirey Branch and Middle Creek; thence running down the run of Middle Creek described by offset courses along the south and east bank of said creek as follows: South 78 deg 36 min 12 sec East 55.17 feet to an iron stake, North 70 deg 53 min 05 sec East 86.73 feet to an iron stake, North 15 deg 53 min 55 sec East 459.39 feet to an iron stake, North 08 deg 20 min 23 sec East 190.25 feet to an iron stake, North 20 deg 06 min 13 sec East 442.60 feet to an iron stake, North 08 deg 51 min 48 sec East 134.82 feet to an iron stake, North 11 deg 41 min 53 sec East 347.50 feet to an iron stake, North 10 deg 41 min 43 sec East 403.70 feet to an iron stake, North 14 deg 23 min 33 sec East 173.45 feet to an iron stake, North 22 deg 15 min 03 sec East 155.45 feet to an iron stake, North 16 deg 42 min 08 sec East 243.12 feet to an iron stake, North 04 deg 15 min 44 sec East 418.93 feet to an iron stake, North 03 deg 43 min 00 sec East 249.21 feet to an iron stake, North 14 deg 31 min 08 sec East 461.98 feet to an iron stake, North

21 deg 17 min 32 sec East 146.38 feet to an iron stake, North 53 deg 22 min 56 sec East 130.58 feet to an iron stake, North 82 deg 05 min 03 sec East 104.38 feet to an iron stake, South 70 deg 10 min 08 sec East 39.71 feet to an iron stake, South 06 deg 24 min 04 sec East 370.36 feet to an iron stake, South 09 deg 35 min 35 sec East 226.55 feet to an iron stake, South 20 deg 24 min 13 sec East 169.72 feet to an iron stake, South 31 deg 00 min 42 sec East 271.32 feet to an iron stake, South 35 deg 07 min 37 sec East 310.75 feet to an iron stake, South 41 deg 56 min 37 sec East 306.96 feet to an iron stake, South 31 deg 49 min 05 sec East 307.78 feet to an iron stake, South 40 deg 29 min 32 sec East 148.50 feet to an iron stake, South 55 deg 33 min 22 sec East 181.73 feet to an iron stake, South 70 deg 15 min 44 sec East 164.67 feet to an iron stake, South 87 deg 50 min 14 sec East 164.68 feet to an iron stake, North 88 deg 30 min 57 sec East 155.06 feet to an iron stake, South 88 deg 32 min 15 sec East 173.12 feet to an iron stake, North 78 deg 40 min 45 sec East 219.74 feet to an iron stake, North 45 deg 03 min 15 sec East 164.90 feet to an iron stake, North 29 deg 00 min 09 sec East 142.18 feet to an iron stake, South 85 deg 08 min 07 sec East 56.78 feet to an iron stake, South 29 deg 31 min 34 sec East 165.40 feet to a concrete monument, South 31 deg 13 min 56 sec East 178.26 feet to an iron stake, North 89 deg 51 min 59 sec East 167.90 feet to an iron stake, South 66 deg 46 min 29 sec East 316.27 feet to an iron stake, South 83 deg 17 min 32 sec East 89.80 feet to an iron stake, North 86 deg 17 min 04 sec East 188.39 feet to an iron stake, North 61 deg 41 min 03 sec East 324.73 feet to an iron stake, North 73 deg 01 min 06 sec East 50.71 feet to an iron stake, South 61 deg 10 min 21 sec East 48.00 feet to an iron stake, South 27 deg 18 min 24 sec East 74.79 feet to an iron stake, South 05 deg 38 min 08 sec West 53.63 feet to an iron stake, South 23 deg 41 min 44 sec West 67.84 feet to an iron stake, South 41 deg 33 min 11 sec West 66.83 feet to an iron stake, South 57 deg 37 min 16 sec West 160.30 feet to an iron stake, South 50 deg 24 min 44 sec West 117.45 feet to an iron stake, South 31 deg 50 min 11 sec West 108.90 feet to an iron stake, South 22 deg 13 min 16 sec West 141.30 feet to an iron stake, South 02 deg 48 min 08 sec West 76.11 feet to an iron stake, South 39 deg 28 min 52 sec East 132.97 feet to an iron stake, South 23 deg 53 min 28 sec East 184.67 feet to an iron stake, South 44 deg 45 min 38 sec East 264.20 feet to an iron stake, South 65 deg 52 min 43 sec East 120.12 feet to an iron stake, South 86 deg 37 min 42 sec East 94.34 feet to an iron stake, South 25 deg 25 min 08 sec East 109.36 feet to an iron stake, South 06 deg 53 min 33 sec East 149.38 feet to an iron stake, North 89 deg 19 min 29 sec East 219.81 feet to an iron stake, North 34 deg 54 min 27 sec East 86.22 feet to an iron stake, North 10 deg 34 min 11 sec West 112.41 feet to an iron stake, South 77 deg 36 min 31 sec East 37.42 feet to an iron stake, South 26 deg 12 min 44 sec East 100.23 feet to an iron stake, South 04 deg 18 min 13 sec East 91.25 feet to an iron stake, South 42 deg 54 min 29 sec West 127.36 feet to an iron stake, South 31 deg 34 min 17 sec East 95.08 feet to an iron stake, South 88 deg 15 min 13 sec East 84.70 feet to an iron stake, North 62 deg 42 min 02 sec East 60.13 feet to an iron stake, and North 44 deg 44 min 42 sec East 74.08 feet to an iron stake with black gum pointers on the east bank of Middle Creek at the intersection of Buzzard Branch with Middle Creek; thence running up the run of Buzzard Branch the following courses: South 17 deg 13 min 00 sec West 116.30 feet to an iron stake, South 09 deg 55 min 05 sec East 175.47 feet to an iron stake,

South 27 deg 23 min 32 sec West 190.97 feet to an iron stake, South 08 deg 55 min 27 sec West 115.80 feet to an iron stake, South 48 deg 54 min 17 sec West 152.20 feet to an iron stake, South 56 deg 44 min 27 sec West 120.01 feet to an iron stake, South 51 deg 48 min 17 sec West 129.44 feet to an iron stake, South 44 deg 29 min 17 sec West 93.66 feet to an iron stake, South 70 deg 23 min 27 sec West 116.70 feet to an iron stake, South 58 deg 27 min 12 sec West 140.61 feet to an iron stake, South 35 deg 36 min 28 sec West 230.10 feet to an iron stake, South 40 deg 36 min 37 sec West 128.10 feet to an iron stake, South 26 deg 04 min 42 sec West 73.93 feet to an iron stake, South 65 deg 31 min 39 sec West 109.59 feet to an iron stake, South 36 deg 17 min 21 sec West 244.55 feet to an iron stake, South 21 deg 54 min 07 sec West 121.93 feet to an iron stake, South 16 deg 54 min 47 sec West 156.79 feet to an iron stake, South 01 deg 34 min 33 sec East 113.67 feet to an iron stake, South 14 deg 58 min 07 sec West 120.21 feet to an iron stake, South 08 deg 59 min 03 sec East 123.87 feet to an iron stake, South 09 deg 08 min 35 sec West 89.67 feet to an iron stake, South 25 deg 56 min 45 sec West 92.18 feet to an iron stake, and South 10 deg 06 min 36 sec West 114.48 feet to a concrete monument at the head of Buzzard Branch; thence running South 51 deg 43 min 11 sec East 136.60 feet to an iron stake in the center of a 30' easement (D.B. 862, pg. 668) to NCDOT; thence running along the center of the 30' easement the following courses: South 34 deg 27 min 13 sec West 180.00 feet to an iron stake, South 48 deg 28 min 13 sec West 84.66 feet to an iron stake, South 74 deg 48 min 13 sec West 300.00 feet to an iron stake, South 86 deg 03 min 13 sec West 300.30 feet to an iron stake, and South 68 deg 31 min 13 sec West 719.30 feet to a railroad spike in the center of County Home Road; thence running along the center of County Home Road South 03 deg 31 min 04 sec West 591.78 feet to a PK nail, the point of beginning, containing 500.12 Acres, more or less, as shown with a survey and map by L. Dennis Lee, P.A., dated 3-22-94 and entitled "Map for Johnston County".

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services



January 9, 2002

Mr. Bobby Lutfy
NCDENR
Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Response to Comments
Hydrologic Review of Revised Design Hydrogeologic Report
Johnston County Landfill - Phase 4A
Smithfield, North Carolina

Dear Mr. Lutfy:

G. N. Richardson and Associates, Inc. (GNRA) has received your comment letter of October 30, 2001 regarding the above referenced project. This letter is written in response to those comments and to transmit revised data for the Design Hydrogeologic Report. Included with this letter are the following:

- Revised Text for the Design Hydrogeologic Report;
- Revised Figure 4;
- Revised Figures 15 and 16;
- Revised Boring Log for MW-8D;
- Revised Tables 5 and 6
- Revised first page for Appendix G;
- Revised Water Quality Monitoring Plan for Appendix J.

The following is our response to each of your comments. For ease in review, we have included your comments in this letter (written in italics) followed by our responses.

Comment #1
Page 1 - On the first line of page 1, the "piggy back" expansion phase is between unlined MSWLF units, not lined.

Response
The wording of this sentence has been revised.

Comment #2
Page 1 - The last line of page 1 should be deleted...

Response
This sentence has been deleted.

Comment #3
Page 3 - Inert debris is defined differently from Construction and Demolition debris. There the word "inert" should be deleted from the last sentence of the first paragraph in Section 2.4.

Response
The word "inert" has been deleted.

Comment #4
Page 4 - There is an erroneous statement that "a Water Quality Monitoring Plan is not included with this document".

Response
This statement has been revised to indicate the location of the Water Quality Monitoring Plan.

Comment #5
Page 4 - The statement is made that "this phase (Phase 4A) will be constructed as a double-lined landfill for portions of the landfill..." If it is not possible for Phase 4A to be monitored separately from Phases 3 and 4, then the entire Phase 4A will need to be double-lined in order to effectively monitor this Phase distinctly.

Response
We will modify the landfill design such that the entire Phase 4A footprint will be double-lined. The double liner system design will be submitted to NCDENR under separate cover after receipt of any other comments from NCDENR regarding the engineering design of the project (Permit to Construct Application Volume 1 of 2). The text of the Design Hydrogeologic Report has been modified to reflect this change.

Comment #6
Page 5 - Section 3.4 should read: There are no Holocene age fault zones....

Response
The correction has been made in the revised text included with this letter.

Comment #7
Pages 9 and 10 - Section 4.3.3 should reference the proposed spray irrigation plan for the landfill site and how this could influence ground-water levels.

Response
This section has been revised to include the requested information.

Comment #8
Page 10 - Section 4.3.4 references the "Geophex Report is provided in Appendix G", however, the Table of Contents references Appendix I.

Response
The reference has been corrected.

Comment #9
Page 11 - For Section 4.4.1, refer to previous comment above regarding the second comment for Page 4.

Response
See response to Comment #5. The text has been changed to reflect the change in design.

Comment #10
Page 11 - Section 4.4.2 is somewhat confusing in the usage of the terms "units" and "aquifers". It should be made clear that there is only one aquifer system which includes the unconsolidated soils and the fractured bedrock. Reference to a "second aquifer" should be deleted.

Response
This section has been revised in accordance with the above comment.

Comment #11
Page 12 - The last paragraph of Section 4.4.2 is also confusing. While the fracture flow is different from the porous flow, it is my understanding that there is one interconnected aquifer system. Comments of the "aquifer thickness" need to clarified and revised.

Response
This section has been revised in accordance with the above comment.

Comment #12
Page 12 - Section 4.4.3 discusses ground-water recharge and discharge conditions. The report seems to accurately conclude that there is ground-water discharge to the lower portion of the unnamed tributary that drains the Phase 4A area. If this is the case, I again raise the question of the need for a french drain system for the lower portion of this drainage. (The need for this would be augmented by the proposed spray irrigation program at the landfill site.)

Response
The section of this drainage that indicates discharge flow during seasonal high water table conditions (as seen during Hurricane Floyd) is only the lower, northern-most, 200 feet of the draw. This section is outside the footprint of the landfill. Additionally, once the storm water from Phases 1 and 2 is diverted from this area it is likely that the water table in this area will be lowered further. Although irrigation is planned for the covers of Phases 3 and 4, the irrigation rate will be 0.1 inches/day. This irrigation rate should not raise ground water levels and is not expected to create a need for a french drain system beneath the landfill.

Comment #13
Page 14 - There is still some confusion on how effective porosity values were determined. There are some references to empirical values from Groundwater and Wells and other references to values based on soil analyses and the use of the Textual Classification Triangle. The effective porosity values that appear in Tables 5 and 6 do not appear consistent with the soils data plotted on the Textual Classification Triangle.

Response
For well samples in which a sieve analysis was performed, the textural classification triangle was used to determine effective porosities. For wells where a sieve analysis was not performed, empirical values from Groundwater and Wells was used. Page 14 and Tables 5 and 6 have been revised to reflect this.

Comment #14
Page 14 - As previously referenced, if the Phase 4A area can not be monitored separately from the unlined landfill units, then the entire Phase 4A unit needs to have a leak detection system using the double-liner system. What is the basis for establishing an Action Leakage Rate of 3,000 gallons per day? The water quality of the leakage should be monitored at least semi-annually, at the time of water quality monitoring. The mouth of the drainage feature for Phase 4A is a critical ground water monitoring location. Ground water monitoring needs to be included for this area.

Response
A double-liner system for the entire Phase 4A footprint will be designed and submitted under separate cover to ensure monitor-ability of Phase 4A. Regarding the Action Leakage Rate, the calculation for the rate is in the Facility And Engineering Plan included in the Permit to Construct Application Volume 1 of 2. A copy of the calculation is included with this letter for clarity. It should be noted that the actual calculated ALR was significantly higher than the proposed 3,000 gallons per day which is based upon an EPA recommended value of 100 gallons/acre/day. This value is based upon recent studies by the U.S. EPA.

Comment #15
Figure 4 - The Aerial Photograph is not legible

Response
A new copy is enclosed. Please note that due to the poor quality of the original photograph, a clear copy is difficult to produce. We have attempted to provide a clearer copy for your review. It should be noted that within the 2000 foot radius the area consists almost exclusively of farmland and woods.

Comment #16
Figures 15 and 16 - The ground water contours in the vicinity of well CDLMW-5 are still inconsistent with the data on both figures. The ground water contours are still somewhat questionable in the vicinity of the MW-9 well cluster. While the contours are consistent with the wells, they cross over topographic contours indicating above ground flow. (Some of the problem may result from the plotting of well locations. For example MW-10 is plotted on the figures at a ground surface elevation of about 168, while Table 1 indicates an elevation of over 173.) Comparing the ground water contours with the topographic contours, both figures indicate surface water flow fairly far up all three drainage features. This may need to be re-evaluated.

Response
Both figures have been revised in accordance with this comment and are included for your review. Regarding the area surrounding MW-9 and MW-10, these contours have been revised to

reflect ground water flow, not surface water flow, in these areas. This is consistent with what is seen on-site.

Comment #17
Table 2 - the Top of Casing Elevation (and ground surface elevation) on the revised Borehole Log for MW-8d is still inconsistent with the data on Table 2).

Response
The borehole log has been revised and is included with this letter for your review.

Comment #18
Table 5 and Table 6 - It is still not clear how the Effective Porosity Values were determined. It appears that some are still based upon empirical book values and others are stated to be based upon soil analyses and use of the Textual Classification Triangle. It is not clear which values were arrive at by which method. I was not able to match any data I plotted on the Textual Classification Triangle with data reported in the Tables. Site specific samples are preferred, however the samples should be representative of the saturated portion of the formation being referenced. The Table of Contents should reference Table 5A.

Response
See response to Comment #13.

Comment #19
Appendix F - Refer to previous comments regarding well MW-8d.

Response
The boring log has been revised.

Comment #20
Appendix G - In the Table at the beginning of Appendix G, the value for the % passing #200 for the first PZ-5s sample should be 25.9.

Response
This table has been revised and is included with this letter for your review.

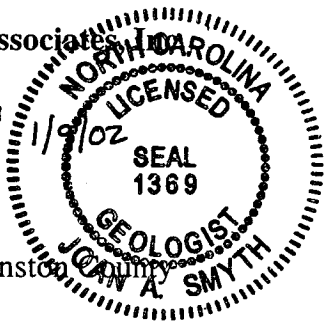
The remainder of comments refer to the Water Quality Monitoring Plan. The Water Quality Monitoring Plan has been revised in accordance with these comments and is included in its entirety for your review.

Upon completion of your review of the attached revised portions of the Design Hydrogeologic Report, please place these revised sections in the Report that you currently have, and remove the former versions. If you have any questions, or require additional information, please contact me at your earliest convenience.

Sincerely,
G. N. Richardson and Associates, Inc.

Joan A. Smyth

Joan A. Smyth, P.G.
Project Hydrogeologist



cc: Tim Broome - Johnston County

PROJECT Johnston County MSW Landfill - Phase 4A

SUBJECT Leak Detection System Calculations

SHEET 1 OF 4
JOB NO. JOHNSTON-9
DATE 12/17/99
COMPUTED BY PKS
CHECKED BY GNR

Objective

To determine the performance of a layer of geonet drainage media (GDM) in the leak detection system (LDS) and select an Action Leakage Rate (ALR) based on predicted GDM performance.

Reference

Richardson, G.N. "Design of Waste Containment Liner and Final Cover Systems" - Course Notes, American Society of Civil Engineers, pp. 2-64 - 2-68, 3-78 - 3-91.

Assumptions

- GDM minimum transmissivity = 4.1 x 10^{-4} $m^3/m/sec$ at a hydraulic gradient of 0.25 and a compressive load of 8,000 psf (≈ 114' waste @ 70 pcf) (per project specifications). Use this value in the calculations. This will yield a conservatively long detection time and a conservatively low ALR in that most areas will have less than 114 feet of overlying waste and most slopes are less than 25% (lower gradients typically yield higher transmissivity values in GDM).

- The maximum allowable head in the GDM is 0.20 inches (= minimum thickness).

- Leakage is uniform over the entire landfill.

- Darcy's Law is valid for all flow conditions considered.

- For detection time calculations, time for flow in collection piping is minimal.

Analysis

Based on the minimum required transmissivity for the GDM to be used, use Darcy's Law to determine the travel (detection) time along the longest flow path. For selecting the ALR, again use Darcy's Law to calculate the maximum saturated flow in the GDM to each collection point. Divide the maximum saturated flow by a factor of safety of 3 to select the ALR for each collection point.

Equations

Darcy's Law:

$$Q = kiA = \theta iw$$

where:

- Q = Flow (m^3/s)
- k = Hydraulic conductivity of GDM (m/sec)
- i = Flow gradient or slope (m/m)
- A = Area of flow = $t \times w$ (m^2)
- t = Thickness of GDM (m)
- w = Unit width of GDM (m)
- θ = GDM transmissivity ($m^3/m/s$).

LEAKDETECTION.WPD

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services
425 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

Detection Time:

In that continuity must exist:

$$Q = VA$$

where: V = Flow velocity = length (l)/time (m/s)
A = Area of flow = $t \times w$ (m^2).

thus: (l/time) ($t \times w$) = $\theta i w$

therefore: $$DetectionTime = \frac{lt}{\theta i}$$

For hazardous waste (Subtitle C) landfills the recommended maximum detection time is 24 hours. However, detection times of several days is an adequate detection time for MSW landfills.

Action Leakage Rate (ALR):

$$ALR = Q/FS = \theta i w$$

where: FS = Factor of safety (= 3)
i = Slope of GDM into collection point (m/m)
w = Width of GDM along collection point (m).

G.N. Richardson & Associates
ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 314
JOB #: JOHNSTON-9
DATE: 12/17/99
BY: PKS
CHKD BY: GNR

Johnston County MSW Landfill - Phase 4A
Leak Detection System Calculations

Input Parameters:

Geonet Drainage Media Thickness (t) =	0.2 in 0.005 m		(User Input)
Geonet Drainage Media Transmissivity (Theta) =	4.1E-04	m^3/m/s	(User Input)
Action Leakage Rate (ALR) Factor of Safety (FS) =	3		(User Input)

Note: Spreadsheet Converts Units as Required.

Leak Detection Trench	Maximum Flow Length (ft)	Slope of GDM To LD Trench	Width of LD Trench (ft)	Detection Time (days)	Q (m^3/day)	ALR (Gallons/Day)
1	245	0.07	1610	0.2	1217	107145
2	250	0.07	1570	0.2	1187	104483
3	215	0.07	1260	0.1	952	83853
4	1145	0.02	1285	2.5	277	24433

See Attached

<3 Days O.K. Short Time

LEAKDETECTION WB3

ALR is much higher than anticipated flows based on recent studies sponsored by USEPA. Typical values of 0-86 gallons/acre/day initially to 0-15 gal./ac./day during operations have been reported for composite GM/GCL primary liner systems. Therefore, use EPA recommended value of 100 gallons/ac/day.

∴ 100 gal/ac./day x 31.4 ac lined ⇒ 3,140 gallons

SAY ALR = 3,000 gallons/day

SIZE COLLECTION PIPE:

- Conservatively use peak ALR determined above (107,145 gal/day ⇒ 0.17 cfs) → Q

$$\text{Req'd. Pipe Diam.} = 16\left[\frac{Q \times n^{0.01}}{\sqrt{S}}\right]^{.375}$$ (Manning's Eqn. - Pipes Flowing Just Full)

→ 0.02 min.

$$D_{reqd} = 16\left[\frac{(.17)(.01)}{\sqrt{.02}}\right]^{.375} = 3.0''$$ ⇒ USE 4" O.K.

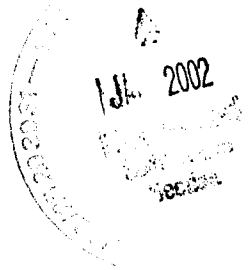
(Very Conservative For Actual Flows)

G.N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services

TRANSMITTAL FORM

If enclosures are not as noted or
if you require additional information,
please notify us immediately

January 7, 2002



Mr. Ed Mussler, P.E.
NC DENR Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, NC 27605

SUBJECT: **Johnston County MSW Landfill - Phase 4A Permit to Construct Application**

GNRA PROJECT NO: **JOHNSTON-9**

We are sending you the following items:

COPIES	ITEM	DESCRIPTION
1	Letter	Response to Comments/Description of Revisions
1	Revised Sections	Revised Sections as Listed Below
1	Revised Drawings	Revised Permit Drawings

These are transmitted as checked below:

[ ] For Information
[ ] As Requested
[ ] For Review and Comments
[ ] For Revision
[X] For Approval
[ ] Approved
[ ] Approved as Noted
[ ] Approved as Noted-Revise and Resubmit
[ ] Not Approved-Revise and Resubmit
[ ] For Record and File
[ ] Submittal
[ ] For Recording

REMARKS: Ed: These sections and drawings were revised per changes made to the liner system as a result of our discussions with yourself and Bobby Lutfy in the past few weeks as well as due to some general edits to various details and report sections that GNRA would like to include at this time. Please find attached a revised Title Sheet/Spine & Executive Summary, Attachment A (Facility and Engineering Plan), Attachment B (Tech. Specs.), Attachment C (CQA Manual), Attachment E (Closure/Post-Closure Plan), Attachment G (Slope Stability & Piggyback Liner Evaluation), Attachment H (Alternative Liner Evaluation), and Attachment I (Project Drawings). Edits made to the Design Hydrogeologic Report have been submitted under separate cover to Bobby's attention.

cc:

Pieter K. Scheer, P.E.

425 N. BOYLAN AVENUE • RALEIGH, NORTH CAROLINA 27603 • TEL. 919-828-0577 • FAX. 919-828-3899

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

January 25, 2002

Mr. Pieter Scheer
G.N. Richardson & Associates
425 North Boylan Avenue
Raleigh, NC 27603

51-03

RE: Permit to Construct Application, Johnston County MSW Landfill, Phase 4A, Permits 51-01 and 51-02

The NC Division of Waste Management, Solid Waste Section (Section) has completed its review of the engineering portion of the permit to construct application for the above referenced facility. Rule .1603 (a)(1), of the NC Solid Waste Management Rules (15A NCAC 13B .1600), directs that an application for permit amendment shall be submitted as set forth in Paragraph (a) of Rule .1617. The section hydrogeologist has reviewed the Hydrogeologic Report section of the permit amendment application and sent a review under separate cover. The hydrogeologic section of the application has been determined to be complete.

When reviewing and editing comments on the quality assurance plan and/or the technical specifications, please ensure that both documents are consistent. Comments or questions on one section may not be duplicated for the other section, but could apply to both. Based on its review, the Section requests the following information:

FACILITY PLAN

1. Johnston County will need to provide a legal description of the property or properties that make up the facility, sufficient to record the permit against. Typically this is the deed with meets and bounds. If several properties have been previously consolidated and recorded, then that instrument may suffice.
2. 2.6.3 Leak Detection System. Are the pumps equipped to automatically pump the leak detection system, or is this a manual operation? If it is not automatic, what is the plan or procedure to check this system? How is the liquid removed measured? The removed liquid measurement should be recorded and included in the facility records that are kept. (See also operations plan/record keeping and Section 4 of the Facility Plan)
3. 4.4 Leachate Discharge and Storage System- Are the pumps automatic? How is the leachate volume measured? The removed liquid measurement should be recorded and included in the facility records that are kept. (See also operations plan/record keeping)

OPERATIONS MANUAL

4. The Solid Waste Section has modified Johnston County's landfill permit to provide for leachate recirculation in Phase 5, use of alternate daily cover, and to provide a procedure to spray irrigate reclaimed wastewater at the facility. Please consolidate the appropriate portions of the respective plans into one operations manual. The manual should also include the operation requirements for the C&D disposal area.

5. 1.6.1 Fire Control- This Section should be expanded for the benefit of the owner/operator.
6. 2.4 Waste Screening- Is the number of vehicles inspected sufficient, such that it meets recommendations that 1-2% of the waste stream be routinely, randomly, inspected? What types of trucks are targeted for inspection? How is the random truck chosen?
7. 2.5.3-Cell Activation- It is recommended that a notation be placed in the facility operating record that the GT-S separator textile has been removed from the gravel columns, prior to activating the cell or subcell.
8. 2.7-Height Monitoring- How is this done or measured?
9. 3.3.1.3- What is the allowable discharge to the sewer treatment plant? Is a procedure needed to ensure that adequate draw down is performed in a timely manner in the advent of a hurricane or other tropical disturbance?
10. 3.3.3-Leachate Quality Sampling- Leachate must be analyzed for the listed parameters as well as Appendix I constituents (I assume that is what the metals and volatile scan refers to, please clarify) sulfates and nitrates. Leachate recirculation in Phase V requires more frequent leachate analysis. A plan should also be presented to the Section which contains a provision to collect samples from the leachate removal risers and not as a grab sample from the lagoon. Leachate data provided to the section, that has been drawn from the large volume storage facility, is not representative of leachate quality. All facilities are being required to upgrade their leachate sampling plans.
11. 3.3.4 Record Keeping - What records are kept and at what frequency?
12. 3.3.5- The Section should be notified in advance of any plan to store leachate in the landfill unit.

When submitting revisions to the application, the changed pages should be clearly identified with a revision date in either the header or the footer. It is not necessary to submit five copies of the revisions. Two copies will suffice. When the application is finalized and there are no more changes, then a total of five copies will be needed. The final version of the application should also contain an appendix with copies of correspondence and response to comments.

These comments are intended to expedite the review of the referenced application, and in no way do they restrict the Section's right to request additional information during the technical review process. If you have any additional questions or need help, please feel free to call me at (919) 733-0692 Ext. 343. My email address is : ed.mussler @ncmail.net.

Sincerely,

Edward F. Mussler III, P.E.
Environmental Engineer
Solid Waste Section

cc: Mark Fry, SWS
Jim Barber, SWS
Robert Hearn
Haywood Phthisic, Johnston County
File

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services

FAX TRANSMITTAL SHEET

PLEASE DELIVER THE FOLLOWING TO: 51-03

NAME: Ed Mussler

COMPANY: NC DWM

FAX NUMBER: 715-3605

FROM: Pieter Scheer

DATE: 1/25/02 TIME:

REFERENCE: Johnston County - Phase 4A - E&S Control Permit

COMMENTS: Ed: Please see the attached per my e-mail.

Total number of pages including cover sheet: 3

Please call if there are problems with this fax.

State of North Carolina Department of Environment and Natural Resources
Raleigh Regional Office

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

NCDENR
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

RECEIVED
JUL 18 2001

DIVISION OF LAND RESOURCES
LETTER OF APPROVAL
July 11, 2001

Johnston County
P. O. Box 2263
Smithfield, NC 27577
ATTN: Haywood Phthisic

RE: Project Name: J. C. Landfill, Phase 4
County: Johnston
Submitted by: G. N. Richardson & Assoc, Inc.
Date Received: June 18, 2001, June 25, 2001
Date Processing Initiated: June 18, 2001
Watershed: Neuse #1/03-04-02
New Submittal (X) Revised ( )

Dear Mr. Phthisic:

This office has reviewed the subject Erosion and Sedimentation Control Plan. We find the plan to be acceptable and hereby issue this letter of approval. If any modifications, performance reservations, or recommendations are applicable, a list is enclosed and is incorporated as a part of this letter of approval. The enclosed Certificate of Approval should be posted at the job site. In addition, it should be noted that this plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, in accordance with Title 15A, North Carolina Administrative Code (NCAC) 4B.0029.

If any modifications are not incorporated into the plan and implemented in the field, the site will be in violation of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute (NCGS), 113A-61.1).

15A NCAC 4B.0018(a) requires that a copy of the approved plan be on file at the job site. Also, this letter gives the notice required by NCGS 113A-61.1(a) concerning our right to perform periodic inspections to ensure compliance with the approved plan.

North Carolina's sedimentation pollution control program is performance oriented, requiring protection of the natural resources and adjoining properties. If at any time during this project it is determined that the Erosion and Sedimentation Control Plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (NCGS 113A-51 through 66), this office may require revisions in the plan and its implementation to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with applicable federal and state water quality laws, regulations and rules. This could include the Division of Water Quality under stormwater or other specific water quality standards, and the U.S. Army Corps of Engineers under Article 404 jurisdiction. Our approval does not supersede any other required permit or approval.

Due to the location of this project, it should be noted that a rule to protect and maintain existing buffers along watercourses in the Neuse River Basin became effective on July 22, 1997. The Neuse River Riparian Area Protection and Maintenance Rule (15A NCAC 2B .0233) applies to all perennial and intermittent streams, lakes, ponds and estuaries in the Neuse River Basin with existing vegetation on the adjacent land or "riparian area". In riparian areas with existing vegetation in the first 30 feet directly adjacent to the stream, the rule prohibits land disturbance or new development within the first 30 feet of land next to the water (the remaining 20 feet of the total buffer must be revegetated upon completion of any proposed land-disturbing activity). In riparian areas with existing vegetation that is less than 30 feet wide, the rule prohibits land disturbance or new development within the area that contains the existing vegetation (but not the entire 50 foot riparian area). For more information about this riparian area rule, please contact the Division of Water Quality's Wetland/401 Unit at 919-733-1786, or a Division of Water Quality representative at this regional office.

Please note that this approval is based in part on the accuracy of the information provided concerning financial responsibility. You are requested to file an amended Financial Responsibility Form if any changes become necessary. In addition, it would be helpful if you would notify this office when the proposed land-disturbing activity covered by this plan is initiated.

Your cooperation is appreciated and we look forward to working with you on this project. If there are any questions, please do not hesitate to contact this office.

Sincerely,

John L. Holley, Jr., P.E., CPESC
Regional Engineer
Land Quality Section

JLH:clm
cc: Pieter K. Scheer, P.E., G. N. Richardson & Associates, Inc.
Mr. Ken Schuster, P.E., Division of Water Quality

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

January 24, 2002

Mr. Haywood Phthisic
Public Utilities Director
Johnston County Department of Public Utilities
P.O. Box 2263
Smithfield, NC 27577

51-03

Re: Johnston County Landfill, Cell 4A, New Facility Designation, Permits 5101 and 5102, Site Study Approval

Dear Mr. Phthisic,

The Solid Waste Section (Section) of the Division of Waste Management has conducted review of the Cell 4A proposal at the Johnston County Landfill. The proposed development of Cell 4A qualifies the existing facilities (5101 and 5102) as a new facility. Rule .1603(a)(1)(E) defines a new facility as one that has a substantial change to the waste stream defined in the effective permit.

A permit to construct application for Cell 4A has been filed with the Section. Included in this permit application were demonstrations to update the existing site study of the landfill locale, in conformance with the Solid Waste Management Rules. A detailed site study was performed in 1995 for facility 5102 which is adjacent to the original landfill, 5101.

The Section has completed its review of the information submitted to update the site study report for the Johnston County Municipal Solid Waste Landfill Facilities, current permits numbers 5101 and 5102. Pursuant to Rule .1618(a)(1), Johnston County is hereby notified that the combined facilities, as proposed in the conceptual plan, are suitable for development as a solid waste management facility.

The Permit to Construct Application shall be prepared in accordance with 15A NCAC 13B.1617(a) and shall address the first five-year phase of landfill development. The Permit to Construct Application should be in general accordance with the conceptual plan shown in the Site Study.

Solid Waste Management Rule .0201 requires the Division to issue a solid waste permit in two parts. The first part is a Permit to construct and the second part is a Permit to Operate. This letter is not a permit. This letter only informs the applicant that they may proceed with their permit application. The final action the Division may take on a permit application is the issuance or denial of a permit. If you have any questions, please contact Ed Mussler at 919-733-0692, extension 343.

Sincerely,

James C. Coffey

James C. Coffey, Acting Section Chief
Solid Waste Section

cc: Pieter Scheer, P.E. GNRA
Jim Barber, DWM
Mark Fry, DWM
Robert Hearn, DWM

NCDENR
North Carolina Department of Environment and Natural Resources
Michael F. Easley, Governor
William G. Ross Jr., Secretary

January 23, 2002

Mr. James H. Longdon, Jr.
Chairman
Johnston County Board of Commissioners
P. O. Box 1049
Smithfield, N. C. 27577

Re: Johnston County Landfill Phase 4-A

Dear Mr. Longdon,

The Division of Waste Management has provided the following schedule that would lead to the permit for the Phase 4A section:

By February 8, 2002, receive and review any remaining requested comments from the County's consultant and prepare draft permit;
By February 10, 2002, publish public notice;
March 28, 2002, following required 45 day period, the permit is issued.

This schedule assumes no major issues are raised during the public comment period.

It is noted that in September, 2001, the Division of Waste Management issued an approval for the county to commence specific site preparation work, related to sedimentation and erosion control, which would have to be done whether or not the facility was built and would have to be done before construction could begin. During the past six months, the Division staff also participated in the review of a county proposal to spray irrigate reclaimed wastewater on the landfill.

I hope the above noted schedules will meet your solid waste disposal planning needs.

Sincerely,

Dempsey E. Benton

cc Dexter Matthews
(johnstonlandfill)

1601 Mail Service Center, Raleigh, North Carolina 27699-1601
Phone: 919-733-4984 \ FAX: 919-715-3060 \ Internet: www.enr.state.nc.us/ENR/

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G.N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services

TRANSMITTAL FORM

If enclosures are not as noted or
if you require additional information,
please notify us immediately

January 7, 2002

Mr. Ed Mussler, P.E.
NC DENR Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, NC 27605

SUBJECT: **Johnston County MSW Landfill - Phase 4A Permit to Construct Application**

GNRA PROJECT NO: **JOHNSTON-9**

We are sending you the following items:

COPIES	ITEM	DESCRIPTION
1	Letter	Response to Comments/Description of Revisions
1	Revised Sections	Revised Sections as Listed Below
1	Revised Drawings	Revised Permit Drawings

These are transmitted as checked below:

[ ] For Information
[ ] As Requested
[ ] For Review and Comments
[ ] For Revision
[X] For Approval
[ ] Approved
[ ] Approved as Noted
[ ] Approved as Noted-Revise and Resubmit
[ ] Not Approved-Revise and Resubmit
[ ] For Record and File
[ ] Submittal
[ ] For Recording

REMARKS: Ed: These sections and drawings were revised per changes made to the liner system as a result of our discussions with yourself and Bobby Lutfy in the past few weeks as well as due to some general edits to various details and report sections that GNRA would like to include at this time. Please find attached a revised Title Sheet/Spine & Executive Summary, Attachment A (Facility and Engineering Plan), Attachment B (Tech. Specs.), Attachment C (CQA Manual), Attachment E (Closure/Post-Closure Plan), Attachment G (Slope Stability & Piggyback Liner Evaluation), Attachment H (Alternative Liner Evaluation), and Attachment I (Project Drawings). Edits made to the Design Hydrogeologic Report have been submitted under separate cover to Bobby's attention.

cc:

Pieter K. Scheer, P.E.

425 N. BOYLAN AVENUE • RALEIGH, NORTH CAROLINA 27603 • TEL. 919-828-0577 • FAX. 919-828-3899

NCDA Agronomic Division 4300 Reedy Creek Road Raleigh, NC 27607-6465 (919) 733-2655 Report No: W09531 W

Waste Analysis Report

Grower: City of Raleigh
Attn: Don Edwards
PO Box 590
Raleigh, NC 27602

Copies To:

Farm:

6/12/02

Wake County

Sample Info.	Laboratory Results (parts per million unless otherwise noted)														
Sample ID:	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C	
1	Total 9429	2338	1492	211784	2461	10236	4598	81.1	89.4	81.7	55.6				
	IN -N														
Waste Code:	-NH4														
MLS	-NO3	Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)	
Description:	OR-N	798	14.5	0.20	13.2				11.89	368		81.28	73.75	1.50	
Municipal (Lime Stab.)	Urea														

Recommendations:	Nutrients Available for First Crop lbs/ton (wet basis)													Other Elements lbs/ton (wet basis)						
Application Method	N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Na	Ni	Cd	Pb	Al	Se	Li
Broadcast	4.3	5.2	2.3	206.6	2.4	10.0	4.5	0.08	0.09	0.08	0.05			1.3	0.02	T	0.02			
Soil Incorp	6.1	6.5	2.6	258.2	3.0	12.5	5.6	0.10	0.11	0.10	0.07			1.3	0.02	T	0.02			

The waste product has a high neutralizing value and should only be applied at rates needed to increase soil pH to the desired range. The ALE indicates the amount of the waste required to equal the neutralizing value of one ton of agricultural lime.

Sample Info.	Laboratory Results (parts per million unless otherwise noted)														
Sample ID:	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C	
2	Total 10011	2678	1387	197512	2532	9572	5342	94.7	103	77.4	58.5				
	IN -N														
Waste Code:	-NH4														
MLS	-NO3	Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)	
Description:	OR-N	772	14.6	0.33	16.1				11.84	388		66.68	72.25	1.90	
Municipal (Lime Stab.)	Urea														

Recommendations:	Nutrients Available for First Crop lbs/ton (wet basis)													Other Elements lbs/ton (wet basis)						
Application Method	N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Na	Ni	Cd	Pb	Al	Se	Li
Broadcast	3.7	4.9	1.8	158.0	2.0	7.7	4.3	0.08	0.08	0.06	0.05			1.0	0.02	T	0.02			
Soil Incorp	5.3	6.1	2.0	197.6	2.5	9.6	5.3	0.09	0.10	0.08	0.06			1.0	0.02	T	0.02			

The waste product has a high neutralizing value and should only be applied at rates needed to increase soil pH to the desired range. The ALE indicates the amount of the waste required to equal the neutralizing value of one ton of agricultural lime.

Sample Info. | Laboratory Results (parts per million unless otherwise noted)

Sample ID:		N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
3	Total	12304	2574	1446	211068	2501	10754	4708	87.5	95.9	93.6	55.0			
	IN -N														
Waste Code:	-NH4														
MLS	-NO3														
Description:	OR-N														
Municipal (Lime Stab.)	Urea														

Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)
828	14.4	0.25	14.0				11.87	480		78.30	82.00	1.40

Recommendations: Nutrients Available for First Crop — lbs/ton (wet basis) | Other Elements — lbs/ton (wet basis)

Application Method	N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Na	Ni	Cd	Pb	Al	Se	Li
Broadcast	5.4	5.5	2.2	198.3	2.4	10.1	4.4	0.08	0.09	0.09	0.05			1.3	0.02	T	0.02			
Soil Incorp	7.7	6.9	2.5	247.9	2.9	12.6	5.5	0.10	0.11	0.11	0.06			1.3	0.02	T	0.02			

The waste product has a high neutralizing value and should only be applied at rates needed to increase soil pH to the desired range. The ALE indicates the amount of the waste required to equal the neutralizing value of one ton of agricultural lime.

Sample Info. | Laboratory Results (parts per million unless otherwise noted)

Sample ID:		N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
4	Total	5737	2457	1124	228390	2970	19880	5148	84.4	95.3	74.2	67.0			
	IN -N														
Waste Code:	-NH4														
MLS	-NO3														
Description:	OR-N														
Municipal (Lime Stab.)	Urea														

Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)
598	8.16	0.23	11.0				11.89	406		65.63	83.00	1.70

Recommendations: Nutrients Available for First Crop — lbs/ton (wet basis) | Other Elements — lbs/ton (wet basis)

Application Method	N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Na	Ni	Cd	Pb	Al	Se	Li
Broadcast	2.1	4.4	1.4	179.9	2.3	15.7	4.1	0.07	0.08	0.06	0.05			0.79	0.01	T	0.01			
Soil Incorp	3.0	5.5	1.6	224.8	2.9	19.6	5.1	0.08	0.09	0.07	0.07			0.79	0.01	T	0.01			

The waste product has a high neutralizing value and should only be applied at rates needed to increase soil pH to the desired range. The ALE indicates the amount of the waste required to equal the neutralizing value of one ton of agricultural lime.

Sample Info. | Laboratory Results (parts per million unless otherwise noted)

Sample ID:		N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
5	Total	13862	3712	1117	199649	2983	8590	6447	125	139	78.6	55.4			
	IN -N														
Waste Code:	-NH4														
MLS	-NO3														
Description:	OR-N														
Municipal (Lime Stab.)	Urea														

Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)
638	9.71	0.60	13.1				11.8	346		58.74	82.75	1.90

Recommendations: Nutrients Available for First Crop — lbs/ton (wet basis) | Other Elements — lbs/ton (wet basis)

Application Method	N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Na	Ni	Cd	Pb	Al	Se	Li
Broadcast	4.6	6.0	1.3	140.7	2.1	6.1	4.5	0.09	0.10	0.06	0.04			0.75	0.01	T	0.02			
Soil Incorp	6.5	7.5	1.4	175.9	2.6	7.6	5.7	0.11	0.12	0.07	0.05			0.75	0.01	T	0.02			

The waste product has a high neutralizing value and should only be applied at rates needed to increase soil pH to the desired range. The ALE indicates the amount of the waste required to equal the neutralizing value of one ton of agricultural lime.

FINAL FACT SHEET AND PERMIT DECISION
PERMIT NUMBER: 51-03

4-3-02

FACILITY: Johnston County Landfill
COUNTY: Johnston
CITY: Smithfield, North Carolina

OWNER: Johnston County
PO Box 2263
Smithfield, NC 27577

OPERATOR: SAME

Description

A Solid Waste Permit, Part 1: Permit to Construct, has been prepared by the Division of Solid Waste Management for the construction and operation of Phase 4A at the Johnston County Landfill, a municipal solid waste landfill facility (MSWLF). The division has determined that the proposed facility plan, engineering plan, construction quality assurance plan, operation plan, closure and post-closure plan and the water quality monitoring plan, as identified in the application, satisfy the requirements and intent of the North Carolina Solid Waste Management Rules, codified as 15A NCAC 13B .1600.

The Johnston County Landfill is owned and operated by Johnston County. The facility is located on NCSR 1503, west of Smithfield, Johnston County, NC. The county currently has two permitted facilities at the location, Permits 51-01 and 51-02. These two facilities are being combined into a single new permit, number 51-03. The combined facility encompasses approximately 500 acres. Phase 4A is being built between Phases 3 and 4 at the landfill. These two phases were unlined disposal units and have ceased accepting waste. Phase 4A will be a lined disposal unit and will "piggy-back" between phases 3 and 4. This permit approves the facility plan and construction and operation of cells 1 and 2 of Phase 4A. Cell 3 of the phase will be permitted and constructed in the future. Phase 4A will add approximately eleven years to the remaining fifteen years of life of the facility . If waste receipts do not reach the permitted levels, the project could last longer.

The MSWLF is permitted to dispose of household, industrial and commercial solid waste. Hazardous or other banned wastes such as yard waste and white goods are not approved for disposal. Separate areas are provided for the management of construction and demolition debris, yard waste, white goods and scrap tires. A convenience center is also provided for the public. The facility will accept waste from Johnston County. The facility will have a total net permitted capacity of approximately 5,660,000 cubic yards. Phase 4A adds approximately 2,155,000 net cubic yards of disposal capacity to the currently permitted capacity of the facility. Johnston County is a rapidly growing county and adds population constantly. Based on historic numbers and population increases, the permitted disposal rate will be approximately 104,000 tons per year based on 312 operating days per year. The

amount of waste disposed of will increase with the population growth of the county and the rate numbers provided are for information purposes. If the population of the county does not increase as currently projected, then the disposal rates will decrease proportionally.

Permit Structure

The permit is divided into sections. Part 1 is the Permit to Construct and Part 2 in the Permit to Operate.

Public Comment Period

North Carolina Solid Waste Management Rules require that the public be given a 45-day period to comment on the draft permit. This 45-day period began on February 11, 2002. The permit was, and still is, available for review by appointment from 9 AM to 4 PM, Monday-Friday, at the Division of Waste Management, 401 Oberlin Road, Raleigh, NC. All data submitted by the applicant is available as part of the administrative record. Persons wishing to comment on either this permit or the proposed permit conditions should have submitted their comments in writing by 5 PM, March 27, 2002. Comments were to be sent to the address shown below and include the permit number. No comments were received by the Division regarding draft permit 51-03

Division Contact

Comments and requests for more information should be sent to:

Mr. Edward Mussler, P.E.
North Carolina Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646
(919) 733-0692 ext 343
FAX (919) 733-4810
e-mail- ed.mussler@ncmail.net

Public Hearing Notice

The North Carolina Solid Waste Management Rules provide for a public hearing. A public hearing on the draft permit was not scheduled for this permit. No parties contacted the division. A hearing was not held.

NOTIFICATION

Persons who wanted to receive notice of the final permit decision should have registered with the division contact. No one requested notification.

PERMIT DECISION- Permit to Construct, 51-03, was issued to Johnston County on April 3, 2002.

DATE February 8 2002

N.C. Dept of Environmental & Natural Resources

245464

IN ACCOUNT WITH

The Smithfield Herald

P. O. BOX 1417 SMITHFIELD, N. C. 27577

ISSUED TWICE A WEEK - TUESDAY AND FRIDAY

TELEPHONE: 934-2176 TERMS: NET 30 DAYS

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PUBLIC NOTICE

North Carolina Department of
Environment and Natural Resources
Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646
Telephone 919-733-0692 or
fax 919-733-4810

Notice of public comment period and public hearing on the draft permit (Permit Number 51-03) to construct and operate Phase 4A of the Johnston County Landfill, a municipal solid waste landfill facility (MSWLF), located in Johnston County, pursuant to 15A NCAC 13B .610 of the Solid Waste Management Rules is hereby given.

North Carolina Solid Waste Management Rules require that the public be given a 45-day period to comment on the draft permit prepared by the NC Division of Solid Waste Management. This 45 day period will begin February 11, 2002 and end at 5 PM on March 27, 2002. Persons wishing to comment on either this permit or the proposed permit conditions should submit their comments in writing to the division contact Edward Mussler, PE, at the above address. All data submitted by the applicant is available as part of the administrative record and may be viewed during business hours (9 am - 4 pm, Monday-Friday, by appointment) at the Division of Waste Management, 401 Oberlin Road, Suite 150, Raleigh, North Carolina.

The MSWLF facility is owned and operated by Johnston County, PO Box 2263, Smithfield, North Carolina 27577. The two existing, permitted landfills (Permits 51-01 and 5102) are being combined into new permit, 51-03. This will form an approximate 500-acre site that is located off NCSR 1503, approximately three miles west of Smithfield, NC. A new permit is required because Phase 4A will add approximately 2,155,000 cubic yards of net disposal capacity to the currently permitted capacity of 3,340,000 cubic yards, and extend the life of the facility by an estimated 11 years. The phase is being permitted to operate a MSWLF unit to dispose of an average 104,000 tons per year of household, commercial and industrial solid waste, over the next five years.

A public hearing has not been scheduled for this permit. Any person interested in a public hearing on this permit should notify the division contact. If sufficient interest exists, then a public hearing will be scheduled.

A fact sheet, copy of the draft permit, and rules for the public hearing may be obtained from the division contact. Written comments may be sent to the address listed above. The permit number must be included on all correspondence. Persons wishing notification of a final permit decision may register with the contact. Additional information concerning this and other solid waste issues may be found on-line at http://wastenot.enr.state.nc.us.

APPROVED FOR PAYMENT
2-12-02

FEB 2002

PUBLIC NOTICE

North Carolina Department of
Environment and Natural Resources
Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646
Telephone 919-733-0692 or
fax 919-733-4810

Notice of public comment period and public hearing on the draft permit (Permit Number 51-03) to construct and operate Phase 4A of the Johnston County Landfill, a municipal solid waste landfill facility (MSWLF), located in Johnston County, pursuant to 15A NCAC 13B .610 of the Solid Waste Management Rules is hereby given.

North Carolina Solid Waste Management Rules require that the public be given a 45-day period to comment on the draft permit prepared by the NC Division of Solid Waste Management. This 45 day period will begin February 11, 2002 and end at 5 PM on March 27, 2002. Persons wishing to comment on either this permit or the proposed permit conditions should submit their comments in writing to the division contact Edward Mussler, PE, at the above address. All data submitted by the applicant is available as part of the administrative record and may be viewed during business hours (9 am - 4 pm, Monday-Friday, by appointment) at the Division of Waste Management, 401 Oberlin Road, Suite 150, Raleigh, North Carolina.

The MSWLF facility is owned and operated by Johnston County, PO Box 2263, Smithfield, North Carolina 27577. The two existing, permitted landfills (Permits 51-01 and 5102) are being combined into new permit, 51-03. This will form an approximate 500-acre site that is located off NCSR 1503, approximately three miles west of Smithfield, NC. A new permit is required because Phase 4A will add approximately 2,155,000 cubic yards of net disposal capacity to the currently permitted capacity of 3,340,000 cubic yards, and extend the life of the facility by an estimated 11 years. The phase is being permitted to operate a MSWLF unit to dispose of an average 104,000 tons per year of household, commercial and industrial solid waste, over the next five years.

A public hearing has not been scheduled for this permit. Any person interested in a public hearing on this permit should notify the division contact. If sufficient interest exists, then a public hearing will be scheduled.

A fact sheet, copy of the draft permit, and rules for the public hearing may be obtained from the division contact. Written comments may be sent to the address listed above. The permit number must be included on all correspondence. Persons wishing notification of a final permit decision may register with the contact. Additional information concerning this and other solid waste issues may be found on-line at http://wastenot.enr.state.nc.us.

February 8

NORTH CAROLINA
JOHNSTON COUNTY

AFFIDAVIT OF PUBLICATION

Before the undersigned, a Notary Public of said County and State, duly commissioned, qualified, and authorized by law to administer oaths, personally appeared

Bretia E Sauls, who being first duly sworn, deposes and says: that he (she) is

~~(Owner, partner, publisher, or other officer~~ or employee authorized to make this affidavit)

of THE SMITHFIELD HERALD, a newspaper published, issued, and entered as second class mail in the City of Smithfield in said County and State; that he (she) is authorized to make this affidavit and sworn statement; that the notice or other legal advertisement, a true copy of which is attached hereto, was published in The Smithfield Herald on the following dates:

February 8, 2002

and that the said newspaper in which such notice, paper, document, or legal advertisement was published was, at the time of each and every such publication, a newspaper meeting all of the requirements and qualifications of Section 1-597 of the General Statues of North Carolina and was a qualified newspaper within the meaning of Section 1-597 of the General Statutes of North Carolina.

This 8th day of February, 2002

Bretia E Sauls
(Signature of person making affidavit)

Sworn to and subscribed before me, this 8th day of February, 2002.

Roberta H. Brown
Notary Public

My Commission expires: March 6, 2005

Johnston County MSW Landfill Timeline

51-03

December 31	Phase 5 Full
December 15 - 31	State Review of CQA and PTO Issuance
April 15	Start Work on Phase 4A (8 month construction schedule)
April 1	Board Approval of Construction Contract
March 20	Bid Date for Phase 4A (In time for Board Deadline)
March 15	End of 45 Day Public Comment Period (Issuance of PTC)
January 29	Start of 45 Day Public Comment Period (Issuance of Draft PTC)

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Gregory J. Thorpe, Ph.D.
Acting Director
Division of Water Quality

APPROVED
DIVISION OF SOLID WASTE MANAGEMENT
DATE 4/3/02 BY

5103 - PTO
A3 Part VI - Doc 1.

March 27, 2002

Mr. Timothy G. Broome, P.E., Director of Infrastructure and Engineering
Johnston County
Department of Public Utilities
Post Office Box 2263
Smithfield, North Carolina 27677

Subject: Permit No. WQ0019631
Johnston County
Conjunctive Use at the Johnston County Landfill
Reclaimed Water Utilization System
SRF Project Number CS370560-07

51-03

Dear Mr. Broome:

In accordance with your application received February 12, 2001, we are forwarding herewith Permit No. WQ0019631, dated March 27, 2002, to Johnston County for the construction and operation of the subject wastewater treatment reclaimed water utilization system.

This permit shall be effective from the date of issuance until March 31, 2007 and shall be subject to the conditions and limitations as specified therein. Please pay particular attention to the monitoring requirements in this permit. Failure to establish an adequate system for collecting and maintaining the required operational information will result in future compliance problems.

The Division of Waste Management, Solid Waste Section has issued Permits 51-01 and 51-02 for the operation of the Johnston County Landfill. The Solid Waste Section has approved the modification of Permit 51-02 to allow for spray irrigation of reclaimed wastewater onto certain identified fields in the landfill (see attached letter from the Solid Waste Section dated October 30, 2001). This permit shall become void if the Solid Waste Section terminates the spray irrigation modification of Permit 51-02. This permit cannot be altered in any way (with the exception of simple permit renewal) without prior approval from the Solid Waste Section.

The conjunctive use permit application and supporting documentation has been evaluated by the Division, and it has been determined that flow equalization at the Central Johnston County Regional Wastewater Treatment Facility is not required to meet the limitations of Section III.2 in Permit No. WQ0019631. Accordingly, this permit is issued pursuant to T15A:2H.0219(p), with the inclusion of condition VI.3.

If any parts, requirements, or limitations contained in this permit are unacceptable, you have the right to request an adjudicatory hearing upon written request within thirty (30) days following receipt of this permit. This request must be in the form of a written petition, conforming to Chapter 150B of the North Carolina General Statutes, and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714. Unless such demands are made this permit shall be final and binding.

Upon completion of construction and prior to operation of this permitted facility, a certification must be received from a professional engineer certifying that the permitted facility has been installed in accordance with the approved plans and specifications. Mail the Certification to the Non-Discharge Branch, 1617 Mail Service Center, Raleigh, North Carolina 27699-1617. (Engineer's Certification Form is attached.) Additionally, a copy of the Certification shall be mailed to the Division of Waste Management, Solid Waste Section, Inspection Engineer, 1646 Mail Service Center, Raleigh, NC 27699-1646

One set of approved plans and specifications is being forwarded to you. If you need additional information concerning this matter, please contact Cecil G. Madden, Jr., P.E. at (919) 715-6203.

Sincerely,

Gregory J. Thorpe, Ph.D.

Attachment 1: Compliance Boundary Map and Sheets 1, 2 & 3 (Maps showing the Landfill Reclaimed Effluent Irrigation System)
Attachment 2: Two landfill maps produced by G.N. Richardson & Assoc., showing other wells
Attachment 3: Letter from the Division of Waste Management, Solid Waste Section dated October 30, 2001
Attachment 4: Operations Manual, Appendix E: Irrigation of Reclaimed Wastewater. Johnston County MSW Landfill. Prepared by: G. N. Richardson & Associates, Inc., Raleigh, NC. January 2002.

kp:nw
cc: Hazen & Sawyer, Charlotte Office (Attn.: James N. Struve, P.E.)
Johnston County Health Department
Division of Waste Management, Solid Waste Section (Attn.: James C. Coffey, Chief)
Raleigh Regional Office, Water Quality Section & Groundwater Section
Groundwater Section, Central Office
Technical Assistance and Certification Unit
Non-Discharge Compliance/Enforcement Unit
Daniel Blaisdell, P.E.
Cecil Madden, P.E.
Ken Pohlig, P.E.
SRF

NORTH CAROLINA

ENVIRONMENTAL MANAGEMENT COMMISSION

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

RALEIGH

RECLAIMED WATER UTILIZATION PERMIT

In accordance with the provisions of Article 21 of Chapter 143, General Statutes of North Carolina as amended, and other applicable Laws, Rules, and Regulations

PERMISSION IS HEREBY GRANTED TO

Johnston County

FOR THE

construction and operation of a 266,918 GPD (97,425,200 gallons/year) reclaimed water utilization system consisting of spray irrigation onto 15 individual spray fields/zones totaling 246.04 acres at the Johnston County Landfill, to serve Johnston County with no discharge of wastes to the surface waters, pursuant to the application received February 12, 2001 and in conformity with the project plan, specifications, and other supporting data subsequently filed and approved by the Department of Environment and Natural Resources and considered a part of this permit.

This permit shall be effective from the date of issuance until March 31, 2007, and shall be subject to the following specified conditions and limitations:

I. PERFORMANCE STANDARDS

1. Upon completion of construction and prior to operation of this permitted facility, a certification must be received from a professional engineer certifying that the permitted facility has been installed in accordance with this permit, the approved plans and specifications, and other supporting materials. If this project is to be completed in phases and partially certified, you shall retain the responsibility to track further construction approved under the same permit, and shall provide a final certificate of completion once the entire project has been completed. Mail the Certification to the following two addresses:

Division of Water Quality
Water Quality Section
Non-Discharge Compliance
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

Division of Waste Management
Solid Waste Section
Inspector Engineer
1646 Mail Service Center
Raleigh, NC 27699-1646

2. The following offices shall be notified at least forty-eight (48) hours in advance of operation of the installed facilities so that an in-place inspection can be made. Such notification to the regional supervisor shall be made during the normal office hours from 8:00 a.m. until 5:00 p.m. on Monday through Friday, excluding State Holidays.

   a. Raleigh Regional Office/Water Quality Supervisor
   Telephone number (919) 571-4700, and

   b. Division of Waste Management
   Solid Waste Section, Inspection Engineer
   Telephone number (919) 733-0692

3. The reclaimed water utilization facilities shall be effectively maintained and operated at all times so that there is no discharge to the surface waters, nor any contamination of ground waters which will render them unsatisfactory for normal use. In the event that the facilities fail to perform satisfactorily, including the creation of nuisance conditions or failure of the irrigation area to adequately assimilate the wastewater, the Permittee shall take immediate corrective actions including those actions that may be required by either the Division of Water Quality or the Division of Waste Management, Solid Waste Section, such as:

   a. the temporary or permanent termination of those spray irrigation zones not performing satisfactorily, causing nuisance conditions, or failing to assimilate the wastewater, and

   b. the construction of additional or replacement wastewater treatment and disposal facilities.

4. The issuance of this permit shall not relieve the Permittee of the responsibility for damages to surface or groundwaters resulting from the operation of this facility.

5. The residuals generated from these treatment facilities must be disposed in accordance with General Statute 143-215.1 and in a manner approved by the Division of Water Quality.

6. Diversion or bypassing of the untreated wastewater from the treatment facilities is prohibited.

7. The following buffers shall be maintained:

a) 100 feet between wetted areas and water supply wells,
b) 100 feet between wetted areas and waters classified as SA,
c) 25 feet between wetted areas and surface waters not classified as SA,
d) 100 feet between wastewater treatment units and wells,
e) 50 feet between reclaimed water storage/irrigation ponds and property lines, and
f) 50 feet between wastewater treatment units and property lines.

8. Public access to the irrigation sites shall be controlled during active site use. Such controls may include the posting of signs showing the activities being conducted at each site. A sign shall be posted in plain sight showing these activities.

9. This permit shall become void if the Division of Waste Management, Solid Waste Section terminates the spray irrigation modification of Permit 51-02. This permit in no way alleviates the Permittee from any additional spray irrigation restrictions and/or obligations placed on them by the Solid Waste Section in the form of future permit modifications.

10. This permit cannot be altered in any way (with the exception of simple permit renewal) without prior approvals from the Division of Water Quality and from the Division of Waste Management, Solid Waste Section.

II. OPERATION AND MAINTENANCE REQUIREMENTS

1. The facilities shall be properly maintained and operated at all times.

2. Upon classification of the facility by the Water Pollution Control System Operators Certification Commission (WPCSOCC), the Permittee shall employ a certified wastewater treatment plant operator to be in responsible charge (ORC) of the wastewater treatment facilities. The operator must hold a certificate of the type and grade at least equivalent to or greater than the classification assigned to the wastewater treatment facilities by the WPCSOCC. The Permittee must also employ a certified back-up operator of the appropriate type and grade to comply with the conditions of 15A NCAC 8G .0202. The ORC of the facility must visit each Class I facility at least weekly and each Class II, III, and IV facility at least daily, excluding weekends and holidays, and must properly manage and document daily operation and maintenance of the facility and must comply with all other conditions of 15A NCAC 8G .0202. Once the facility is classified, the Permittee must submit a letter to the WPCSOCC which designates the operator in responsible charge within thirty days after the wastewater treatment facilities are 50% complete.

3. A suitable, year-round vegetative cover shall be maintained on the irrigation areas.

4. Irrigation shall not be performed during inclement weather or when the ground is in a condition that will cause runoff.

5. Adequate measures shall be taken to prevent wastewater runoff from the spray field.

6. The facilities shall be effectively maintained and operated as a non-discharge system to prevent the discharge of any wastewater resulting from the operation of this facility.

7. The application rate shall not exceed a cumulative loading over any twelve (12) month period as given by the following table. The instantaneous application rate shall not exceed 0.3 inches per hour.

Field #	Crop	Maximum Irrigation (inches/year)	Acres	Maximum Annual Application (gallons/year)
1	Trees	20	32.35	17,568,800
2	CB*	20	54.73	29,723,100
3	CB*	16	10.44	4,535,900
4	CB*	16	6.03	2,619,800
5	Grass	16	24.11	10,475,000
6	Grass/Trees	14	8.82	3,353,000
7	Grass/Trees	14	5.15	1,957,800
8	Grass/Trees	14	28.97	11,013,200
9	Grass/Trees	15	2.35	957,200
10	Grass/Trees	15	6.91	2,814,500
Livestock Area & Forest Service Area	Grass	15	5.90	2,403,200
Roadway Dust Control Area	Grass/Dirt Road	15	6.70	2,729,000
Closed LF Cells 1 & 2	Grass	5	15.90	2,158,800
Closed LF Cell 3	Grass	5	11.26	1,528,800

Closed LF Cell 4	Grass	5	26.42	3,587,100
		Totals:	**246.04**	**97,425,200**

CB* = Coastal Bermuda hay, overseeded with annual rye as a winter cover crop

Only those spray irrigation fields (zones) specified above and delineated in the approved Plans can be irrigated with reuse quality wastewater. Spray irrigation of reuse quality wastewater onto tracks of land not specified above is not approved, and can only be approved with permit modification.

8. If a spray irrigation field has been modified such that the ground topography has been altered (from borrow operations, for example) compared to the approved Plans, then spray irrigation activities may only be reinstated at the altered field with permit modification because of the altering of the ground topography. Such a permit modification application must be accompanied by a re-evaluation of the soils and groundwater of the altered field.

9. No type of wastewater other than that from the Central Johnston County Regional wastewater treatment facility shall be sprayed onto the irrigation area.

10. Should the limit for fecal coliform (daily maximum concentration of 25 per 100 ml) or turbidity (instantaneous maximum of 10 NTU) be exceeded, all wastewater shall be handled in one of three ways, until the levels have stabilized below these maximum levels. Johnston County may further treat the wastewater to bring it into compliance with reclaimed water standards without returning the water to the facility's headworks, may reroute it to the headworks of the Central Johnston County Regional wastewater treatment facility for treatment to reuse standards, or may discharge it in strict accordance with the conditions of the facility's existing NPDES permit.

III. MONITORING AND REPORTING REQUIREMENTS

1. Any monitoring (including groundwater, surface water, soil or plant tissue analyses) deemed necessary by the Division of Water Quality or the Division of Waste Management, Solid Waste Section to insure surface and ground water protection will be established and an acceptable sampling reporting schedule shall be followed.

2. As an indicator of proper operation and maintenance, the facility shall produce an effluent in compliance with the following limitations:

Parameter	Monthly Average [a]	Daily (Instantaneous) Maximum [c]
BOD_5 (5-day, 20°C)	10 mg/l	15 mg/l
NH3 as N	4 mg/l	6 mg/l
TSS	5 mg/l	10 mg/l
Fecal Coliform	14 per 100 ml [b]	25 per 100 ml
Turbidity		10 NTU

a. Monthly averages for all but fecal coliform shall be the arithmetic mean of all samples collected during the reporting period.
b. Monthly average for fecal coliform shall be the geometric mean of all samples collected during the reporting period.
c. Daily maximum shall be the maximum value of all samples collected during the reporting period.

The effluent from the subject facilities shall be monitored, by the Permittee, at the point prior to discharge to the spray irrigation field for the following parameters:

Parameter	Sampling Point	Sampling Frequency	Type of Sample
Flow	Influent or Effluent	As Used	Recording
Turbidity	Effluent	Continuous	Recording
BOD5 (5-day, 20°C)	Effluent	*2/Month	Composite
TSS	Effluent	*2/Month	Composite
Fecal Coliform	Effluent	*2/Month	Grab
Settleable Matter	Effluent	Daily	Grab
NH3 as N	Effluent	*2/Month	Composite
NO3	Effluent	*2/Month	Composite
TKN	Effluent	*2/Month	Composite
TDS	Effluent	**Triannually	Grab
TOC	Effluent	**Triannually	Grab
Chloride	Effluent	**Triannually	Grab

The effluent pH shall not be less than 6.0 standard units nor greater than 9.0 standard units.

* 2/Month sampling frequency only during the months of April through October. During the remainder of the year, these parameters shall be monitored monthly.
** Triannually sampling shall be conducted during March, July, and November.

If Groundwater sampling indicates or predicts compliance problems with Groundwater Standards, this permit will be modified to include additional and/or more restrictive limitations.

3. Adequate records shall be maintained by the Permittee tracking the amount of wastewater disposed. These records shall include, but are not necessarily limited to the following information:

a. date and time of irrigation,
b. volume of wastewater irrigated,
c. zone irrigated,
d. length of time zone is irrigated,

e. continuous weekly, monthly, and year-to-date hydraulic (inches/acre) loadings for each zone,
f. weather conditions, and
g. maintenance of cover crops.

4. Copies of all operation and disposal records (as specified in condition III 2) on Form NDAR-1 and of all effluent monitoring data (as specified in condition III 3 and III 4) on Form NDMR-1 shall be submitted on or before the last day of the following month. All information shall be submitted to the following two address. Three (3) copies of all forms shall be submitted to the Division of Water Quality (address below), and one copy of all forms shall be submitted to the Division of Waste Managment (address below).

Division of Water Quality
Water Quality Section
Non-Discharge Compliance/Enforcement Unit
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

Division of Waste Management
Solid Waste Section
Compliance Hydrogeologist
1646 Mail Service Center
Raleigh, NC 27699-1646

5. A maintenance log shall be maintained at this facility including but not limited to the following items:

a. Daily sampling results including residual chlorine, settleable matter, and dissolved oxygen in the aeration basin and at the clarifier weir.
b. Visual observations of the plant and plant site.
c. Record of preventative maintenance (changing of filters, adjusting belt tensions, alarm testing, diffuser inspections and cleanings, etc.).
d. Date of calibration of flow measurement device.
e. Date and results of power interruption testing on alternate power supply.

6. **Noncompliance Notification**:

The Permittee shall report by telephone to the Raleigh Regional Office, Water Quality Supervisor (telephone number 919-571-4700) and the Division of Waste Management, Solid Waste Section, Compliance Hydrogeologist (telephone number 919-733-0692), as soon as possible, but in no case more than 24 hours or on the next working day following the occurrence or first knowledge of the occurrence of any of the following:

a. Any occurrence at the wastewater treatment facility which results in the treatment of significant amounts of wastes which are abnormal in quantity or characteristic, such as the dumping of the contents of a sludge digester; the known passage of a slug of hazardous substance through the facility; or any other unusual circumstances.

b. Any process unit failure, due to known or unknown reasons, that render the facility incapable of adequate wastewater treatment such as mechanical or electrical failures of pumps, aerators, compressors, etc.

c. Any failure of a pumping station, sewer line, or treatment facility resulting in a by-pass directly to receiving waters without treatment of all or any portion of the influent to such station or facility.

d. Any time that self-monitoring information indicates that the facility has gone out of compliance with its permit limitations.

Persons reporting such occurrences by telephone shall also file a written report in letter form within five (5) days following first knowledge of the occurrence. This report must outline the actions taken or proposed to be taken to ensure that the problem does not recur.

IV. GROUNDWATER REQUIREMENTS

1. Prior to beginning waste disposal operations, three (3) monitor wells (named DWQ-MW-1, DWQ-MW-2, and DWQ-MW-3) shall be installed to monitor groundwater quality. The wells shall be constructed such that the water level in the well is never above or below the screened (open) portion of the well at any time during the year. The well shall be a minimum of 20 feet deep, with a 15 foot slotted screen. However, the screened portion of the well shall not extend into bedrock. There shall be a minimum of a 2-foot bentonite seal above the screened interval, and grouted to the surface, with a 2-inch minimum thick concrete pad around the well casing at ground surface extending at least 12-inches out from the well casing. The soil below the concrete pad shall be compacted prior to placement of the concrete pad. The general location and name for each well is marked on Attachment 1. Each monitoring well shall be constructed in accordance with this permit, and approved by the Raleigh Regional Office/Groundwater Section and by the Division of Waste Management, Solid Waste Section/Hydrogeologist.

2. The wells must be constructed by either a North Carolina Certified Well Contractor, the property owner, or the property lessee according to General Statutes 87-94.4(b)(2). If the construction is not performed by a certified well contractor, the property owner or lessee must physically perform the actual well construction activities, and the wells must be constructed according to the North Carolina Well Construction Standards (15A NCAC 2C .0108) and the local county rules.

3. All wells that are constructed for purposes of groundwater monitoring shall be constructed in accordance with 15A NCAC 2C .0108 (Standards of Construction for Wells Other than Water Supply) and any other state and local laws and regulations

pertaining to well construction.

4. The following offices shall be notified at least forty-eight (48) hours prior to the construction of any monitoring well so that an inspection can be made of the monitoring well location. Such notification shall be made during the normal office hours from 8:00 a.m. until 5:00 p.m. on Monday through Friday, excluding state holidays.

   a. Raleigh Regional Office/Groundwater Regional Supervisor
   Telephone number (919) 571-4700, and

   b. Division of Waste Management
   Solid Waste Section/Hydrogeologist
   Telephone number (919) 733-0692

5. Within sixty (60) days of completion of all monitoring wells, the permittee shall submit original copies of a scaled site map (scale no greater than 1"=200'). The map(s) must include the following information:
   a. The location and identity of each monitoring well.
   b. The location of major components of the waste disposal system.
   c. The location of property boundaries within 500 feet of the disposal area(s).
   d. The latitude and longitude of the established horizontal control monument.
   e. The elevation of the top of the well casing (which shall be known as the "measuring point") relative to a common datum.
   f. The depth of water below the measuring point at the time the measuring point is established.
   g. The location of Review and Compliance boundaries.
   h. The date the map is prepared and/or revised.

   Control monuments shall be installed in such a manner and made of such materials that the monument will not be destroyed due to activities that may take place on the property. The permittee is responsible for the geographic accuracy of any map submitted, however produced.

   Two original maps and all supporting documentation shall be mailed to the Division of Water Quality (address below), and one original map and all supporting documentation shall be mailed to the Division of Waste Management (address below).

   Division of Water Quality
   Groundwater Section
   Permits and Compliance Unit
   1636 Mail Service Center
   Raleigh, North Carolina 27699-1636

   Division of Waste Management
   Solid Waste Section
   Compliance Hydrogeologist
   1646 Mail Service Center
   Raleigh, NC 27699-1646

6. Within thirty (30) days of completion of all well construction activities, a certification must be received from a professional engineer or a licensed geologist certifying that the monitoring wells are located and constructed in accordance with the Well Construction Standards (15A NCAC 2C) and this permit. This certification should be submitted with copies of the Well Completion Form (GW-1) for each well. Mail this certification and the associated GW-1 forms to the following addresses:

Division of Water Quality	Division of Waste Management
Groundwater Section	Solid Waste Section
Permits and Compliance Unit	Compliance Hydrogeologist
1636 Mail Service Center	1646 Mail Service Center
Raleigh, North Carolina 27699-1636	Raleigh, NC 27699-1646

7. The following monitoring wells shall be sampled every month starting initially after construction and proceeding through the start-up of waste disposal operations, and thereafter every month for the parameters listed below:

DWQ monitoring wells:	DWQ-MW-1
	DWQ-MW-2
	DWQ-MW-3
Existing landfill monitoring wells:	CDLMW-5
	MW-3
	MW-5-1
	MW-5-2
	MW-5-10
	PZ-3
Sampling Parameter List:	Water Level

The depth to water in each well shall be measured from the surveyed point on the top of the casing. The measuring points (top of well casing) of all monitoring wells shall be surveyed relative to a common datum.

All reports and documentation GW-59 shall be mailed to the following two addresses:

Division of Water Quality	Division of Waste Management
Groundwater Section	Solid Waste Section
Permits and Compliance Unit	Compliance Hydrogeologist
1636 Mail Service Center	1646 Mail Service Center
Raleigh, North Carolina 27699-1636	Raleigh, NC 27699-1646

(Note: Updated blank forms (GW-1 and GW-59) may be downloaded from the Groundwater Section's website at http://gw.ehnr.state.nc.us/ or requested from the Groundwater Section address mentioned above.)

For the initial sampling of the wells, the permittee shall submit a copy of the GW-1 Form (Well Construction Record) with the Compliance Monitoring Form (GW-59) for each well to the addresses listed above. Initial Compliance Monitoring Forms that do not include copies of the GW-1 form may be returned to the permittee without being processed. Failure to submit these forms as required by this permit may result in the initiation of enforcement activities pursuant to NC General Statutes 143-215.6A.

The results of the sampling and analysis must be received on Form GW-59 (Groundwater Quality Monitoring: Compliance Report Form) by the Division of Water Quality, Groundwater Section and the Division of Waste Management, Solid Waste Section, on or before the last working day of the month following the sampling month. The data of all groundwater sampling analyses required by the permit conditions must be reported using the most recent GW-59 form along with attached copies of the laboratory analyses.

8. Waste application activities shall not occur when the vertical separation between ground surface and the water table is less than one (1) foot. Verification of the water table elevation can be confirmed by water level readings obtained from the monitor wells near the site or auger boring(s), which must be done within 24 hours, prior to application of wastewater. Any open borings must be properly filled with native soil, prior to application to decrease the chance of any waste contaminating the groundwater.

9. The compliance boundary and review boundary for wastewater disposal systems are specified by 15A NCAC 2L. For systems utilizing reclaimed water, 15A NCAC 2H .0219(k) specifies that both the compliance boundary and review boundary shall be established at the property line. An exceedance of groundwater quality standards at or beyond the compliance boundary is subject to immediate remediation action in addition to the penalty provisions under North Carolina General Statute §143-215.6A(a)(1).

10. Any groundwater quality monitoring, as deemed necessary by the Division of Water Quality, Groundwater Section or by the Division of Waste Management, Solid Waste Section, shall be provided.

V. INSPECTIONS

1. Adequate inspection, maintenance, and cleaning shall be provided by the Permittee to insure proper operation of the subject facilities.

2. The Permittee or his designee shall inspect the wastewater treatment and disposal facilities to prevent malfunctions and deterioration, operator errors and discharges which may cause or lead to the release of wastes to the environment, a threat to human health, or a nuisance. The Permittee shall keep an inspection log or summary including at least the date and time of inspection, observations made, and any maintenance, repairs, or corrective actions taken by the Permittee. This log of inspections shall be maintained by the Permittee for a period of three years from the date of the inspection and shall be made available upon request to the Division of Water Quality, the Division of Waste Management, Solid Waste Section, or other permitting authority.

3. Any duly authorized officer, employee, or representative of the Division of Water Quality or Division of Waste Management, Solid Waste Section may, upon presentation of credentials, enter and inspect any property, premises or place on or related to the disposal site or facility at any reasonable time for the purpose of determining compliance with this permit; may inspect or copy any records that must be maintained under the terms and conditions of this permit, and may obtain samples of groundwater, surface water, or leachate.

VI. GENERAL CONDITIONS

1. This permit shall become voidable unless the facilities are constructed in accordance with the conditions of this permit, the approved plans and specifications, and other supporting data.

2. This permit is effective only with respect to the nature and volume of wastes described in the application and other supporting data.

3. This permit is issued pursuant to T15A:2H.0219(p) for the construction and operation of a reclaimed water utilization facility without flow equalization. In the event that non-compliance with any permit limitation results from the absence of flow equalization, this permit may be administratively reopened, and a requirement for the construction of a flow equalization basin may be incorporated into the permit.

4. This permit is not transferable. In the event there is a desire for the facilities to change ownership, or there is a name change of the Permittee, a formal permit request must be submitted to the Division of Water Quality accompanied by an application fee, documentation from the parties involved, and other supporting materials as may be appropriate. The approval of this request will be considered on its merits and may or may not be approved.

5. Failure to abide by the conditions and limitations contained in this permit may subject the Permittee to an enforcement action by the Division of Water Quality in accordance with North Carolina General Statute 143-215.6A to 143-215.6C.

6. The issuance of this permit does not preclude the Permittee from complying with any and all statutes, rules, regulations, or ordinances which may be imposed by other government agencies (local, state, and federal) which have jurisdiction.

7. A set of approved plans and specifications for the subject project must be retained by the Permittee for the life of the project.

8. The annual administering and compliance fee must be paid by the Permittee within thirty days after being billed by the Division of Water Quality. Failure to pay the fee accordingly may cause the Division of Water Quality to initiate action to revoke this permit as specified by 15 NCAC 2H .0205(c)(4).

9. The Permittee, within 90 days following issuance of this permit, shall request modification of NPDES Permit No. NC0030716 issued to the Central Johnston County Regional wastewater treatment facility. The modification shall amend the existing NPDES permit to allow the conjunctive use of reclaimed water as provided for in this permit.

10. This permit in no way negates, precludes, or invalidates the most recent reissuance of NPDES Permit No. NC0030716, and the Permittee shall continue to comply with all conditions provided for therein.

Permit issued this 27th day of March, 2002

NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

Greg T. Thorpe, Ph.D., Acting Director
Division of Water Quality
By Authority of the Environmental Management Commission

Permit Number WQ0019631

Permit No. WQ0019631
Non-Discharge Permit
Johnston County

ENGINEER'S CERTIFICATION

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically/weekly/full time) the construction of the Conjunctive Use Reclaimed Wastewater System serving Johnston County, located at the Johnston County Landfill, 630 County Home Road, Johnston County, hereby state that to the best of my abilities, due care and diligence was used in the observation of the following construction:

construction and operation of a 266,918 GPD (97,425,200 gallons/year) reclaimed water utilization system consisting of spray irrigation onto 15 individual spray fields/zones totaling 246.04 acres at the Johnston County Landfill, to serve Johnston County, pursuant to the application received February 12, 2001, and in conformity with the project plan, specifications, and other supporting data subsequently filed and approved by the Department of Environment and Natural Resources

I certify that the construction of the above referenced project was observed to be built within substantial compliance and intent of the approved plans and specifications.

Signature _____ Registration No. _____

Date _____

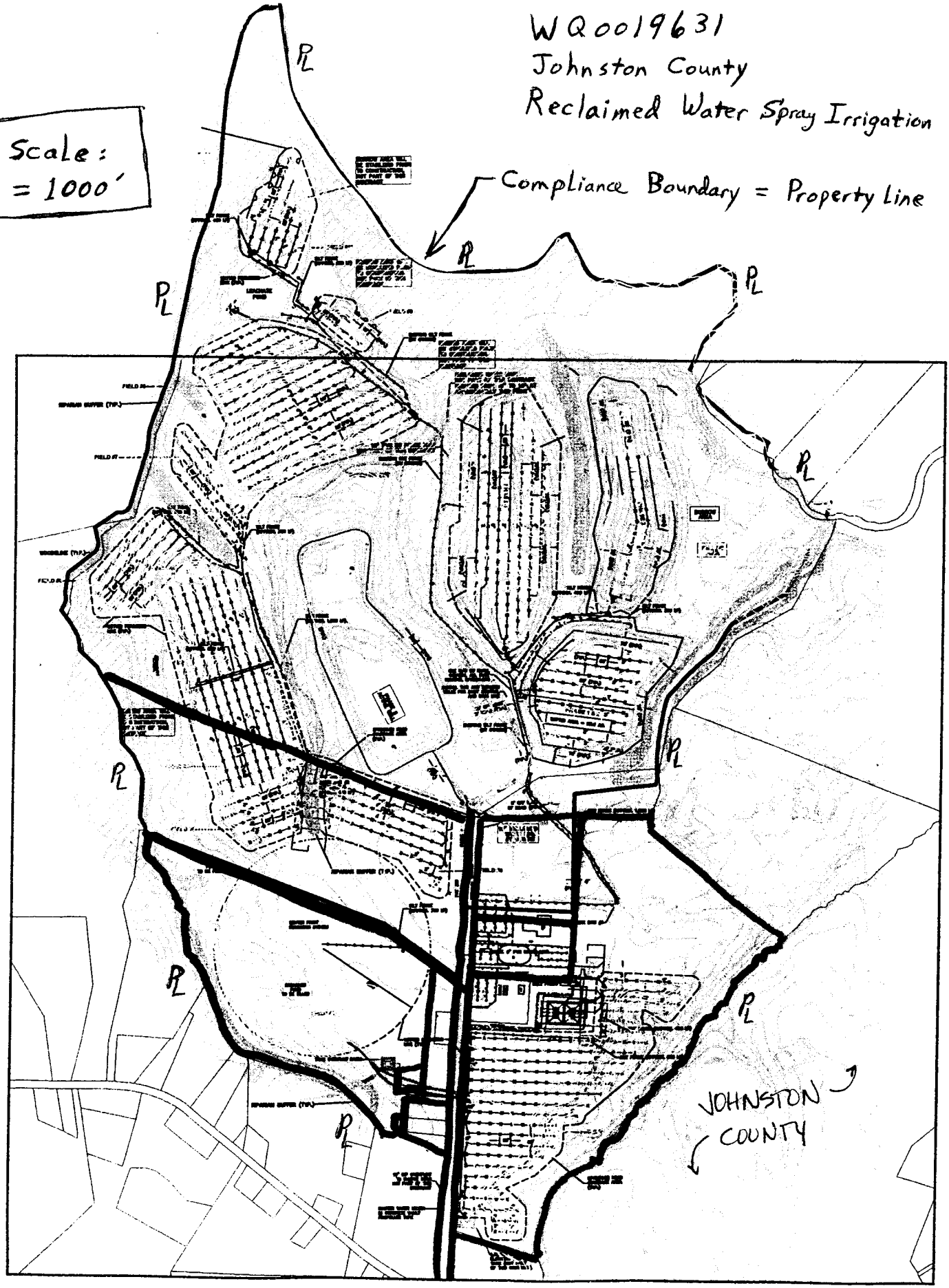
Mail this Certification to:

DENR/DWQ
Non Discharge Permit Unit
Water Quality Section
1617 Mail Service Center
Raleigh, NC 27699-1617

Attachment 1

WQ0019631
Johnston County
Reclaimed Water Spray Irrigation

Scale:
1" = 1000'



Attachment 1

WQ 0019631
Johnston County
Reclaimed Water Spray Irrigation
Johnston County Landfill

N

200 100 0 200 400
SCALE 1" = 200'

SPRINKLER COVERAGE AREA (TYP.)
MIDDLE CREEK
BORROW AREA WILL BE STABILIZED PRIOR TO CONSTRUCTION, NOT PART OF THIS CONTRACT
SILT FENCE (APPROX. 400 LF)
FIELD #10
WETTED PERIMETER LINE (TYP.)
LEACHATE POND
SILT FENCE (APPROX. 250 LF)
BORROW AREA WILL BE STABILIZED PRIOR TO CONSTRUCTION, NOT PART OF THIS CONTRACT
FIELD #9
Monitoring Well DWQ-MW-3
EXISTING SILT FENCE (BY OTHERS)
ERODED AREA WILL BE STABILIZED PRIOR TO CONSTRUCTION, NOT PART OF THIS CONTRACT
FIELD #8
RIPARIAN BUFFER (TYP.)
POND
RECLAIMED WATER MAIN NOT PART OF THIS CONTRACT REDUCES FROM 16" TO 10" AT APPROXIMATELY THIS POINT
12" PVC RS FORCE MAIN NOT PART OF THIS CONTRACT
EXISTING SILT FENCE (BY OTHERS)
FIELD #7
WOODSLINE (TYP.)
PHASE 4
PHASE 3
SILT FENCE (APPROX. 700 LF)
SILT FENCE (APPROX. 350 LF)
BORROW AREA
MATCH LINE SEE SHEET C4 OF 8
MATCH LINE SEE SHEET C4 OF 8

REVISION INFORMATION				DRAWING INFORMATION		
Num	Description	Date	Init		Init	Date
				Drawn By	SRM	06/01
				Checked By	KCY	06/01
				Approved By	RES	06/01

February 11, 2002

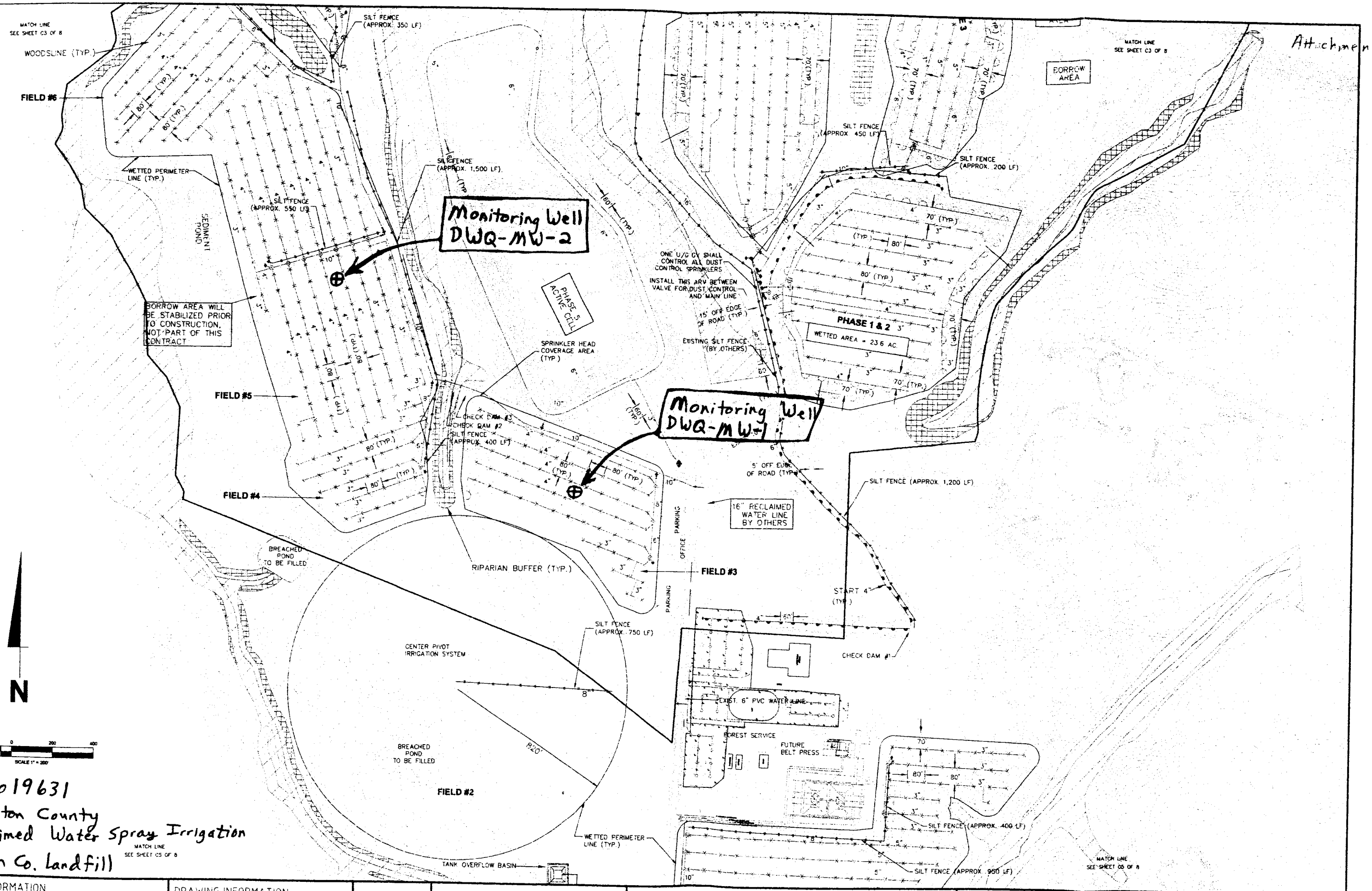
Wetted Areas Plan - Area A

LANDFILL RECLAIMED EFFLUENT IRRIGATION SYSTEM

JOHNSTON COUNTY
Department of Public Utilities
P.O. Box 2263
Smithfield, NC 27577

SHEET
EXHIBT 1
of 3

Attachment 1



WQ0019631
Johnston County
Reclaimed Water Spray Irrigation
Johnston Co. Landfill

REVISION INFORMATION				DRAWING INFORMATION		
Num	Description	Date	Init		Init	Date
				Drawn By:	SRM	06/01
				Checked By:	KCY	06/01
				Approved By:	RES	06/01

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 031744 RICHARD E. SIMMONS REGISTERED
February 11, 2002

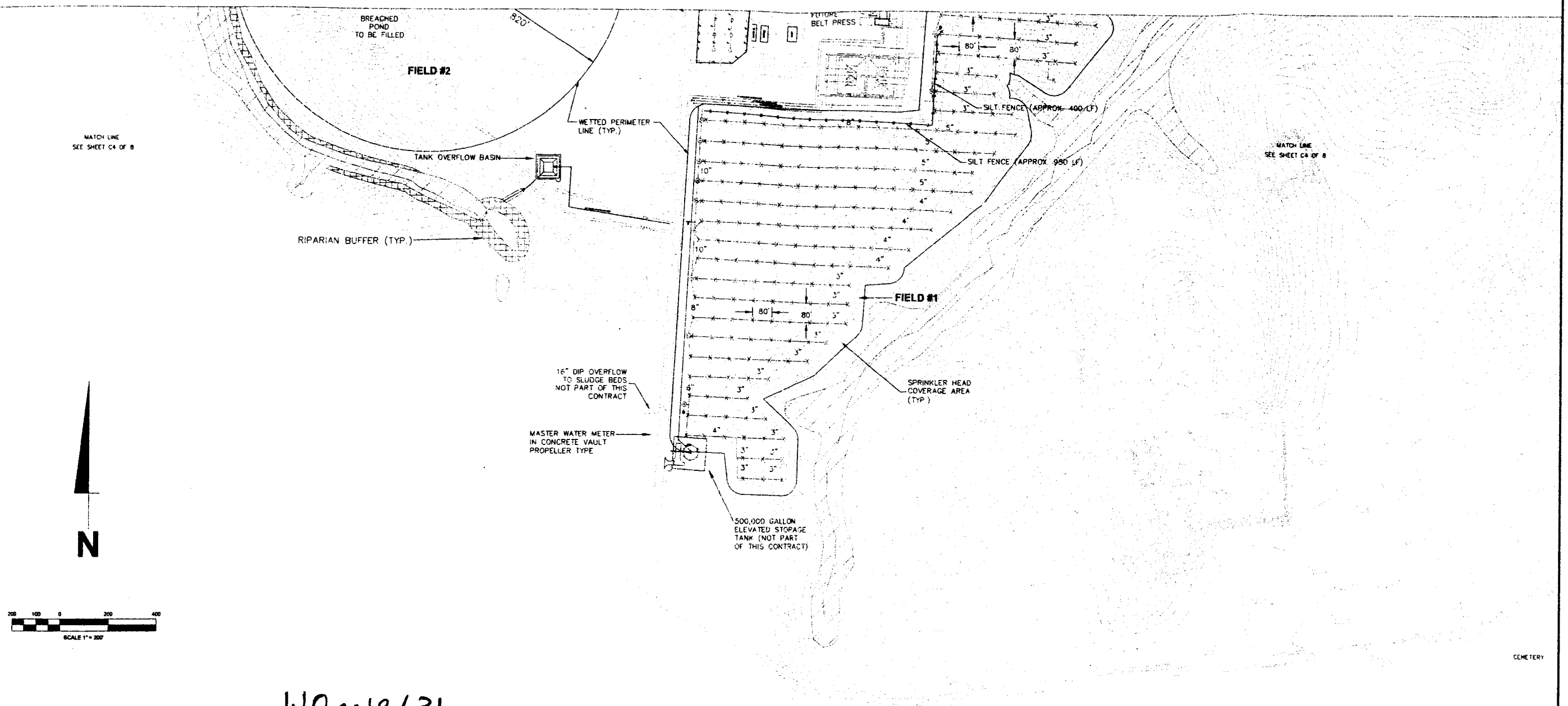
Wetted Aeras Plan - Area B

LANDFILL RECLAIMED EFFLUENT IRRIGATION SYSTEM

JOHNSTON COUNTY
Department of Public Utilities
P.O. Box 2263
Smithfield, NC 27577

SHEET
EXHIBT 2
of 3

Attachment 1



WQ0019631
Johnston County
Reclaimed Water Spray Irrigation
Johnston County Landfill

REVISION INFORMATION				DRAWING INFORMATION		
Num	Description	Date	Init		Init	Date
				Drawn By	SRM	06/01
				Checked By	KCY	06/01
				Approved By	RES	06/01

February 11, 2002

Wetted Areas Plan - Area C

LANDFILL RECLAIMED EFFLUENT IRRIGATION SYSTEM

JOHNSTON COUNTY
Department of Public Utilities
P.O. Box 2263
Smithfield, NC 27577

SHEET
EXHIBT 3
of 3

Attachment 2

Map showing wells:
CDLMW-5
MW-3
PZ-3

G.N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services
425 N. Boylan Avenue Raleigh, North Carolina
(919)-828-0577 Fax:(919)-828-3899 www.gnra.com

FIGURE NO. 1
FILE NAME JOHN-B0209
SCALE: AS SHOWN
PROJECT NO. JOHN-4
CHECKED BY: J.A.S.
DRAWN BY: C.T.J.
DATE: AUG. 2001

TITLE: GROUND WATER POTENTIOMETRIC SURFACE MAP

N

SW-2
SW-1

MW-5
MW-5A
TOC=173.7
DTW=13.34
WTE=160.36

MW-12B
TOC=156.12
DTW=28.78
WTE=127.34

TOC=166.6
DTW=34.92
WTE=131.68
MW-6

MW-13D
MW-13
TOC=179.57
DTW=16.18
WTE=163.39

PZ-1

MW-4C
MW-4D
MW-4B
TOC=201.7
DTW=8.22
WTE=195.48
MW-4

PZ-4

PZ-3
TOC=194.91
DTW=8.74
WTE=186.17

CDLMW-5

MW-7C
MW-7B
MW-7D
MW-7
TOC=164.5
DTW=23.86
WTE=140.64

PZ-10

PZ-9D
PZ-9

PZ-7
PZ-8
PZ-6
PZ-5
PZ-5D

DRY
TOC=155.43
MW-8
MW-8D

MW-11
TOC=144.32
DTW=8.72
WTE=135.60

MW-10
TOC=175.65
DTW=3.52
WTE=172.13

MW-9
MW-9B
MW-9D
MW-9C
TOC=167.89
DTW=7.30
WTE=160.59

MW-3
TOC=234.16
DTW=22.62
WTE=211.54

MW-3B

PHASE 3
PHASE 4
PHASE 5
PHASE 1 & 2

140 150 160 170 180 190 200 210

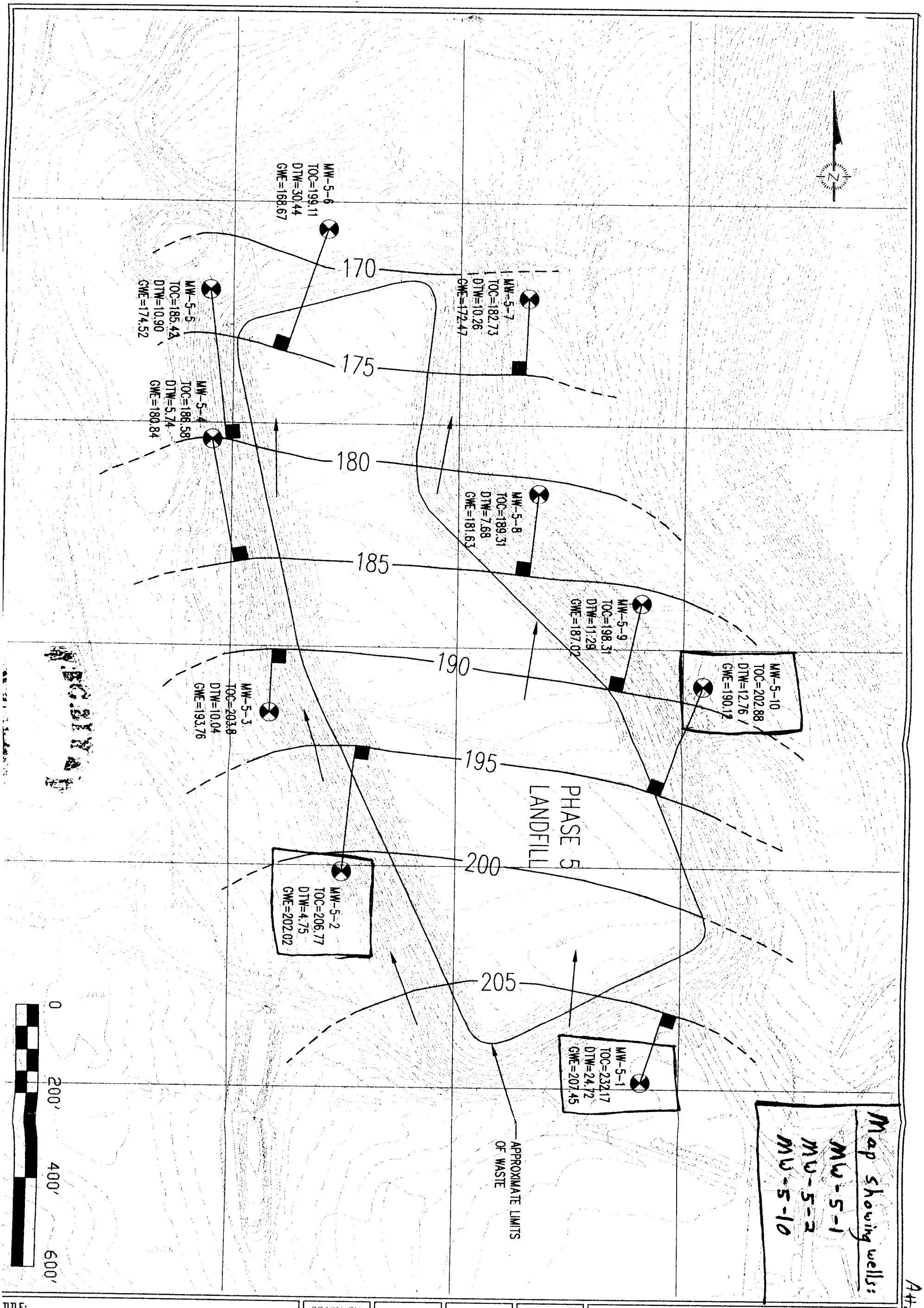
0 400' 800' 1200'

LEGEND

- EXISTING MONITORING WELLS.
- ASSESSMENT/DEEP WELLS.
- PERMIT SHALLOW PIEZOMETER

NOTE:

1. GROUNDWATER DATA COLLECTED APRIL, 2001.



Map showing wells:
MW-5-1
MW-5-2
MW-5-10

Attachment 2

TITLE:

POTENTIOMETRIC MAP
JOHNSTON COUNTY LANDFILL
PHASE 5, APRIL 2001

DRAWN BY:	CHECKED BY:	SCALE:	FIGURE NO.
C.T.J.	J.A.S.	AS SHOWN	1
DATE:	PROJECT NO.	FILE NAME	
AUG. 2001	JOHN-4	JOHN-B0208	

G.N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services
425 N. Boylan Avenue Raleigh, North Carolina
(919)-828-0577 Fax:(919)-828-3899 www.gnra.com

Attachment 3

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Interim Director

NCDENR

RECEIVED
Nov 2 2001

October 30, 2001

Mr. Haywood Phthisic
Director of Public Utilities
Johnston County
P.O. Box 2263
Smithfield, NC 27577

Re: Irrigation of Reclaimed Wastewater at the Johnston County Municipal Solid Waste Landfills, Modification to Permits 51-01 and 51-02

Dear Mr. Phthisic:

The Solid Waste Section (Section) has completed its review of the proposed modification to the permits for the referenced facilities. In accordance with the Solid Waste Management Rules and Condition 9, Appendix 4, Permit to Operate Number 51-02, the Section hereby approves the modification which allows the irrigation of reclaimed wastewater consistent with the Operations Manual dated October 2001, submitted on behalf of Johnston County by G. N. Richardson & Associates. The modification will be incorporated into the permit for the new MSWLF facility, which combines both existing landfills into one permitted facility.

The following document will be included, by reference, in the list of approved documents for Permits 51-02 and 51-01, and any new permit prepared by the Section. The document is referenced as:

> *Operations Manual- Addendum. (Irrigation of Reclaimed Wastewater). Johnston County MSW Landfill. Johnston County, North Carolina.* Prepared for: Johnston County Department of Public Utilities. Prepared by: G. N. Richardson & Associates, Inc. Raleigh, NC. August 2001. Revised October 2001.

The county has prepared, and submitted to the Division of Water Quality, drawings and details of elements of the irrigation system that will be installed at the two landfill facilities, i.e. pump stations and force mains. The proposed location and construction details of permanent systems must be included with the facility drawings that are being prepared for the permitting process currently under review by the Section. In addition, any construction activities that are completed before issuance of a permit to construct by the Section for Phase 4A, must be documented with as-built drawings, submitted to the Section. This will be a requirement of any Solid Waste permit issued by the Division of Waste Management.

It should be understood by the County that the irrigation activities proposed in the modification could affect the development of future municipal solid waste landfill units within the facility and could result in a reduction in total landfill disposal capacity.

If you have any further questions, please do not hesitate to contact me at (919) 733-0692, extension 256. Specific questions about permitting and the current status of the permit application can be directed to Ed Mussler, the permitting engineer.

Sincerely,

James C Coffey

James C. Coffey, Acting Chief
Solid Waste Section

cc: Ed Mussler, DWM
Mark Fry, DWM
Robert Hearn, DWM
Jim Barber, DWM
Kenneth Pohlig, DWQ
Greg Richardson, GNRA

Attachment 4

Operations Manual
Appendix E: Irrigation of Reclaimed Wastewater

Johnston County Landfill Facility
Johnston County, North Carolina

RECEIVED
MAR 8 2002
CONSTRUCTION GRANTS &
LOAN SECTION

Prepared for:
Johnston County
Department of Public Utilities

January 2002

PERMIT ISSUE DOCUMENTS

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
425 N. Boylan Avenue
Raleigh, North Carolina 27603

JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER

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JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER

1.0 OVERVIEW

This Operations Manual Addendum was prepared for the Johnston County MSW Landfill located off of Highway 210 on County Home Road for the purpose of describing the operation of an irrigation system for reclaimed wastewater, which is proposed for the site. The system will be owned and operated by Johnston County.

2.0 CONTACT INFORMATION

All correspondence and questions concerning the operation of the reclaimed wastewater irrigation system should be directed to the appropriate County personnel listed below:

Johnston County Department of Public Utilities
204 S. Second Street, P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 989-5075 (Downtown); (919) 934-4576 (Landfill)
Fax: (919) 934-7174 (Downtown); (919) 989-7152 (Landfill)

Solid Waste Manager:	Rick Proctor
Public Utilities Director:	Haywood Phthisic
Director of Engineering:	Tim Broome, P.E.

3.0 IRRIGATION SYSTEM OPERATION

3.1 Areas to be Irrigated

Areas to be irrigated and order of priority (1 being the highest) include the following:

Priority 1:

- Wooded area behind (east of) NC Forest Service building (Field 1) (Not on Solid Waste Permit Site;
- Agricultural fields to the south of the landfill office and yard waste area on newly acquired land (Field 2) (majority not on Solid Waste Permit Site);
- Area behind (west of) landfill office including the current yard waste processing area (Fields 3 & 4); and
- Wooded area south of the leachate storage lagoon (future Phase 7 and Phase 8 area) (Fields 6, 7, & 8).

Priority 2:

- Closed landfill areas on Phase 1&2, 3, and 4 (Also, Phase 5 in future) (LF Cap 1&2, LF Cap 3, and LF Cap 4).

Priority 3:

- Inactive borrow areas (Fields 5, 9, & 10).

In addition to these areas, the County plans to use reclaimed wastewater for the control of dust within the facility. **Figure 1** presents the location of the various planned irrigation areas.

3.2 Periods of Operation

The irrigation system will be operated during the months of April through October. In addition, irrigation will be discontinued on any day that rainfall exceeds 0.2 inches.

3.3 Irrigation Amounts

Irrigation amounts off the landfills will be in accordance with the agronomic rates determined for the landfill site (based on "wettest" year amounts) in an analysis performed by Robert Evans, Ph.D., P.E. of N.C. State University and entitled "Hydrologic Wastewater Reuse Irrigation Analysis for Johnston County". Irrigation amounts on the landfill final covers will be in accordance with HELP model evaluations performed by G.N. Richardson & Associates. A tabulation of these amounts is given in **Table 1**. Restrictions to these amounts are as stated herein. Note that based on site monitoring of the irrigation program (see **Section 3.5**), future increases to these amounts may be allowed.

3.4 Irrigation Restrictions

3.4.1 Monitoring Wells

No irrigation will occur within 100 feet of an actively monitored site monitoring well.

3.4.2 Closed Landfill Areas

Irrigation over closed landfill areas shall only take place over closed areas which have at least 2 feet of soil cover or at least 1.5 feet of soil cover and a synthetic barrier.

3.4.3 Future Landfill Areas

Irrigation over areas designated as future landfill areas (or areas within 300 feet of future landfill areas) will be discontinued within 2 years before the anticipated start of construction for that area unless it is demonstrated by use of piezometers, monitoring wells, or other method (see **Section 3.5**) that irrigation rates are not creating an artificial rise in groundwater levels. Closed landfill areas, if to be lined over as part of a future landfill area (i.e. Phases 6, 7, & 8) may be irrigated in accordance with **Section 3.4.2** within 2 years prior to construction.

3.4.4 Borrow Areas

No irrigation will be performed in active borrow areas. Irrigation may be performed in inactive borrow areas as long as the ground surface is prepared to promote vegetation (soil type, nutrients, etc.).

3.5 Site Monitoring of Irrigation Program

In order to monitor the effect of the irrigation program both to ground water quality and to the ground water table a monitoring program will be implemented. This program will consist of two elements. One will be the addition of sampling and testing of the treated irrigation water as part of the regular Spring and Fall ground water sampling/testing events already performed as part of site operations. After sampling, the irrigation water will be tested for the same detection monitoring parameters as for the other site samples.

In addition, the second element of the monitoring program will be the installation of piezometers in each future landfill area to be irrigated (i.e. Phases 6, 7, and 8). At a minimum, one piezometer will be installed roughly in the central portion of the proposed future landfill phase before irrigation can begin over that area. The water elevations in these piezometers will be measured and recorded both during the spring and fall, concurrent with regular site ground water monitoring, and in the mid-summer. These levels will be evaluated in order to determine if there appears to be a rise in ground water elevations due to the irrigation activities. Should ground water elevations be maintained within a couple of feet of initial levels or levels that might otherwise be considered normal considering other factors such as weather, etc., the irrigation amounts for that area may be increased. Likewise, if there appears to be a significant (more than a couple of feet) increase in ground water elevation, which cannot be otherwise explained, irrigation activities in this area will be reduced or suspended. Also, as stated in **Section 3.4.3**, irrigation in future landfill areas will be halted at least two years prior to planned construction activities in that area.

3.6 System Maintenance and Inspections

Inspection of the irrigation system during periods of operation will be performed by landfill staff on a weekly basis for the closed landfill areas. Other areas may be inspected

less frequently, but not less than once per month. As much of the proposed system will be above ground, inspection for damaged piping, valves, sprinklers, etc. will be done on a mostly visual basis. Should maintenance be required to any portion of the irrigation system, that part of the system will be shut off until adequate repairs are made.

Table 1: Recommended Irrigation Amounts

Field Type	Max. Daily Application Rate cm/day (inch/day)	Annual Application Rate cm/year (inch/year)
Field with Trees	0.60 (0.25)	36 (14)
Field with Grass	0.60 (0.25)	40 (16)
Landfill Final Cover[1]	0.25 (0.1)	12 (5)
Fields 1 and 2	0.60 (0.25)	50 (20)

Note:

1) At a rate less than that which would cause saturation of the upper 9 inches of soil cover. This will be controlled by the use of soil moisture devices, which will automatically shut off the irrigation system if the upper 9 inches becomes saturated.

51-03

-Booklet-

Johnston County
Contract Documents
and
Technical Specifications
For Reclaimed Water Irrigation System

Feb. 2002

19
RECEIVED
CONSTRUCTION GRANTS &
LOAN SECTION

JOHNSTON COUNTY

CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS

FOR RECLAIMED WATER IRRIGATION SYSTEM

RECEIVED
2002 FEB

Board of Commissioners
James H. Langdon, Jr., Chairman
Cookie Pope
Thomas M. Moore
Allen L. Mims, Jr.
Wade M. Stewart
Fred Smith
W. Ray Woodall

Rick J. Hester, County Manager

NORTH CAROLINA
PROFESSIONAL
SEAL
6114
ENGINEER
TIMOTHY G. BROOME
2/14/02

February 2002

Johnston County Department of Utilities
Post Office Box 2263
Smithfield, N.C. 27577
(919) 989-5075

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Supplementary General Conditions	SC: 1-15
Special Project Conditions	SPC: 1-3
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DIVISION 2 - SITEWORK

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APPENDIX A – EROSION CONTROL PERMIT

APPENDIX B – Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts

JOHNSTON COUNTY
RECLAIMED WATER IRRIGATION SYSTEM

Sealed bids will be received by Johnston County at the Board of Commissioners meeting room, Johnston County Courthouse on Market Street in Smithfield, NC until 2:00 PM, on _____, 2002, for the construction of the reclaimed water irrigation system.

The work will consist of approximately 20,400 l.f. of 3" through 12" pipe, 130 sprinklers, 45 irrigation hydrant assemblies and appurtenances.

Plans, Specifications, and Contract Documents are open to public inspection at the office of Johnston County Department of Utilities, 204 S. Second Street, Smithfield, N.C.; and the Associated General Contractors and F.W. Dodge Company offices in *Raleigh, Greensboro, Charlotte, and Wilmington.* They will be loaned to prospective bidders on application to the Engineer, accompanied by a deposit of *$100.00* for each set of documents requested. **Small minority and women's businesses and labor surplus area firms are encouraged to submit bids.**

All documents must be returned in good condition within two (2) weeks after the time for receiving bids, whereupon one-half of the deposit will be returned to each bonafide bidder or supplier furnishing quotations to Contractors. No deposit will be refunded to any non-bidder.

Each bid must be accompanied by a certified check or a bid bond by an acceptable surety company of not less than five percent (5%) of the amount of the bid, made payable to Johnston County as a bid guarantee.

A Performance and a Payment Bond will be required for the successful bidder in the amount of one hundred percent (100%) of the contract price, conditioned upon the faithful performance of the contract, payment of all persons supplying labor or furnishing materials, and payment of all liabilities incurred in connection with the work under this contract.

North Carolina law requires any contractor bidding on work in the State which costs $30,000.00 or more to show evidence that he is licensed under the "Act to Regulate the Practice of General Contracting."

No bid may be withdrawn for a period of sixty (60) days after the scheduled closing time for receiving bids.

The Owner reserves the right to reject any and all bids and any part of a bid and to waive formalities and technicalities in the bidding procedure.

No consideration will be given any request for Plans and Specifications within the five (5) day period immediately prior to the date for receiving bids.

Bids must be submitted on the printed form, or exact copies thereof, contained in the Contract Documents.

Bidders shall make positive efforts to use small and minority-owned businesses and comply with GS 143-128.

Johnston County Department of Utilities
P.O. Box 2263
Smithfield, N.C. 27577
(919) 989-5075

INFORMATION FOR BIDDERS

BIDS will be received by Johnston County (herein called the "OWNER"), at the Board of Commissioners meeting room, Johnston County Courthouse, on Market Street in Smithfield, NC, until 2:00 p.m., _____, 2002 and then at said office publicly opened and read.

Each Bid must be submitted in a sealed envelope, addressed to Timothy G. Broome, P.E, Director of Infrastructure and Engineering, Johnston County Utilities, 204 South Second Street, Smithfield, North Carolina 27577. Each sealed envelope containing a BID must be plainly marked on the outside as BID for construction of the Johnston County Reclaimed Water Irrigation System, and the envelope should bear on the outside the name of the BIDDER, his address, his license number if applicable, and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope address to the OWNER.

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

Each BIDDER shall acknowledge receipt of all addenda in the spaces provided in the Bid Form. The BID form and BID bond may be submitted loose. It is not necessary to submit these documents in the specification book. Each BIDDER will be responsible to assure himself that all ADDENDA have been received. The Owner reserves the right to reject all bids.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within sixty (60) days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID schedule by examination of the site and review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the work to be done.

Each BIDDER shall submit a price for all alternates listed therein. Failure to do so will result in the bid being considered incomplete and may result in rejection of the bid.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID Bond payable to the OWNER for five percent (5%) of the total amount of the BIDS. As soon as the BID prices have been compared, the

OWNER will return the BONDS of all except the three lowest responsible BIDDERS. When the Agreement is executed, the Bonds of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the payment BOND and performance BOND have been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A Performance Bond and a Payment Bond, each in the amount of 100 percent of the contract price, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract. Performance and Payment Bonds shall be valid for a period of at least one year from the date of acceptance of the completed work on each contract division.

Attorneys-in-fact who sign Bid Bonds or Payment Bonds and Performance Bonds must file with each Bond a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the Performance Bond and Payment Bonds within twenty (20) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary Agreement and Bond forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may at his option consider the BIDDER in default in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within fifteen (15) days of receipt of acceptable Performance Bond, Payment Bond, and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement with such period, the BIDDER may by written notice withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within fifteen (15) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the sixty (60) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability of the BIDDER to perform the work, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the Owner may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is property qualified to carry out the obligations of the Agreement and to complete the work contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the lowest responsive, responsible BIDDER unless all bids are rejected.

The OWNER will award the contract conditioned upon funds being made available for such construction for each division. However, the OWNER reserves the right to reject all bids.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to his BID.

The low BIDDER shall supply the names and addresses of major materials SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER.

Time of Completion and Liquidated Damages: The BIDDER must agree to commence work within the time stipulated in the Agreement. Bidders must also agree to pay as liquidated damages the amount set forth in the Agreement for each consecutive calendar day that the work is incomplete after the scheduled date of completion.

Interpretations of Plans and Specifications: No interpretation of the meaning of the plans, specifications, or other documents will be made to any bidder orally prior to the receipt of bids.

Any request for such interpretation shall be in writing addressed to Johnston County Department of Utilities, P.O. Box 2263, Smithfield, N.C. 27577. To be given consideration, such request must be received at least seven (7) days prior to the scheduled date for opening bids. Any such interpretation or supplemental instructions will be issued in the form of addenda to the specifications, which will be mailed to all persons receiving a set of contract documents, not later than five days prior to the date for opening of bids. Failure of any bidder to receive such addenda shall not relieve him or any obligation under his bid as submitted. All addenda so issued shall be come part of the contract documents.

Right to Increase or Decrease the Amount of Work: The work comprises approximately the quantities shown in the Bid Form which will be used as a basis for comparison of bids and not for final estimate. The Owner does not, by expression or by implication, agree that the actual work shall correspond with the estimated quantities. The Owner reserves the right to increase or decrease the various amounts of work by 25% with no changes in unit prices.

BIDDER shall make positive efforts to use small and minority owned businesses and comply with GS-143. The BIDDER that is awarded the project shall submit documentation to indicate compliance.

Notice of Special Conditions: Attention is called to those parts of the contract documents and specifications which deal with the items below:

(a) Inspection and testing of materials
(b) Insurance requirements

BID FORM
FOR
JOHNSTON COUNTY
RECLAIMED WATER IRRIGATION SYSTEM

FROM:

Bidder: _____ Submitted: _____

Address: _____

Contractor's License No.: _____

TO: Johnston County Board of Commissioners

_____

The undersigned, as Bidder, hereby declares that the only person, or persons, interested in this Bid as principal(s) is, or are, named herein; that no other persons have any interest in the Bid or in the Contract to be entered into; that this Bid is made without connection with any person, company, or parties making a bid; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the SITE of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done, that he has examined the Plans and Specifications for the work and the contractual documents relative thereto; and that he has satisfied himself as to the work to be performed.

Bidder acknowledges receipt of the following addenda:

No. _____ _____ _____ _____

Date: _____ _____ _____ _____

The Bidder further proposes and agrees, if this Bid is accepted, to contract with the Owner, Johnston County, in the attached form to contract, to furnish all material, equipment, tools, apparatus, means of transportation, and labor necessary thereto, and to complete the construction of the proposed facilities in full and complete accordance with the Plans, Specifications and Contract Documents, to the full and entire satisfaction of the Engineer and the Owner at the prices listed hereafter.

ITEMS OF WORK: The work comprises approximately the quantities shown herein which will be used as a basis for comparison of bids and not for final estimate. The Owner does not, expressly or by implication, agree that the actual amount of work shall correspond with the estimated quantities.

Names of materials requested herein must be shown. In case of error in extension, the "Unit Price" shall govern rather than the "Total."

The unit prices and lump sum amounts listed below include all labor, materials, overhead, profit, insurance, taxes, etc., to cover the finished work, in place.

BID FORM
FOR
JOHNSTON COUNTY
RECLAIMED WATER IRRIGATION SYSTEM

Item	Description	Quantity	Unit Price	Total Cost
1.	Mobilization (less than 2% of bid)	1 LS	$_____/LS	$_____
2.	10" Irrigation Main, PVC SDR 21, Class 200	6,345 LF	$_____/LF	$_____
3.	8" Irrigation Main, PVC SDR 21, Class 200	4,065 LF	$_____/LF	$_____
4.	6" Irrigation Main, PVC SDR 21, Class 200	6,945 LF	$_____/LF	$_____
5.	4" Irrigation Main, PVC SDR 21, Class 200	1,450 LF	$_____/LF	$_____
6.	3" Irrigation Main, PVC SDR 21, Class 200 including PVC fittings	1,600 LF	$_____/LF	$_____
7.	10" Gate Valve w/ box	3 EA	$_____/EA	$_____
8.	8" Gate Valve w/ box	2 EA	$_____/LF	$_____
9.	Hydrant Assembly, complete including all hydrant fittings	45 EA	$_____/EA	$_____
10.	Combination air relief/vacuum relief/ pressure air relief valve, hydrant mounted	21 EA	$_____/EA	$_____
11.	Combination air relief/vacuum relief/ pressure air relief valve with manhole complete	1 EA	$_____/EA	$_____
12.	Dust Control Sprinkler Assembly	130 EA	$_____/EA	$_____
13.	Silt Fence	6,200 LF	$_____/LF	$_____
14.	Protection Concrete	30 CY	$_____/CY	$_____
15.	Trench Stabilization (6" depth)	2,000 LF	$_____/LF	$_____
16.	Undercut Excavation and Replacement with Select Borrow	100 CY	$_____/CY	$_____
17.	Stone Check Dam	1 EA	$_____/EA	$_____

Item	Description	Quantity	Unit Price	Total Cost
18.	D.I. Fittings	4000 LBS	$_____/LB	$_____
TOTAL BASE BID				**$**_____

(To be Fully Completed for Acceptable Bid)
Material Information

Material	Manufacturer/Source
PVC Pipe	_____
D.I. Pipe	_____
Gate Valves	_____
Air Vacuum and Air Release Valves	_____

PROPOSED SUB-CONTRACTORS:

Name	Address	Type and Extent of Work

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

Bidder understands that the Owner reserves the right to reject all bids and to waive any technicalities and formalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for receiving bids.

Upon receipt of notice of award, bidder will execute the formal contract attached within twenty (20) days and deliver a Surety Bond or Bonds.

ATTACHED HERETO is a certified check on the _____ _____ Bank of _____ and/or bid bond with the _____Company for the sum of _____ Dollars ($_____), made payable to _____ as a bid guarantee.

The attached bid security is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

The Bidder further proposes and agrees hereby to commence the work with adequate forces and equipment within fifteen (15) days after being notified by the Owner to proceed, and to complete the work within one hundred fifty (150) calendar days. Bidder further agrees to pay as liquidated damages the sum of $200.00 for each consecutive calendar day thereafter.

Firm: _____

By: _____

Title: _____

(Seal - if bid is by a corporation)

BID BOND

KNOW ALL MEN BY THESE PRESENT, that we, the undersigned, _____

_____, as Principal, and _____

as Surety, are hereby held and firmly bound unto _____ as OWNER

in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this _____ day of _____, 2002.

The Condition of the above obligation is such that whereas the Principal has submitted to a certain BID, attached hereto and hereby made a part hereof, to enter into a contract in writing for the construction of _____

_____.

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID.

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____ (L.S.)
Principal

_____
Surety

By: _____

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

AGREEMENT

THIS AGREEMENT, made the _____ day of _____, 2002, by and between Johnston County, hereinafter called the "OWNER" and _____ doing business as (an individual), or (a partnership), or (a corporation) hereinafter call "CONTRACTOR".

WITNESSETH:

That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the construction of the Johnston County Reclaimed Water Irrigation System.

2. The CONTRACTOR will furnish all of the materials, supplies, tools, equipment, labor, and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS within fifteen (15) calendar days after the date of the NOTICE TO PROCEED and will complete the same within one hundred fifty (150) consecutive calendar days unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS. The CONTRACTOR further agrees to pay the sum of $200.00 per day as liquidated damages to the OWNER for each calendar day that the work exceeds the period so stated.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of $_____, or as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

A. ADVERTISEMENT FOR BIDS
B. INFORMATION FOR BIDDERS
C. BID FORM
D. BID BOND
E. AGREEMENT
F. PAYMENT BOND
G. PERFORMANCE BOND
H. NOTICE OF AWARD
I. ACCEPTANCE OF AWARD
J. NOTICE TO PROCEED
K. CHANGE ORDER
L. CERTIFICATE OF SUBSTANTIAL COMPLETION
M. GENERAL CONDITIONS
N. SUPPLEMENTAL GENERAL CONDITIONS
O. SPECIAL PROJECT CONDITIONS
P. SALES TAX
Q. Drawings numbered 1 through 8, and dated June, 2001.
R. Specifications dated February, 2002.
S. ADDENDA:

No. _____, dated _____, 2002
No. _____, dated _____, 2002
No. _____, dated _____, 2002
No. _____, dated _____, 2002
No. _____, dated _____, 2002

6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT DOCUMENTS.

7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in (3) copies each of which shall be deemed an original on date first above written.

OWNER:

Johnston County

By: _____

Rick J. Hester

County Manager

(SEAL)

ATTEST:

_____

Joyce H. Ennis, Clerk to the

Board of County Commissioners

CONTRACTOR:

_____

By: _____

Name: _____

Address: _____

_____

(SEAL)

ATTEST:

_____

Name: _____

_____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that _____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called
(Corporation, Partnership or Individual)

Principal, and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, and held and firmly bound unto

Johnston County
(Name of Owner)

P.O. Box 2263, Smithfield, N.C. 27577
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day _____, 2002, a copy of which is hereto attached and made a part hereof for the construction of:

_____

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by Subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder of the SPECIFICATIONS

accompanying the same shall be any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this the _____ day of _____, 2002.

ATTEST:

_____
(Principal Secretary)

(SEAL)

_____
Witness as to Principal

_____
(Address)

_____

ATTEST:

_____
Witness as to Surety

_____
(Address)

_____

_____
Principal

By: _____ (s)

_____
(Address)

_____

_____
Surety

By: _____
Attorney-in-Fact

_____
(Address)

_____

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called
(Corporation, Partnership or Individual)

Principal, and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, and held and firmly bound unto

Johnston County
(Name of Owner)

P.O. Box 2263, Smithfield, N.C. 27577
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day _____, 2002, a copy of which is hereto attached and made a part hereof for the construction of:

_____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same

shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this the _____ day of _____, 2002.

ATTEST:

_____	_____
Principal Secretary	Principal
(SEAL)	By: _____
_____	_____
Witness as to Principal	Address
_____	_____
Address	
_____	_____
	Surety
ATTEST:	
_____	By: _____
Witness as to Surety	Attorney-In-Fact
_____	_____
Address	Address
_____	_____

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

NOTICE OF AWARD

TO: _____

_____

_____

Project Description: Reclaimed Water Irrigation System

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____.

You are hereby notified that your BID has been accepted for items in the amount of $_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance Bond, Payment Bond and certificates of insurance within twenty (20) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within twenty (20) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your Bid Bond. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this ____ day of _____, 2002.

Johnston County
Owner

By: _____

Rick J. Hester

County Manager

Receipt of the above NOTICE OF AWARD is hereby acknowledged by this the ____ day of _____, 2002.

By: _____

Title: _____

Contractor: _____

NOTICE TO PROCEED

TO: _____

_____

_____

_____

DATE: _____

PROJECT: Reclaimed Water Irrigation System

_____

You are hereby notified to commence WORK in accordance with our Agreement dated _____, 2002, on or before _____, 2002, and you are to complete the work within 150 consecutive calendar days thereafter. The date of completion of all WORK is therefore _____

Johnston County
Owner

By: _____

Rick J. Hester

County Manager

ACCEPTANCE OF NOTICE:

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

_____

this the _____ day of _____, 2002

By: _____

Title: _____

CHANGE ORDER

Change Order No.: _____ **Date:** _____

NAME OF PROJECT: Reclaimed Water Irrigation System

OWNER: Johnston County

CONTRACTOR: _____

The following changes are hereby made to the CONTRACT DOCUMENTS:

Justification:

CHANGE to CONTRACT PRICE:

Original CONTRACT PRICE: $_____

Current CONTRACT PRICE adjusted by previous CHANGE ORDER: $_____

The CONTRACT PRICE due to this CHANGE ORDER will be (increased) (decreased) by $_____.

The new CONTRACT PRICE including this CHANGE ORDER: $_____.

CHANGE to CONTRACT TIME:

Original CONTRACT TIME: _____

Current CONTRACT TIME Changed by previous Change Orders: _____

The CONTRACT TIME will be (increased) (decreased) by _____ calendar days.

The NEW CONTRACT TIME including this Change Order: _____ calendar days

The date for completion of all work will be: _____

Approvals Required:
To be effective this Order must be approved by the State agency if it changes the scope or objective of the Project, or as may otherwise be required by the GENERAL CONDITIONS.

CONTRACTOR: _____

ENGINEER: _____

OWNER: _____

AGENCY: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER's Project No. ..... ENGINEER's Project No. .....

Project .....

.....

CONTRACTOR .....

Contract For ..... Contract Date .....

This certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To .....

OWNER

And To .....

CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of the OWNER, the CONTRACTOR, and the ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

.....

Date of Substantial Completion

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. When this Certificate applies to a specified part of the Work the items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

NSPE-ACEC 1910-8-D (1978 Edition)

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Professional Engineers

The date of Substantial Completion is the date upon which all guarantees and warranties begin, except as follows:

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities and insurance shall be as follows:

RESPONSIBILITIES:

OWNER: _____

_____

_____

CONTRACTOR: _____

_____

_____

The following documents are attached to and made a part of this Certificate:

Executed by ENGINEER on .....

.....

ENGINEER

By: .....

The CONTRACTOR accepts this Certificate of Substantial Completion on .....

.....

CONTRACTOR

By: .....

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

[INSERT LOGOS]

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General [seal] Contractors of America

Construction Specifications Institute

[seal]

These General Conditions have been prepared for use with the Owner-Contractor Agreements (No. 1910-8-A-1 or 1910-8-A-2) (1996 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC User's Guide (No. 1910-50). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. 1910-17) (1996 Edition).

CDC No. 1910-8 (1996 Edition)

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order*--A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy

Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices.

48. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

1.02 *Terminology*

A. *Intent of Certain Terms or Adjectives*

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe

an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. *Day*

1. The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. *Defective*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, "provide" is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.

2.02 *Copies of Documents*

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *CONTRACTOR's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

3.02 *Reference Standards*

A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or

more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any

such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the necessity of OWNER's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER

or ENGINEER by the owners of such Underground Facilities, including OWNER, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price of Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

4.05 *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes,

including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but

not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.07 *Waiver of Rights*

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond

direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall

not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed

item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants

and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

6.10 *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant

thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a cov rpart of all approved Shop Drawings will be a lable to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to ENGINEER for OWNER.

6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any

Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to

CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1.

F. *Resubmittal Procedures*

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;

2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;

4. use or occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 - OTHER WORK

7.01 *Related Work at Site*

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *OWNER'S Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract

Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 *Authorized Variations in Work*

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the

Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. *CONTRACTOR's Fee:* The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefor as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to pro-gress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on

the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

D. *Reduction in Payment*

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has

delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially

complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will promptly make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the

reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 OWNER May Suspend Work

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored

elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1990 ed.) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect. Paragraph numbers correspond to paragraphs in the Standard General Conditions being amended or supplemented.

SC-1. The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (No. 1910-8, 1990 ed.) have the meanings assigned to them in the General Conditions.

SC-1.12 Amend by adding the following:

The Contract Time shall be consecutive calendar days.

SC-2.2 Amend as follows:

Owner shall furnish to the Contractor five (5) sets of the Contract Documents.

SC-4.1 Amend by adding the following:

The project will be available to the Contractor immediately upon issuance of "Notice to Proceed".

SC-4.3.1.2 Amend by adding the following:

Extreme care shall be exercised when excavating with heavy equipment near existing utility lines, drainage structures, building structures, cables, railroad, and streets. The Owner will not assume nor accept any responsibility for charges assessed by private or public utility companies or from the NC Department of Transportation for damages sustained to their property by virtue of action on the part of the Contractor, nor for such charges as may be imposed by the utility or Department of Transportation for personnel to furnish field location of the facility. All such costs are to be borne by the Contractor within the unit prices and/or lump sum prices stated in the Bid.

SC-5.1 Amend by adding to the end of this paragraph the following sentence:

The performance bond and the payment bond shall be executed by a surety company legally authorized to do business in the State of North Carolina and shall become effective upon the awarding of the construction contract. A bid bond is required and shall be in an amount of five percent (5%) of the bid amount as required by GS 143-129.

SC-5.4 The limits of liability for the insurance required by paragraph 5.4 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

5.4.1/5.4.2 Workers' Compensation, etc. under paragraphs 5.4.1 and 5.4.2 of the General Conditions:

(1)	State	Statutory
(2)	Applicable Federal (e.g., Longshoreman's)	Statutory

5.4.3/5.4.4/5.4.5 Comprehensive General Liability (under paragraphs 5.4.3 through 5.4.5 of the General Conditions):

(1) Bodily Injury (including completed operations and products liability):

$500,000.00 for each person
$1,000,000.00 for each occurrence

Property Damage:

$1,000,000 for each occurrence
$1,000,000 - aggregate

(2) Property Damage Liability Insurance will provide Explosion, Collapse and Underground coverages where applicable. Equal to Contract Amount.

(3) Personal Injury, with employment exclusion deleted.

$500,000 - annual aggregate

5.4.6 Comprehensive Automobile Liability:
Bodily Injury:

$300,000 for each person
$500,000 for each occurrence

Property Damage:

Combined single limit of $200,000

5.4.8 Umbrella Coverage for This Contract - $5,000,000
This coverage shall be continuous in excess of the self insured retention.

SC-5.4.14 Add the following to Article 5.4 as a new paragraph 5.4.14:

5.4.14 The insurance required under the above paragraphs shall provide adequate protection for the Contractor and his subcontractors, respectively, as well as the Owner and Engineer, against damage claims which may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also, against any special hazards which may be encountered in the performance of this contract.

The Contractor shall maintain flood insurance on building structures, equipment, and other insurance items of new construction which could be damaged during a period of flooding during the period of the construction contract (until the new facilities are accepted by the Owner).

SC-5.4.15 Add the following to Article 5.4 as a new paragraph 5.4.15:

5.4.15 The Contractor shall either (a) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage, and Vehicular Liability of the type and in the same amounts as specified in the preceding paragraph, or (b) insure the activities of his subcontractors in his own policy

SC-5.4.16 Add the following to Article 5.4 as a new paragraph 5.4.16:

5.4.16 Prior to beginning construction, the Contractor shall furnish to the Owner and Engineer certificates of insurance by companies acceptable to the Owner and Engineer covering the above specified items and including an endorsement incorporating the Save Harmless Agreement assumed by the Contractor. The Contractor shall be solely responsible for securing certificates of insurance coverage as therefore specified from all subcontractors engaged in the work.

SC-5.6 Delete paragraph 5.6 of the General Conditions in its entirety and insert the following in its place:

5.6 Contractor shall purchase and maintain until final payment property insurance upon the Work at the site to the full insurable value thereof (subject to deductible amounts as may be provided in these Supplementary Conditions or required by Laws and Regulations). This insurance shall include the interests of Owner, Contractor, Subcontractors, Engineer and Engineer's consultants in the Work (all of whom shall be listed as insured or additional insured parties), shall insure against the perils of fire and extended coverage, shall include "all-risk" insurance for physical loss and damage including theft, vandalism and malicious

mischief, collapse and water damage, and such other perils and may be provided in these Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property including buildings, structures, and other insurable items of construction, while in the course of construction, including foundations, additions, attachments, and all permanent fixtures belonging to and constituting a part of said buildings or structures (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all-risk" insurance or otherwise provided in these Supplementary Conditions, Contractor shall purchase and maintain similar property insurance of portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for payment. The policies of insurance required to be purchased and maintained by Contractor in accordance with this paragraph 5.6 shall comply with the requirements of GC-5.8.

SC-6.1 Amend by adding the following:

At no time during the course of construction shall any of the Contractor's personnel behave in any ungentlemanly or abusive manner on the job site or in any meetings or conference involving the Owner or Engineer. Ungentlemanly, abusive , uncooperative behavior shall be grounds for dismissal of the Contractor's personnel from the project.

No alcoholic beverages or narcotics of any description will be allowed on the job site at any time. Furthermore, anyone under the influence of alcohol or narcotics shall be removed from the job site immediately. A second offense involving Contractor's personnel under the influence of alcohol or narcotics on the job site shall constitute grounds for automatic, permanent dismissal from any further work on the project.

SC-6.2 Amend by adding the following:

The Owner and Engineer shall have authority of approval of the project superintendent and all subcontractors employed on the project. Within five (5) days from receipt of the Notice of Award, the name and written summary of qualifications of the project superintendent and the name and address, and scope of work proposed for all subcontractors shall be submitted for approval by the Owner and the Engineer. The decision for approval or disapproval shall be final and binding.

SC-6.8 Amend by adding the following:

WITHIN FIVE (5) DAYS of the bid opening and before the Notice of Award, the apparent Successful Bidder is required to identify all Subcontractors to be employed in the project. The apparent Successful

Bidder shall also identify the Amount of Work that each Subcontractor is employed to perform.

SC-6.8.1 Amend by adding the following:

Prime Contractors shall not sublet the contract, nor any portion thereof, without the written consent of the Owner.

If such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with his own organization work amount to not less than 50% of the total contract amount and 50% of the total labor. Upon request by the Owner, the Contractor shall furnish sufficient documentation, satisfactory to the Owner, to demonstrate compliance herewith.

A subcontractor shall not sublet, sell, transfer, assign, or otherwise dispose of his contract with the Contractor, nor any portion thereof, or of his right, title, or interest therein.

The Contractor shall not assign the whole or any of this contract or any moneys due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any moneys due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior liens of all persons, firms, and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

SC-6.15 Amend by adding the following:

"Contractors are required to pay North Carolina Sales and/or Use Taxes and County Sales Taxes where applicable on all equipment and materials incorporated into the project. The Owner is qualified to receive rebate of the amount of such Sales Taxes as are paid on Materials and/or Equipment incorporated into the project.

Pursuant to North Carolina General Statutes, Section 105-164, 14, the Owner is eligible for Sales and Use Tax refunds on all materials which become a permanent part of the construction. The Contractor agrees to provide the Owner documentation which meets the requirements of Sales and Use Tax Regulation 42 regarding requests for refund of sales and use taxes. Those requirements are outlined below:

(g) All refund claims must be substantiated by proper documentary proof and only those taxes actually paid by the claimant during the fiscal year covered by the refund claim may be included in the claim.

Any local sales or use taxes included in the claim must be separately stated in the claim for refund. In cases where more than one county's sales and use tax has been paid, a breakdown must be attached to the claim for refund showing the amount of each county's local tax separately.

To substantiate a refund claim for sales and use taxes paid on purchases of building materials, supplies, fixtures, and equipment by its contractor, the claimant must secure from such contractor certified statements setting forth the cost of the property purchased from each vendor and the amount of state and local sales and/or use taxes paid thereon. Such statement must also include the cost of any tangible personal property withdrawn from the contractor's warehouse stock and the amount of state and local sales or use tax paid therein by the Contractor. Similar certified statements by his subcontractors must be obtained by the general Contractor and furnished to the claimant (Owner). Any local sales or use taxes included in the Contractor's statement must be shown separately from the State sales or use taxes. The Contractor's statements must not contain sales or use taxes paid on purchases of tangible personal property purchased by such contractors for use in performing the contract which does not annex to, affix to or in some manner become a part of the building or structure being erected, altered or repaired for the governmental entities as defined by NCGS 105-164(c). Examples of property on which sales and use tax has been paid by the Contractor and which should not be included in the Contractor's statement are scaffolding, forms of concrete, fuel for the operation of machinery and equipment, tools, equipment repair, parts and equipment rentals, blueprints, etc.

The Contractor shall submit notarized sales tax certificates which meet the requirements detailed above with each monthly payment request. Payment will not be made until the sales tax certificate(s) has been submitted to the Owner.

SC-6.17 Amend by adding the following:

The Contractor shall be responsible for disposal of all other waste/spoil materials. Means of disposal shall be subject to the Engineer's approval.

SC-6.20.3 Amend by adding the following:

The Contractor shall be responsible for removing and disposing of any obstructions or obstacles at the site of the work along the right-of-way to the satisfaction of the Engineer. Minor obstructions shall be removed and properly disposed of or protected and re-erected to as good a condition as found, at the same or adjacent locations, as directed by the Engineer.

1. Fences at the site or along the right-of-way, which interfere with the construction operations, shall be maintained by the Contractor until completion of the work unless written permission is obtained from the Owner thereof to leave the fence dismantled until construction is completed. He shall remove, rebuild, and extend fences as necessary to keep stock away from the construction area or from straying away.

2. Upon completion of work, all fences are to be restored to their original location and condition, unless shown differently on the Plans. The Contractor shall purchase new material, if necessary, to replace all materials damaged, lost, or destroyed.

SC-6.20.4 Add the following to Article 6.20 as a new paragraph 6.20.4:

6.20.4 During progress of the work, the convenience and protection of the public must be provided for, and interferences held to a minimum.

1. The Contractor shall, at all times, conduct the work in such a manner as to insure the least practicable obstruction to public travel. The convenience of the general public and of the residents along and adjacent to the area of the work shall be provided for in a satisfactory manner, consistent with the operation and local conditions. Roads and streets must be kept open at all times, or suitable detours provided. When necessary to close streets, "Street Closed" signs shall be placed immediately adjacent to the work, at such locations as traffic demands, and the Contractor shall notify the Owner, law enforcement agencies, fire departments, and parties operating emergency vehicles before the street is closed and again as soon as it is opened. Access to fire hydrants and other fire extinguishing equipment shall be provided and maintained at all times.

2. When necessary, the Contractor shall provide watchmen and lights to burn between twilight and sunrise, and shall erect and maintain barriers and all other necessary protection about the work at his own expense. He shall also take other precautions as may be necessary to protect life, limb, and property. The Owner reserves the right to remedy and neglect on the part of the Contractor as regards to the protection of the work after 24 hours notice in writing; and in cases of emergency, the Owner shall have the right to remedy and neglect without previous notice and in either case deduct the cost of such remedy from money due the Contractor.

SC-6.20.5 Add the following to Article 6.20 as a new paragraph 6.20.5:

6.20.5 The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-054).

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

The Contractor shall contact the local Plant Protection and Quarantine Office of the US Department of Agriculture to determine if any part of this project or any area of his operations in connection therewith is within any quarantine. If so, the Contractor shall thoroughly clean and wash all equipment that moves out of the quarantine area at any time during or after construction of the project and he shall comply with all restrictions and regulations of the US Department of Agriculture and the NC Department of Agriculture.

SC-7.4 Delete Article 7.4 in its entirety and insert the following:

7.4 If OWNER contracts with others for the performance of other work on the project at the site, the following will be set forth:

7.4.1 The Prime General Contractor shall be responsible for overall project coordination and scheduling of work items with the Prime Electrical, HVAC and Plumbing Contractors. He shall deliver a revised construction schedule to the Engineer, Owner, and other prime Contractors in sufficient detail to estimate the completion date of major units. Upon request by the Engineer, all Contractors shall make themselves available for project schedules, coordination of work and resolution of conflicts, provided however that such meetings would not be required more often than monthly on the average.

7.4.2 The Prime General Contractor and Prime HVAC Contractor are responsible for notifying the Prime Electrical Contractor of any changes in equipment motor sizes from those shown on the electrical drawings. The General Contractor and HVAC Contractor shall be responsible for any additional costs to the Electrical Contractor resulting from larger or heavier electrical equipment wiring required to accommodate higher horsepower equipment which does not meet technical specification requirements and/or is provided at the convenience of the equipment supplier.

SC-7.5 Add the following to Article 7 as a new paragraph 7.5:

7.5 Should Contractor cause damage to the work or property of any separate Contractor at the site, or should any claim arising out of the Contractor's performance of the work at the site be made by any separate Contractor against Contractor, Owner, Engineer, the Construction Coordinator or any other person, Contractor shall promptly attempt to settle with such other Contractor by agreement, or to otherwise resolve the dispute. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold Owner, Engineer, and the Construction Coordinator harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate Contractor against Owner, Engineer, or the Construction Coordinator to the extent based on a claim arising out of Contractor's performance of the Work.

Should a separate Contractor cause damage to the Work or property of the Contractor or should the performance of Work by any separate Contractor at the site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the Construction Coordinator or permit any action against any of them to be maintained and continued in its name or for the benefit on any action which seeks to impose liability on or to recover damages from Owner, Engineer or the Construction Coordinator on account of any such damage or claim. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate Contractor and Owner and Contractor are unable to agree as to the extent of any adjustment on Contract Time attributable thereto, Contractor may make a claim for an extension of time in accordance with Article 12. An extension of the Contract Time shall be Contractor's exclusive remedy with respect to Owner, Engineer, and Construction Coordinator for any delay, disruption, interference or hindrance caused by a separate Contractor. This paragraph does not prevent recovery from Owner, Engineer, or Construction Coordinator for activities that are their respective responsibilities.

SC-8.12 Add the following to Article 8 as a new paragraph 8.12:

8.12 No official of the Owner, who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction, or material supply contract or any subcontract in connection with construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof. No officer,

employee, architect, attorney, engineer, or inspector of or for the Owner, who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory, or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

SC-11.1 Amend by adding the following:

The work to be done by the Contractor, specified and enumerated under this contract, shall include any minor details of the work not specifically mentioned in the specifications or shown on the plans, but obviously necessary for the proper completion of the work, which shall be considered incidental and as being a part of and included with the work for which prices are given in the Bid Form. The Contractor will not be entitled to any additional compensation therefor.

SC-11.9.3 Paragraph 11.9.3 of the General Conditions is hereby deleted in its entirety and the following is substituted in its place:

"The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment under the following conditions:

11.9.3.1 if the total cost of a particular item of Unit Price Work amounts to 10% or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25% from the estimated quantity of such item indicated in the Agreement; and

11.9.3.2 if there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3 if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof or if OWNER believes that the quantity variation entitles OWNER to an adjustment in the unit price, either OWNER or CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with the Article 11 if the parties are unable to agree as to the effect of any such variation in the quantity of Unit Price Work performed."

SC-12.2 Amend by adding the following:

It is hereby understood and mutually agreed by and between the Contractor and the Owner, that the date of beginning, rate of progress, and the time for completion of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be

commenced on a date to be specified in the Notice to Proceed with the work.

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality. It is further agreed that in the event construction is not completed, or equipment not delivered, within the time specified for completion that the Owner may retain from compensation due the Contractor the stipulated amounts per day for each day thereafter, Sundays and holidays included, that the contract remains uncompleted.

Contract Time extensions for adverse weather delays shall be granted according to the number of days when precipitation exceeds the historical average number of rain events of 0.1 inches rainfall or greater, as established by the US Army Corps of Engineers. The evaluation of weather will be based on the total number of such days over the entire Contract Time.

In addition, time extensions for "impact" days may also be granted if the Contractor can demonstrate that his work plans or production were materially impacted by precipitation which occurred on a previous day. To be considered, the Contractor shall submit detailed documentation relative to each individual "impact" day.

SC-13.2 Amend by adding the following:

The Contractor will provide proper facilities for such access and inspection. Access facilities shall include ladders, walks, foot bridges, dewatering, illumination, etc.

SC-14.2 Delete the last sentence of the paragraph in its entirety and add the following:

The amount of retainage with respect to progress payments will be withheld at the rate of 10%. Retainage shall be released upon approval of the final request for payment.

Amend by adding the following:

The Engineer may allow partial payment of 90% of the estimated value of materials and equipment not incorporated into the Work, pursuant to the following conditions:

1. Major equipment items (as defined by the Engineer) stored off site shall be stored in a bonded warehouse and maintained with

insurance in the name of the Owner for the full value of the equipment.

2. Equipment or materials stored on the site shall be properly stored, protected, and maintained.

3. For any partial payment, the Contractor shall submit, with his monthly progress payment a certified receipt bill from each material or equipment manufacturer.

4. Partial payments on materials or equipment will not be made when the total of such payments would exceed the Contract retainage amount.

SC-14.4 Amend by adding the following:

However, the Owner's payment to the Contractor for the Contractor's first Application for Payment shall not be due for sixty days after such request has been received by the Owner.

SC-14.5 Amend by adding the following:

Final inspection and acceptance of the work is to take place at the completion of the entire work under the Agreement, and any inspection or acceptance of materials and workmanship at the mills, shops, or elsewhere to facilitate the progress of the work, or payment of monthly payment applications of work done, shall not preclude rejection of such materials or workmanship thereafter if same be found unsuitable or not in complete accord with the plans, specifications, and contract documents.

SC-14.7.4 Amend this paragraph by adding to the end the word "or" and inserting thereafter the following:

14.7.4.1 Contractor has failed to make payment to subcontractors or suppliers or for labor, or

14.7.4.2 Contractor has failed to make acceptable submittals in accordance with accepted schedules, or

14.7.4.3 Liability for liquidated damages has been incurred by Contractor.

SC-15.2 Add the following to Article 15 as a new paragraph 15.2:

15.2 No work shall be done under these specifications except by permission of the Engineer and Owner when the weather is unfit for good and careful work to be performed. Should the severity of the weather continue, the Contractor, upon the direction of the Owner, shall suspend all work until instructed to resume operations by the Owner, and the Contract Time shall be

extended to cover the duration of the order. Work damaged during periods of suspension due to inclement weather shall be repaired and/or replaced by the Contractor at his own expense.

SC-16 Delete Article 16 "Dispute Resolution" and "Exhibit GC-A: in their entirety and add the following:

This contract shall not provide in any way for arbitration. This applies to any reference throughout the contract document in the context of dispute resolution.

All parties agree that only the North Carolina Courts shall have jurisdiction over the contract and any controversies arising out of this contract and this agreement shall be governed by and construed in accordance with the law of the State of North Carolina.

SC-17.5 Delete paragraph 17.5 in its entirety and add the following:

17.5 Whenever reference is made to "claims, cost, losses, and damages," it shall include in each case all fees and charges of engineers. Attorneys, other professionals, and all court costs are specifically disallowed.

SC-17.6 Add the following to Article 17 as a new paragraph 17.6:

17.6 Liquidated Damages:

Work on the project shall be commenced with adequate forces within the time stipulated in the Bid and Agreement and fully completed within the stated Contract Time of consecutive calendar days, which shall include Sundays and holidays. No work shall be performed on Saturdays, Sundays, and legal holidays without the prior approval of the Engineer. When the Contractor desires to work on one of the above days, he shall request in writing approval at least one week in advance of the day or days on which he desires to work. Legal holidays shall be the following days: New Year's Day, Easter Monday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day and one other day at Christmas. When a holiday falls on a Saturday, the holiday shall be observed on the preceding Friday, and when a holiday falls on a Sunday, the holiday shall be observed on the following Monday.

Liquidated damages sustained by the Owner as a result of the work not being completed within the Contract Time, shall be as stated in the Agreement for each Contract or Division of Work.

Liquidated damages for this contract shall be assessed for each and every calendar day that the work remains incomplete beyond the Contract Time.

It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract is allowed an additional time for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

1. To any preference, priority, or allocation or order duly issued by the Government;

2. To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, and unusually severe weather; and

3. To any delays of subcontractors occasioned by any of the causes specified in subsections (1) and (2) of this article.

SC-17.7 Add the following to Article 17 as a new paragraph 17.7:

17.7 Where conflicts exist between these General Conditions, Supplemental Conditions, and the Division I Sections of the Specifications, the most stringent requirements shall govern.

END OF SUPPLEMENTARY CONDITIONS

SPECIAL PROJECT CONDITIONS

SPC – 1 Property corners or right-of-way markers disturbed by the Contractor during construction shall be replaced at Contractor's expense by a North Carolina registered surveyor.

SPC – 2 All work shall be performed in accordance with approved permits.

SPC – 3 All construction operations are to be carried out while maintaining the existing solid waste landfill, construction and debris landfill, and yard waste landfill operations. Any short term interruptions of existing traffic patterns or operations shall be scheduled with the Solid Waste Superintendent at least 48 hours in advance.

SPC – 4 SAFETY:

The contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-054).

SPC – 5 ACCESS:

Representatives of the Owner shall have access to the work and all records relative to the work whenever it is in preparation or progress and the Contractor will provide proper facilities for such access and inspection. Access facilities shall include ladders, walks, foot bridges, dewatering, illumination, etc.

SPC – 6 N.C. SALES TAX:

The Contractor shall keep an accurate record of all N.C. sales taxes paid on materials and equipment employed in the work. The Contractor shall submit a certified statement of the N.C. sales taxes paid at the end of the project.

SPC – 7 SPECIAL ATTENTION:

Bidders are directed to pay special attention to the following:

- Comply exactly with all bidding requirements.
- Show license numbers on outside of envelope.
- All Bids are to be submitted on the extra copy of the Bid Form, included herewith.
- Show <u>all</u> data requested on equipment and materials.
- Be sure that the Bid is signed by a responsible agent of the Bidder.

- Show receipt of all Addenda in the designated place on the Bid Form.

SPC – 8 CONSTRUCTION NOTES:

A. The Contractor is to maintain his construction inside the site area. Contractor is to use whatever means, application or methods to maintain his work within the designated site.

B. Working hours for construction shall be 8:00 A.M. to 6:00 P.M. Monday through Saturday. There shall be no work performed on Sundays or holidays without the permission of the Engineer.

C. The County shall furnish potable water required for execution of the work at no cost.

SPC – 9 SALES TAX:

The following procedure in handling the 4% North Carolina Sales Tax and the additional 2% Sales Tax collected by the counties is applicable to this project. Contractors shall comply fully with the requirements outlined hereinafter, in order that the Owner may recover the amount of the tax permitted under the law.

A. It shall be the contractor's responsibility to furnish the Owner documentary evidence showing the materials used and sales tax paid by the contractor and each of his subcontractors.

B. The documentary evidence shall consist of a certified statement, by the contractor and each of his subcontractors individually, showing total purchases of materials from each separate vendor and total sales taxes paid each vendor. Certified statements must show the invoice number, or numbers, covered and inclusive dates of such invoices.

C. Materials used from contractor's or subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices.

D. The contractor shall not be required to certify the subcontractor's statements.

E. The documentary evidence to be furnished to owners eligible for sales or use tax refunds covers sales and/or use taxes paid on building materials used by the contractors and subcontractors in the performance of contracts with churches, orphanages, hospitals not operated for profit, educational institutions not operated for profit and other charitable or religious institutions or organizations not operated for profit and incorporated cities, towns and counties in this State. The documentary evidence is to be

submitted to the above named institution, organizations and governmental units to be submitted to the above named institution, organizations and governmental units to be included in claims for refunds to be prepared and submitted by them to obtain refunds provided by G.S. 105-164.14(2) and (3) of the 1961 Statute as amended, and it to include the purchases of building materials, supplies, fixtures, and equipment which becomes a part of or annex to buildings or structures being erected, altered or repaired under contracts with such institutions, organizations or governmental units.

The Contractor's statements must not contain sales or use taxes paid on purchases of tangible personal property purchased by such Contractors for use in performing the contract which does not annex to, affix to or in some manner become a part of the building or structure being erected, altered or repaired for the governmental units or agencies referred to in this Regulation.

The Contractor or Contractors to whom award is made on this project will be required to follow the procedure outlined above.

Bidders are reminded that the total Additional 2% North Carolina Sales Use Tax which was approved by Referendum in 1969 and Article 40 in 1983 and Article 42 in 1986 is a part of the tax identified above. Purchases in all counties will require separate certified statements for this 2% tax.

This statement shall give the vendor's name, invoice number, total amounts of invoice, dates of invoices, the amount of the special 2% tax paid and the county in which the purchase was made. In the event that the Contractor wishes to file a combined certified statement showing the 4% tax and the 2% tax separately, this will be acceptable provided he give the county in which the 2% was paid.

The certified statements of sales tax shall include all information shown on the form attached at the end of this section. The contractor may reproduce this form for use as his monthly sales tax statement.

END OF SPECIAL PROJECT CONDITIONS

SALES TAX REPORT

FROM _____ TO _____

PROJECT: _____

CONTRACTOR: _____

OWNER: Johnston County

FOR PERIOD _____, 2002 TO _____, 2002

VENDOR	ADDRESS	INVOICE	DATE	AMOUNT	N.C. TAX	COUNTY TAX	NAME OF COUNTY

_____ being duly sworn, certifies that the foregoing statement of sales taxes paid in connection with the referenced contract is true to the best of his or her knowledge and belief.

_____ _____

Signature Title

Sworn to before me this _____ day of _____, 2002. My commission expires _____, 2002.

_____

Notary Public

ST - 1

SECTION 02476 - CONTROL OF EROSION, SILTATION, AND POLLUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section covers the furnishing of materials, labor, and equipment necessary to minimize erosion, siltation, and pollution on the project or projects covered by these specifications.

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

C. Failure on the part of the Contractor to perform the necessary measures to control erosion, siltation, and pollution will result in the Engineer notifying the Contractor to take such measures. In the event that the Contractor fails to perform such measures within 24 hours after receipt of such notice, the Engineer may suspend the work with no extension of contract time, or may proceed to have such measures performed by others at the Contractor's expense, or both.

D. Related Work in Other Sections:

1. Earthwork:	Section 02200
2. Seeding and Mulching	Section 02480

1.3 QUALITY ASSURANCE:

A. Quality Assurance: Erosion and sedimentation control shall conform to the requirements of the North Carolina Sedimentation Pollution Control Act of 1973.

PART 2 - PRODUCTS

2.1 Seeding and seeding materials shall conform to the requirements of Section 02480.

2.2 Silt fences shall conform to the details shown on plans.

2.3 Check dams shall conform to the details shown on the plans.

PART 3 - EXECUTION

3.1 The Contractor shall exercise every reasonable precaution throughout the life of the project to prevent the eroding of soil and the siltation of rivers, streams, lakes, reservoirs, ditches, ground surfaces, or other property. Should any erosion or siltation occur, the Contractor shall take immediate action to correct the situation. The Contractor shall remove and properly dispose of any material washed into rivers, streams, lakes, reservoirs, ditches, storm sewers, or other property. The Contractor shall be liable for any damage to private or public property resulting from insufficient erosion and siltation control measures.

3.2 Construction operations in rivers, streams, ditches, and water impoundments shall be restricted to those areas which must be entered for the performance of work shown on the plans. Excavated materials shall not be deposited in rivers, streams, ditches, or impoundments except that temporary earth dikes may be used when approved by the Engineer, but such dikes shall be completely removed in such manner as to prevent siltation. Frequent fording of flowing streams with equipment will not be permitted. Temporary bridges or other structures shall be used wherever frequent stream crossings are necessary.

3.3 Temporary and permanent erosion control measures shall be provided as shown on the plans or as directed by the Engineer. Temporary sediment control devices must be installed to the extent possible prior to initiation of grading and excavation. The devices must be maintained at a minimum of 50% of the original sediment storage capacity and may not be removed until the areas they serve have been stabilized. Temporary erosion control measures shall include, but not be limited to, the use of temporary berms, dikes, drainage ditches, silt basins, silt ditches, slope drains, structures, stone check dams, vegetation, mulches, mats, netting, gravel, or other necessary methods. Temporary erosion control may include work outside the construction limits.

3.4 The Engineer may limit the area over which excavation, embankment, and grading operations are performed whenever the Contractor's operations are not effectively minimizing erosion and/or siltation.

3.5 All disturbed, non-paved areas shall be seeded and fertilized, mulched, and tacked as soon as practical after cleanup in accordance with the detailed technical specifications therefore. In no case shall a total area of one acre or more be left ungrassed for a period of thirty (30) days when construction has been completed in the area.

3.6 The Contractor shall take every precaution throughout the life of the project to prevent the pollution of rivers, streams, and water impoundments. Pollutants such as chemicals, fuels, lubricants, bitumens, sewage, and other harmful waste shall not be discharged into or alongside rivers, streams, or impoundments, or into natural or

manmade channels leading thereto. The Contractor shall also comply with all Federal, State, and local water and air pollution laws.

3.7 Contractor shall maintain all erosion control measures until such time as the appropriate State authority approves and releases the site at which time the Contractor shall remove all erosion control measures as directed by the Engineer.

END OF SECTION 02476

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. The work of seeding and mulching shall be performed immediately upon completion of grading. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the establishment and growth of the grasses or legumes. In all operations, care shall be taken to preserve the required line, grade, and cross-section of the area.

B. Related Work in Other Sections:

1. Control of Erosion, Siltation, and Pollution Section 02476

PART 2 - PRODUCTS

2.1 SEED:

A. Seed shall be certified by and comply with the rules and regulations of the NC Department of Agriculture. Only high quality seed shall be used. Wet, moldy, or otherwise damaged seed or seed containing an excess of noxious weeds will not be acceptable. Each variety of seed shall be furnished and delivered in separate bags. If seed is to be mixed before sowing, it shall be mixed by methods which will mix the seed thoroughly and uniformly without causing damage to the seed. During handling and storage, seed shall be protected from damage from any cause.

2.2 FERTILIZER:

A. Fertilizer shall comply with the rules and regulations of the NC Department of Agriculture. It shall be manufactured from cured stock and have an analysis of 5-10-10. During handling and storage, the fertilizer shall be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original condition before being used.

2.3 LIME:

A. Lime shall comply with the rules and regulations of the NC Department of Agriculture. It shall be agricultural grade ground dolomitic limestone containing not less than 85% of combined calcium and magnesium carbonates. It shall be so graded that 100% will pass a No. 10 sieve and 40% will pass a No. 100 sieve.

During handling and storage, lime shall be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original condition before being used.

2.4 MULCH:

A. Mulch shall consist of clean grain straw reasonably free from mature seedbearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sanbur, Wild Garlic, Wild Onion, Bermuda Grass, Crotalaria, Witchweed, and restricted noxious weeds as defined by the NC Department of Agriculture at the time of use. Mulch that is matted or lumpy shall be loosened and separated before being used.

PART 3- EXECUTION

3.1 The Seed bed shall be properly prepared and true to line and grade with lime and fertilizer worked into the soil 4" to 6" deep. All weeds and other unacceptable growth shall be cut and disposed of properly. Uneven and rough areas shall be smoothed to provide a uniform surface. The soil shall be loosened to a minimum depth of 5" and all clods shall be broken up. The top 2" or 3" of soil shall be worked into an acceptable seedbed by the use of approved methods. On cut slopes greater the 2:1, the Engineer may permit the depth of preparation to be reduced, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide places in which the seeding materials can lodge.

3.2 Lime and fertilizer shall be distributed uniformly over the prepared seedbed at the specified rates and then harrowed, raked, or otherwise thoroughly worked or mixed into seedbed. Seed shall be distributed uniformly over the prepared seedbed at the specified rate and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. Immediately after seed has been properly covered, the seedbed shall be compacted by means approved by the Engineer.

3.3 Within 24 hours after the completion of seeding, all areas shall be mulched. Mulch shall be spread uniformly by hand or by approved mechanical spreaders which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

3.4 Mulch shall be held in place by applying a sufficient amount of asphalt emulsion or other approved binding material. The rate and method of application shall meet the approval of the Engineer. When the binding material is not applied directly with the mulch, it shall be applied immediately following the mulch application. During the application of the binding material, adequate precautions shall be taken to prevent damage to traffic, structures, traffic control devices, and other appurtenances. When any damage does occur, the Contractor shall repair it, including any necessary cleaning. The Contractor shall take precautions to prevent mulch from entering drainage structures and shall promptly remove any blockages which may occur.

3.5 Unless specified otherwise, the type of seed and the rates for seed, fertilizer, lime and mulch shall be as listed below:

Shoulders, Side Ditches, Slopes (Max. 3:1)

DATE:	TYPE:	PLANTING RATES:
Aug 15 - Nov 1	Tall Fescue	300 lbs./acre
Nov 1 - Mar 1	Tall Fescue and Abruzzi Rye	300 lbs./acre 25 lbs./acre
Mar 1 - Apr 15	Tall Fescue	300 lbs./acre
Apr 15 - Jun 30	Hulled Common Bermudagrass	25 lbs./acre
Jul 1 - Aug 15	Tall Fescue and ***Browntop Millet ***or Sorghum - Sudan Hybrids	120 lbs./acre 35 lbs./acre 30 lbs./acre
	Slopes (3:1 to 2:1)	
Mar 1 - Jun 1 (Mar 1 - Apr 15)	Sericea Lespedeza (scarified) and Add Tall Fescue	50 lbs./acre 120 lbs./acre
(Mar 1 - Jun 30)	Or Add Weeping Lovegrass	10 lbs./acre
(Mar 1 - Jun 30)	Or Add Hulled Common Bermudagrass	25 lbs./acre
Jun 1 - Sep 1	***Tall Fescue and ***Browntop Millet *** or Sorghum - Sudan Hybrids	120 lbs./acre 35 lbs./acre 30 lbs./acre
Sep 1 - Mar 1	Sericea Lespedza (unhulled - unscarified) and Tall Fescue	70 lbs./acre 120 lbs./acre
(Nov 1 - Mar 1)	Add Abruzzi Rye	25 lbs./acre

OR

NCDOT

Sept. 1 - April 1

75# Ky 31 Fescue
50# Pensacola Bahiagrass
500# 10-20-20 Fertilizer
4000# Limestone

April 1 - Sept. 1

75# Pensacola Bahiagrass
50# Ky 31 Fescue
500# 10-20-20 Fertilizer
4000# Limestone

3.6 Seedbed Preparation

A. Chisel compacted areas and spread topsoil 3" deep over adverse soil conditions, if available.

B. Rip the entire area to 6" depth.

C. Remove all loose rock, roots, and other obstructions leaving surface reasonably smooth and uniform.

D. Apply agricultural lime, fertilizer, and superphosphate uniformly and mix with soil (see below*).

E. Continue tillage unit a well-pulverized, firm, reasonably uniform seedbed is prepared 4" to 6" deep.

F. Seed on a freshly prepared seedbed and cover seed lightly with seeding equipment or cultipack after seeding.

G. Mulch immediately after seeding and anchor mulch.

H. Inspect all seeded areas and make necessary repairs or reseeding within the planting season, if possible. If stand should be over 60% damaged reestablish following original lime, fertilizer and seeding rates.

I. Consult the Conservation Inspector on maintenance treatment and fertilization after permanent cover is established.

J. Apply: Agricultural Limestone - 2 tons/acre or 3 tons/acre in clay soils.

K. Fertilizer - 1000 lbs/acre (10-10-10)

L. Superphosphate - 500 lbs/acre (20%)

M. Mulch - 2 tons/acre (small grain straw)

N. Anchor - asphalt emulsion at 450 gal./acre

O. Consult the Conservation Engineer or the Soil Conservation Service for additional information concerning other alternative for vegetation of denuded areas. The above vegetation rates are those which do well under local conditions, other seeding rate combinations are possible.

P. ***Temporary - Reseed according to optimum season for desired permanent vegetation, Do not allow temporary cover to grow over 12" in height before mowing, otherwise fescue may be shaded out.

Q. The Contractor shall maintain seeded areas in a satisfactory condition until final acceptance of the project. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by

the Engineer. Damage or failure resulting from poor seed, the Contractor's operation, or his failure to provide erosion control shall be repaired or replaced at the Contractor's expense.

R. The Contractor shall maintain adequate drainage on the project at all times. In the event water pockets are formed, they shall be drained by the Contractor and all wet and unstable material shall be removed and disposed of and the area backfilled and compacted with suitable material. Such remedial work caused by the failure of the Contractor to keep the area adequately drained shall be performed at his expense.

END OF SECTION 02480

SECTION 02476 - CONTROL OF EROSION, SILTATION, AND POLLUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section covers the furnishing of materials, labor, and equipment necessary to minimize erosion, siltation, and pollution on the project or projects covered by these specifications.

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

C. Failure on the part of the Contractor to perform the necessary measures to control erosion, siltation, and pollution will result in the Engineer notifying the Contractor to take such measures. In the event that the Contractor fails to perform such measures within 24 hours after receipt of such notice, the Engineer may suspend the work with no extension of contract time, or may proceed to have such measures performed by others at the Contractor's expense, or both.

D. Related Work in Other Sections:

1. Earthwork:	Section 02200
2. Seeding and Mulching	Section 02480

1.3 QUALITY ASSURANCE:

A. Quality Assurance: Erosion and sedimentation control shall conform to the requirements of the North Carolina Sedimentation Pollution Control Act of 1973.

PART 2 - PRODUCTS

2.1 Seeding and seeding materials shall conform to the requirements of Section 02480.

2.2 Silt fences shall conform to the details shown on plans.

2.3 Check dams shall conform to the details shown on the plans.

PART 3 - EXECUTION

3.1 The Contractor shall exercise every reasonable precaution throughout the life of the project to prevent the eroding of soil and the siltation of rivers, streams, lakes, reservoirs, ditches, ground surfaces, or other property. Should any erosion or siltation occur, the Contractor shall take immediate action to correct the situation. The Contractor shall remove and properly dispose of any material washed into rivers, streams, lakes, reservoirs, ditches, storm sewers, or other property. The Contractor shall be liable for any damage to private or public property resulting from insufficient erosion and siltation control measures.

3.2 Construction operations in rivers, streams, ditches, and water impoundments shall be restricted to those areas which must be entered for the performance of work shown on the plans. Excavated materials shall not be deposited in rivers, streams, ditches, or impoundments except that temporary earth dikes may be used when approved by the Engineer, but such dikes shall be completely removed in such manner as to prevent siltation. Frequent fording of flowing streams with equipment will not be permitted. Temporary bridges or other structures shall be used wherever frequent stream crossings are necessary.

3.3 Temporary and permanent erosion control measures shall be provided as shown on the plans or as directed by the Engineer. Temporary sediment control devices must be installed to the extent possible prior to initiation of grading and excavation. The devices must be maintained at a minimum of 50% of the original sediment storage capacity and may not be removed until the areas they serve have been stabilized. Temporary erosion control measures shall include, but not be limited to, the use of temporary berms, dikes, drainage ditches, silt basins, silt ditches, slope drains, structures, stone check dams, vegetation, mulches, mats, netting, gravel, or other necessary methods. Temporary erosion control may include work outside the construction limits.

3.4 The Engineer may limit the area over which excavation, embankment, and grading operations are performed whenever the Contractor's operations are not effectively minimizing erosion and/or siltation.

3.5 All disturbed, non-paved areas shall be seeded and fertilized, mulched, and tacked as soon as practical after cleanup in accordance with the detailed technical specifications therefore. In no case shall a total area of one acre or more be left ungrassed for a period of thirty (30) days when construction has been completed in the area.

3.6 The Contractor shall take every precaution throughout the life of the project to prevent the pollution of rivers, streams, and water impoundments. Pollutants such as chemicals, fuels, lubricants, bitumens, sewage, and other harmful waste shall not be discharged into or alongside rivers, streams, or impoundments, or into natural or manmade channels leading thereto. The Contractor shall also comply with all Federal, State, and local water and air pollution laws.

3.7 Contractor shall maintain all erosion control measures until such time as the appropriate State authority approves and releases the site at which time the Contractor shall remove all erosion control measures as directed by the Engineer.

PART 4 – METHOD OF PAYMENT

4.1 The cost of erosion control shall be included in the lump sum bid except for check dams, and silt fence, and no separate payment shall be made therefore.

END OF SECTION 02476

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. The work of seeding and mulching shall be performed immediately upon completion of grading. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the establishment and growth of the grasses or legumes. In all operations, care shall be taken to preserve the required line, grade, and cross-section of the area.

B. Related Work in Other Sections:

1. Control of Erosion, Siltation, and Pollution Section 02476

PART 2 - PRODUCTS

2.1 SEED:

A. Seed shall be certified by and comply with the rules and regulations of the NC Department of Agriculture. Only high quality seed shall be used. Wet, moldy, or otherwise damaged seed or seed containing an excess of noxious weeds will not be acceptable. Each variety of seed shall be furnished and delivered in separate bags. If seed is to be mixed before sowing, it shall be mixed by methods which will mix the seed thoroughly and uniformly without causing damage to the seed. During handling and storage, seed shall be protected from damage from any cause.

2.2 FERTILIZER:

A. Fertilizer shall comply with the rules and regulations of the NC Department of Agriculture. It shall be manufactured from cured stock and have an analysis of 5-10-10. During handling and storage, the fertilizer shall be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original condition before being used.

2.3 LIME:

A. Lime shall comply with the rules and regulations of the NC Department of Agriculture. It shall be agricultural grade ground dolomitic limestone containing not less than 85% of combined calcium and magnesium carbonates. It shall be so graded that 100% will pass a No. 10 sieve and 40% will pass a No. 100 sieve. During handling and storage, lime shall be protected against hardening and caking.

Any hardened or caked lime shall be pulverized to its original condition before being used.

2.4 MULCH:

A. Mulch shall consist of clean grain straw reasonably free from mature seedbearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sanbur, Wild Garlic, Wild Onion, Bermuda Grass, Crotalaria, Witchweed, and restricted noxious weeds as defined by the NC Department of Agriculture at the time of use. Mulch that is matted or lumpy shall be loosened and separated before being used.

PART 3- EXECUTION

3.1 The Seed bed shall be properly prepared and true to line and grade with lime and fertilizer worked into the soil 4" to 6" deep. All weeds and other unacceptable growth shall be cut and disposed of properly. Uneven and rough areas shall be smoothed to provide a uniform surface. The soil shall be loosened to a minimum depth of 5" and all clods shall be broken up. The top 2" or 3" of soil shall be worked into an acceptable seedbed by the use of approved methods. On cut slopes greater the 2:1, the Engineer may permit the depth of preparation to be reduced, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide places in which the seeding materials can lodge.

3.2 Lime and fertilizer shall be distributed uniformly over the prepared seedbed at the specified rates and then harrowed, raked, or otherwise thoroughly worked or mixed into seedbed. Seed shall be distributed uniformly over the prepared seedbed at the specified rate and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. Immediately after seed has been properly covered, the seedbed shall be compacted by means approved by the Engineer.

3.3 Within 24 hours after the completion of seeding, all areas shall be mulched. Mulch shall be spread uniformly by hand or by approved mechanical spreaders which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

3.4 Mulch shall be held in place by applying a sufficient amount of asphalt emulsion or other approved binding material. The rate and method of application shall meet the approval of the Engineer. When the binding material is not applied directly with the mulch, it shall be applied immediately following the mulch application. During the application of the binding material, adequate precautions shall be taken to prevent damage to traffic, structures, traffic control devices, and other appurtenances. When any damage does occur, the Contractor shall repair it, including any necessary cleaning. The Contractor shall take precautions to prevent mulch from entering drainage structures and shall promptly remove any blockages which may occur.

3.5 Unless specified otherwise, the type of seed and the rates for seed, fertilizer, lime and mulch shall be as listed below:

Shoulders, Side Ditches, Slopes (Max. 3:1)

DATE:	TYPE:	PLANTING RATES:
Aug 15 - Nov 1	Tall Fescue	300 lbs./acre
Nov 1 - Mar 1	Tall Fescue and Abruzzi Rye	300 lbs./acre 25 lbs./acre
Mar 1 - Apr 15	Tall Fescue	300 lbs./acre
Apr 15 - Jun 30	Hulled Common Bermudagrass	25 lbs./acre
Jul 1 - Aug 15	Tall Fescue and ***Browntop Millet ***or Sorghum - Sudan Hybrids	120 lbs./acre 35 lbs./acre 30 lbs./acre
	Slopes (3:1 to 2:1)	
Mar 1 - Jun 1 (Mar 1 - Apr 15)	Sericea Lespedeza (scarified) and Add Tall Fescue	50 lbs./acre 120 lbs./acre
(Mar 1 - Jun 30)	Or Add Weeping Lovegrass	10 lbs./acre
(Mar 1 - Jun 30)	Or Add Hulled Common Bermudagrass	25 lbs./acre
Jun 1 - Sep 1	***Tall Fescue and ***Browntop Millet *** or Sorghum - Sudan Hybrids	120 lbs./acre 35 lbs./acre 30 lbs./acre
Sep 1 - Mar 1	Sericea Lespedza (unhulled - unscarified) and Tall Fescue	70 lbs./acre 120 lbs./acre
(Nov 1 - Mar 1)	Add Abruzzi Rye	25 lbs./acre

OR

NCDOT

Sept. 1 - April 1	April 1 - Sept. 1
75# Ky 31 Fescue 50# Pensacola Bahiagrass 500# 10-20-20 Fertilizer 4000# Limestone	75# Pensacola Bahiagrass 50# Ky 31 Fescue 500# 10-20-20 Fertilizer 4000# Limestone

3.6 Seedbed Preparation

A. Chisel compacted areas and spread topsoil 3" deep over adverse soil conditions, if available.

B. Rip the entire area to 6" depth.

C. Remove all loose rock, roots, and other obstructions leaving surface reasonably smooth and uniform.

D. Apply agricultural lime, fertilizer, and superphosphate uniformly and mix with soil (see below*).

E. Continue tillage unit a well-pulverized, firm, reasonably uniform seedbed is prepared 4" to 6" deep.

F. Seed on a freshly prepared seedbed and cover seed lightly with seeding equipment or cultipack after seeding.

G. Mulch immediately after seeding and anchor mulch.

H. Inspect all seeded areas and make necessary repairs or reseeding within the planting season, if possible. If stand should be over 60% damaged reestablish following original lime, fertilizer and seeding rates.

I. Consult the Conservation Inspector on maintenance treatment and fertilization after permanent cover is established.

J. Apply: Agricultural Limestone - 2 tons/acre or 3 tons/acre in clay soils.

K. Fertilizer - 1000 lbs/acre (10-10-10)

L. Superphosphate - 500 lbs/acre (20%)

M. Mulch - 2 tons/acre (small grain straw)

N. Anchor - asphalt emulsion at 450 gal./acre

O. Consult the Conservation Engineer or the Soil Conservation Service for additional information concerning other alternative for vegetation of denuded areas. The above vegetation rates are those which do well under local conditions, other seeding rate combinations are possible.

P. ***Temporary - Reseed according to optimum season for desired permanent vegetation, Do not allow temporary cover to grow over 12" in height before mowing, otherwise fescue may be shaded out.

Q. The Contractor shall maintain seeded areas in a satisfactory condition until final acceptance of the project. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Engineer. Damage or failure resulting from poor seed, the Contractor's operation, or his failure to provide erosion control shall be repaired or replaced at the Contractor's expense.

R. The Contractor shall maintain adequate drainage on the project at all times. In the event water pockets are formed, they shall be drained by the Contractor and all wet and unstable material shall be removed and disposed of and the area backfilled and

compacted with suitable material. Such remedial work caused by the failure of the Contractor to keep the area adequately drained shall be performed at his expense.

PART 4 – METHOD OF PAYMENT

4.1 The cost of seeding and mulching shall be included in the unit bid price for testing, cleanup and seeding as indicated on the Bid Form.

END OF SECTION 02480

SECTION 02999 – RECLAIMED WATER IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 Work under this section consists of furnishing all plant, labor, materials, and equipment for the installation of buried reclaimed water mains, valves, hydrants, fittings, risers, sprinklers, and appurtenances.

1.2 RELATED WORK IN OTHER SECTIONS:

A.	Control of Erosion, Siltation, and Pollution:	Section 02476
B.	Seeding and Mulching:	Section 02480

1.3 QUALITY ASSURANCE:

A. Standards:

1. American National Standards Institute
   a) ANSI A21.10 ductile cast iron fittings
   b) ANSI A21.11 ductile cast iron fittings
   c) ANSI 21.4 ductile cast iron pipe cement lining
   d) ANSI A21.51 ductile cast iron pipe
   e) ANSI A21.6 ductile cast iron pipe dimensions
   f) ANSI A21.8 ductile cast iron pipe dimensions
   g) ANSI B16.1 ductile cast iron fittings
   h) ANSI B16.b ductile cast iron fittings

2. American Society for Testing and Materials
   a) ASTM A48 cast iron butterfly valve body
   b) ASTM A126 cast iron butterfly valve body
   c) ASTM A252 encasement pipe
   d) ASTM A339 ductile cast iron fittings
   e) ASTM A436 cast iron butterfly valve disc
   f) ASTM C33 crushed stone
   g) ASTM D1598 pipe tests
   h) ASTM D1599 pipe tests
   i) ASTM D1784 PVC pipe
   j) ASTM D2152 pipe tests
   k) ASTM D2241 PVC pipe

3. American Water Work Association
   a) AWWA C110 cast iron fittings
   b) AWWA C111 cast iron fittings
   c) AWWA C151 ductile cast iron pipe
   d) AWWA C301 pipe gaskets
   e) AWWA C502 fire hydrants
   f) AWWA C504 butterfly valves
   g) AWWA C509 gate valves
   h) AWWA C600 pipe installation

i) AWWA C900 PVC pipe

4. American Association of State Highway Transportation Officials
   a) AASHTO T99 compaction of backfill

5. Federal Specifications
   (1) IB
   b) WW-P-421C ductile cast iron pipe joints
   (1) pipe gaskets

B. Soil Erosion Control

1. Siltation, sedimentation, and erosion shall be kept to a minimum at all times during construction. Sedimentation and erosion control methods shall be employed by the Contractor during construction in order to comply with the requirements of the N.C. Sedimentation Pollution Control Act of 1973, and to plan requirements.

C. Material Testing

1. Material shall be tested in accordance with the General Conditions of these Specifications and the following:

   a) Pipe: Each joint of pipe shall be subjected to successfully meet a hydrostatic proof test in accordance with AWWA requirements for each type. Cast iron pipe shall be tested prior to lining. Certified test results shall be furnished to the Engineer, for each shipment of pipe.

   b) PVC Pipe: PVC pipe shall be given the Quick Burst Test in accordance with ASTM D1599; Sustained Pressure Test in accordance with ASTM D1598; Acetone Immersion Test in accordance with ASTM D2152; Vise Flattening Test (compress 2" long ring in less than 1 minute to 100% flattening without evidence of splitting or shattering); and Drop Impact Test C. (Single impact load from a free-falling missile having a 2" diameter rounded, 1" long nose compacted on a 6" long horizontal specimen. No shattering or splitting shall occur at the following energies 12" nominal size - 24 ft-lb, 2" - 57 ft-lb, 4" - 86 ft-lb, and 6" 100 ft-lb).

   c) Pipe Fittings: Pipe fittings shall be subject to inspection and testing in accordance with standard manufacturing practice.

   d) Gaskets: Gaskets shall be tested, if required, in accordance with Section 3-4 of AWWA C301, and ANSI A21.11.

   e) Valves: Valves shall be tested to double the design working pressure and test results submitted to the Engineer upon request.

f) Other Material: Other material shall be subject to such testing as the Engineer may require should its acceptability be questioned.

g) System Testing:

(1) Pressure Test:

(a) After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 150% the working pressure at the point of testing or 150 psi whichever is greater. Test pressures shall be of at least 2-hour duration and shall not vary by more than plus or minus 5 psi.

(b) Pressurization: Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

(c) Air Removal: Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged, or left in place at the discretion of the Engineer.

(d) Examination: All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Engineer.

(2) Leakage Test: A leakage test shall be conducted concurrently with the pressure test.

(a) Leakage Defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test

pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

(b) Allowable Leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND(P)^{1/2}}{7400}$$

L - the allowable leakage in gallons per hour
N - the number of joints in the length of pipeline tested
D - the nominal diameter of the pipe, in inches
P - the average test pressure during the leakage test, in pounds per square inch gauge

(c) When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed.

(d) When hydrants are in the test section, the test shall be made against the hydrant.

(e) Acceptance of Installation: Acceptance shall be determined on the basis of allowable leakage. If Any test of pipe laid discloses leakage greater than that specified in 1.3.4.1.7.2.2 of this Section, the Contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.

(f) All visible leaks are to be repaired regardless of the amount of leakage.

(g) Should any test disclose leakage greater than that allowed above, the Contractor shall, at his own expense, locate and repair the defect until the leakage is within the specified allowance.

(h) The Contractor shall perform the above testing to his satisfaction for acceptance before having Engineer present for verification and retesting. All assemblies for testing at time of Engineer's witnessing of test shall be broken down and reconnected.

(3) Submittals:

(a) Shop drawings shall be submitted to the Engineer in accordance with the General Conditions for the following items:

(i) Valves
(ii) Corporation Stops
(iii) Valve Boxes
(iv) Hydrants
(v) Tapping Sleeves and Valves
(vi) Transition Couplings
(vii) Sprinklers

(b) Manufacturer's certifications shall be submitted to the Engineer certifying that the following materials meet all requirements of the specifications:

(i) Pipe
(ii) Fittings

(c) Mix designs for concrete and asphalt shall be submitted to the Engineer for approval, if requested by the Engineer.

(d) Six (6) copies of all submittals are required. None of the above listed equipment or materials shall be used on the project unless the necessary approval for that particular item has been given by the Engineer.

(4) Subsurface Investigations:

(a) Subsurface investigations have not been performed along the pipeline routes.

(b) It shall be the Contractor's responsibility to determine the actual subsurface conditions before submitting a bid.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. General:

1. Where material and product specifications are shown on the drawings, the Owner's standard details shall be met. Where materials and specifications are not shown on the drawings the requirements of this section shall govern.

2. All materials and appurtenances shall meet the following minimum standard requirements therefor. It shall be each manufacturer's

responsibility to check the proposed installation and to furnish material that will be fully capable of performing its intended function.

3. Pipe shall be of the type, size, class and diameter as hereinafter specified and called for by the Plans and/or Bid. General Design considerations shall comply with all applicable AWWA Standards at each type and to the following:

4. Trench width for buried pipe design shall be considered as the outside diameter of the pipe plus 2', from the bottom and up to 1" above the top of the pipe.

5. Buried pipe shall be designed for laying condition "C" (flat bottom trench-tamped backfill) to withstand all internal pressures and external loads with a minimum depth of cover of 3', for pipelines 8" and smaller in diameter, and 3'-6" for lines 10" and larger in diameter, and greater depths of cover where required by the Plans, plus an H-20 live load in accordance with A.A.S.H.T.O. Specifications.

6. Design pressure shall consist of 150 psi working pressure plus 100 psi surge allowance unless noted differently on the Plans.

7. Pipe diameters shown or called for shall be the minimum net inside diameter of the pipe after any required lining is placed.

8. Pipe fittings shall be of the size, configuration and type called for in the Plans. All fittings shall be of at least the same class as the pipe with which they are used. Mechanical joint ductile iron fittings shall be used with all ductile and PVC pipe (4" or larger in diameter). Ductile fittings may be either standard weight or compact type.

9. Valves shall be of the type, size and class required by the Plans and all valves shall have standard mechanical joint ends, except where flanged or other type ends are specifically required. Flanges, where required shall be 125 lb. ANSI standard unless otherwise indicated. All valves shall be furnished with operating nuts for below ground service and handwheels for above ground service. All valves shall be of at least the same class as the pipe with which they are used. A cast iron valve box and cast iron cover marked "RECLAIMED WATER" shall be provided for each underground valve except where shown differently on the Plans. Cast iron rings and covers shall be provided for all air valves and concrete vaults as detailed on Plans.

2.2 DUCTILE CAST IRON PIPE:

A. Ductile cast iron pipe shall be centrifugally cast of ductile cast iron having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and a minimum elongation of 10% (Grade 60-42-10). It shall be designed, manufactured, and shall conform to the requirements of ANSI A21.50 and

A21.51, for a minimum 150 psi operating pressure plus a minimum allowance of 100 psi for surge.

B. Nominal laying lengths shall be 18' or 20' nominal maximum of 20% of each size for each order being as much as 24" shorter than the nominal laying length and an additional 10% as much as 6" shorter than nominal laying length.

C. Pipe joints shall be either Type II or Type III in accordance with Federal Specification WW-P-42 IC except where flanged ends are specifically required by Plans.

D. Dimensions shall conform to the requirements of ANSI LA21.6, ANSI A211.8, ANSI A21.11, and WW-P-42 IC, as applicable. Dimensions shall be gauged at sufficiently frequent intervals to assure dimensional control. Insides of sockets and outside of spigot ends shall be tested with circular gauges.

E. Minimum nominal wall thicknesses and allowable depths of cover shall be as follows:

Maximum Depth Cover	Pipe Diameter (inches)									
Ft.	4	6	8	10	12	14	16	20	24	30
5	0.26	0.25	0.27	0.29	0.31	0.33	0.34	0.36	0.38	0.30
8	0.26	0.25	0.27	0.29	0.31	0.33	0.34	0.36	0.38	0.39
12	0.26	0.25	0.27	0.29	0.31	0.33	0.34	0.39	0.44	0.44
16	0.26	0.25	0.27	0.29	0.31	0.36	0.37	0.42	0.50	0.51

Ductile iron pipe shall be minimum Class 50.

F. Tolerances below the standard thickness of pipe and bell shall not exceed:

Size	Allow. Minus Tolerances (inches)
4-8	0.05
10-12	0.06
14-12	0.07

G. All pipe shall be tested at the factory in accordance with AWWA requirements for each type.

H. Underground pipe shall be coated on the outside with asphaltic coating per ANSI A21.51. The coating shall be continuous, smooth, strongly adherent to the pipe and shall not become brittle from cold nor sticky from the heat.

I. Interior surfaces of each pipe, for water service, shall be cement lined in accordance with ANSI, 21.4, with minimum thickness of 1/16" for 3" to 12" pipe and 3/32" for 14" to 24" pipe, and c" for 30" to 48" pipe.

J. Each pipe shall be weighed prior to placing of the inside lining. Weight, nominal thickness, sampling period, and class of pipe shall be shown on each pipe. The

manufacturer's year of production and the letters DI or Ductile shall also be cast or stamped on the pipe. All markings shall be clear and legible and on, or near, the bell end.

2.3 POLYVINYL CHLORIDE PIPE:

A. PVC pipe 2" and larger shall be rigid polyvinyl chloride with integrally formed, factory fabricated bell, for rubber type joint rings. It shall be suitable for all conditions imposed by Plan locations and for a maximum working pressure of 150 psi, plus 100 psi surge allowance at 73EF. Pipe shall be Type 1, Grade 1, made from clear virgin material and shall conform to the requirements of Commercial Standard C5 256, ASTM D1784, ASTM D2241 and with standard dimension ratio SDR 21 Class 200. All pipe shall bear the National Sanitation Foundation Seal of Approval for potable water, the manufacturer's name, and class of pipe.

(OR)

B. PVC pipe shall be rigid polyvinyl chloride with integrally formed, factory fabricated for rubber ring type joints. It shall be suitable for all conditions imposed by Plan locations and for a minimum working pressure of 150 psi, plus 100 psi surge allowance at 73EF. Pipe shall be Type 1, Grade 1, made from clear virgin material and shall conform to all requirements of AWWA Specifications C-900, Class 150. All pipe shall bear the manufacturer's name, specification, and class of pipe. Each length of pipe shall be 20' "1", or 38' "1" except that, random lengths may be furnished for special connections and other special uses.

C. Provisions must be made for expansion and contraction at each joint, through the rubber gasket and pipe bell. Laying lengths shall be 20'-1", or 38'-1" except that, random lengths may be furnished for special connections and other special uses. PVC pipe shall be colored purple (Pantone 522).

D. PVC pipe smaller than 2" shall be Schedule 40, rated 150 psi, with solvent cemented joints.

2.4 RESTRAINED JOINT PIPE AND FITTINGS

A. Restrained joint pipe and fittings shall be ductile iron manufactured in accordance with AWWA C151 and C153. The restraining method shall be by a snap in place flexing restraining ring at the joint. The pipe and fittings shall be American Flex-Ring, Griffin Snap-Lok, US Pipe, T.R. Flex, or equal.

2.5 DUCTILE CAST IRON FITTINGS

A. Ductile cast iron fittings shall conform to the requirements to ANSI Specification A21.10, with mechanical joint ends conforming to ANSI Specification A21.11, except that material and manufacturer shall conform to ASTM Specification A339, Grade 80-60-3 and compact fittings shall conform to ANSI/AWWA C

153/A21.53. All fittings shall be bituminous coated and cement lined as required for pipe. Where flanged ends may be required, flanges shall conform to applicable requirements of ANSI B16.1 and ANSI B16b. Minimum class shall be equal to class pipe used. Fittings may be either standard weight or compact type.

2.6 PVC FITTINGS

A. PVC fittings and adapters shall conform to the same requirements as for pipe and shall be the same class as the pipe.

2.7 TAPPING SLEEVES AND SADDLES

A. Tapping sleeves shall be ductile iron mechanical joint type or all type 316 Stainless Steel bolt around type with 125 lb. ANSI Standard outlet flange, suitable for 150 psi. Tapping Saddles shall be banded type, with two (2) bands, suitable for bolting in place on the pipe to be tapped. Sleeves shall have a single rubber gasket cemented in place on the inside of the sleeve body. Sleeve shall meet all the requirements of ANSI/AWWA C110/A21.10 and C111/A21.1.

2.8 JOINT MATERIAL

A. Gaskets for pipe and fittings shall be continuous ring of rubber material compounded to resist deterioration and of a texture to assure a permanent and watertight seal. They shall have smooth surfaces, free from pitting, blisters, porosity or any other defects. Gaskets shall conform to the requirements of AWWA Specification C301 and Federal Specification WW-P4211.

B. Gasket lubricant shall be a potable hydrogenated vegetable oil, insoluble in cold water, non-toxic, shall not support the growth of bacteria, and shall not impart taste nor odor to the water. It shall not contain detergents soaps, organic solvents or other deleterious ingredients and shall have no deterioration effects on the gaskets. The lubricant shall be semi-paste, easily applicable, readily adherent to the inside of the bell and shall remain in a usable state throughout the range of temperature in which pipe is normally installed. Lubricant shall be delivered to the job site in unopened containers bearing the manufacturer's name and trade name or trademark.

2.9 GATE VALVES

A. Gate valves shall be iron body or resilient seat, non-rising stem and provided with suitable stem seals. They shall comply with AWWA C509, and be designed for an operating pressure of 200 psi. All valves shall open left (counter clockwise). Buried valves shall have a 2" square operating rest. Extension stems shall be furnished where depth of bury places operating nut in excess of 4' below finished grade. No extra compensation for extension stem will be forthcoming.

2.10 BUTTERFLY VALVES

A. Butterfly valves shall be tight closing, rubber seated valves, conforming to the class required by use and location as shown on the Plans. Valve bodies shall be of heavy duty cast iron. ASTM A126, Class B or ASTM A436, Type 1, with stainless steel seating edges. Valve shafts shall be one piece straight through, or stub shaft, Type 304, or Type 316, 18-8 stainless steel and or sufficient size. Valve shafts may also be solid one-piece high tensile strength carbon steel, with 304 stainless steel journals at places where corrosion resistance is required. Bearings shall be of bronze, Teflon, or other material acceptable to the Engineer, and valve seats shall be of rubber, neoprene, or other acceptable material. Valves shall provide 90E closure and shall be bubble tight after installation, when subjected to twice the design working pressure. Valve seating shall be continuous uninterrupted 360E.

B. Each valve shall be equipped with a suitable underground type, totally enclosed, 2" nut operator designed to hold the valve disc in any intermediate position, between fully open and fully closed, without creeping or fluttering. Manual operator shall be the worm and gear, traveling nut, or lead screw type and shall be self locking. All valves shall open left (counterclockwise).

C. Valves and operators shall be satisfactory for frequent operation and for application involving operation after long periods of inactivity. Valve coatings shall be as specified in B.13 of this Section.

2.11 PRESSURE AIR AND VACUUM VALVES

A. Valve interior and exterior coatings shall be the industry standard unless otherwise specified. Pressure air and vacuum release valves shall be either Crispin Pressure Air Valves, as made by Multiplex Manufacturing Company, or APCO valves as made by Valve and Primer Corporation, or valves of equal characteristics approved by the Engineer. The valves shall be designed for at least 150 psi pressure. Vaults to house Pressure Air and Vacuum Valves shall be concrete and of the design and dimensions as detailed on the plans unless noted otherwise.

2.12 SPRINKLERS

Sprinklers for installation on below ground piping shall conform to the following:

A. Full Circle – Irrigation Duty: Senniger Model 7025 with 9/32" nozzle, Rain Bird Model 70 CWH with 9/32" nozzle, Nelson F70PV with 9/32" nozzle, or approved equal. Units shall be rated approximately 18 gpm at 60 psi with a welted diameter of 135' to 138'.

B. Part Circle – Irrigation Duty: Rain Bird Model 65 PJ-ADJ-TNT with ¼" nozzle, Walla-Walla P65 with ¼" nozzle, or approved equal. Units shall be rated approximately 14 gpm at 60 psi with wetted radius of 58' to 64'.

C. Full Circle – Dust Control: Senniger Model 5023 with 7/32" nozzle, Rain Bird 14070WH with 7/32" nozzle, Nelson F43APV with 7/32" nozzle, or approved equal.

Units shall be rated approximately 11 gpm at 60 psi with a wetted diameter of 110'.

D. Part Circle – Dust Control: Rain Bird Model 35A-PJDA-TNT with 3/16" nozzle, Walla-Walla Model P35 with 3/16" nozzle, or approved equal. Units shall be rated approximately 8 gpm at 60 psi with a wetted radius of 50'.

2.13 HYDRANTS

Hydrants shall be fabricated of ductile iron pipe and ductile iron, compact fittings with mechanical joint or 125 lb. ANS flanged fittings, as shown. Connections for air and vacuum release valves shall be Schedule 40 galvanized steel threaded, installed in drilled and tapped openings in the ductile iron. Hydrants shall be anchored with stainless steel tie rods, anchor blocks, and thrust blocks.

2.14 BLOW-OFFS

A. Blow-offs shall conform to Plan details and shall be of the type shown. The blow-off assembly shall consist of a tee, tapping sleeve, or tapping saddle, as shown; gate valve and box; all fittings shown; and approximately 20' of pipe, of size as shown. The valve shall meet the requirements for other gate valves and shall be suitable for the anticipated pressure.

2.15 VALVE BOXES

A. Valve boxes shall be ductile or gray iron meeting the requirements of ASTM A48 for Class 30 iron. They shall be constructed to the design and dimensions shown on the plans. The castings shall be free from pouring faults, sponginess, cracks, blow holes, and other defects and they shall be clean of scale and sand so as to present a smooth, clean and uniform surface. The boxes and covers shall be given one (1) shop coat of first quality protective asphaltum paint. Covers shall have the word "RECLAIMED WATER" cast in the top.

2.16 CRUSHED STONE

A. Crushed stone for pipe foundation shall meet ASTM C33 #57 stone, washed and graded.

B. COLOR CODING SYSTEM

A. All force mains associated with this project shall be tagged or labeled to warn the public that the water is not intended for drinking. Piping, valves, hydrants, outlets and other appurtenances shall be color-coded, taped or otherwise marked to identify the source of water as being reclaimed water in accordance with the requirements of 15A NCCAC2H.0200 Waste Not Discharged to Surface Waters. Minimum requirements are as follows:

1. All reclaimed water piping and appurtenances shall be installed with identification tape. Identification tape shall be at least 3 inches wide and have white or black lettering on purple (Pantone 522) field stating "CAUTION: RECLAIMED WATER – DO NOT DRINK". Identification

tape shall be installed on top of reclaimed water pipelines, fastened at least every 10 feet to each pipe length with nylon or polypropylene straps and run continuously the entire length of the pipe.

2. All valve boxes, manhole covers, hatch covers, sprinklers, hydrants, and above ground appurtenances shall be integrally colored or painted purple (Pantone 522).

PART 3 - EXECUTION

A. LOCATIONS

a. Pipe work shall be installed at the locations shown on the Plans and to the position, alignment, and grade shown thereon. Prior to beginning work at any location, the Contractor shall consult with the Owner to determine that all rights-of-way, permits, or other legalities are in order. He shall familiarize himself with all conditions and/or limitations of such rights-of-way or permits and shall fully comply with all such requirements. All work shall be confined to rights-of-way or permit limits and any encroachment beyond such limits shall be the Contractor's liability.

B. RELATION OF RECLAIMED WATER MAINS TO SEWERS

a. Crossing a Reclaimed Water Main over a Sewer: Whenever it is necessary for a water main to cross over a sewer, the reclaimed water main shall be laid at such an elevation that the bottom of the water main is at least 18" above the top of the sewer, unless local conditions or barriers prevent an 18" vertical separation, in which case the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10' on each side of the point of crossing.

b. Crossing a Reclaimed Water Main Under a Sewer: Whenever it is necessary for a reclaimed water main to cross under a sewer, both the reclaimed water main and the sewer shall be constructed of ferrous materials and with joints equivalent to reclaimed water main standards for a distance of 10' on each side of the point of crossing. A section of ductile iron pipe shall be centered at the point of crossing.

C. CLEARING AND GRUBBING

a. Clearing and grubbing, where required, shall be done prior to beginning of pipe installation. It shall be done in accordance with applicable portions of items of General Conditions and the following:

i. The Contractor shall consult with the Owner and Engineer prior to starting clearing and a full understanding is to be reached as to procedure. The Contractor shall then conduct clearing and grubbing operations in strict accordance with these agreements.

ii. Clearing of trees and brush along the pipeline shall be carefully done so that no damage will occur outside of the limits of the right-of-way. Trees and brush must be cut by hand and trees felled within the right-of-way limits. Only trees that would seriously interfere with construction shall be cut down and all others shall be saved and protected. Trees 6" or more in diameter shall be trimmed, cut into usable lengths of 3', or as DIRECTED BY THE OWNER and the logs neatly stacked on the edge of the right-of-way or disposed of in a manner approved by the Engineer.

iii. Brush, laps, roots, etc., shall be disposed off-site in a manner approved by the Engineer. Burning of trees, brush and debris will not be permitted.

iv. Grubbing of stumps that are in the way of construction shall be done in any convenient manner which will not cause damage to remaining trees or adjacent property. Stumps shall be disposed as for brush or laps above.

v. Limits of the pipe-laying operation shall be confined to the right-of-way and easements. The width of clearing shall be held to a minimum and in no case more than 30', without the written consent of the Engineer.

(or)

vi. Clearing and grubbing shall be performed in accordance with Section 02200.

D. WORK ON HIGHWAY RIGHT-OF-WAY

a. The Contractor shall not begin work on any property of the Department of Transportation until necessary permits are in hand. He shall conform to all requirements of the Department of Transportation or its authorized representatives in the prosecution of this portion of the work. It shall be the responsibility of each Bidder to contact the local highway representative and to determine the exact requirements for work to be done. Requirements shall include, but are not limited to the following:

b. Where a pipeline crosses under a highway, it shall be installed either by open cut, in tunnel, or in encasement under the highway. Materials and method of crossing shall be indicated on the Plans for each crossing. Where pipe is installed by open cut, at least one full lane for traffic shall be kept open and clear at all times.

c. The Contractor shall provide full-time flagmen, with appropriate red flags, at all times when work is in progress.

d. Necessary warning and descriptive signs shall be provided and placed at each end of the working area while work is in progress along highways. These signs shall be well tended and shall be placed at sufficient distances from the site of the work so that ample warning is given to approaching traffic. Signs shall be adequately lighted at night.

e. The Contractor shall keep all streets open to traffic at all times unless permitted otherwise by the Engineer or Department of Transportation as applicable. The Contractor shall provide, place and maintain temporary traffic control devices as directed by the Engineer or Department of Transportation. The latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways as prepared by the National Joint Committee on Uniform Traffic Control Devices shall be used as a guide in the placement of devices and all devices shall meet the requirements of said manual.

f. Where pipe is installed in open cut across a highway, the cut shall be immediately backfilled and all work of repairing the pavement completed immediately. Any subsequent settlement shall be immediately corrected and repaired.

g. Where pavement is cut and replaced, the Contractor shall cut the edges to a straight and even line before repairing the pavement. No ragged edges will be allowed or accepted.

h. Where asphalt pavement or bituminous surfacing is cut, the entire area to be repaired shall be primed with an asphalt prime coat, acceptable to the Department of Transportation before the pavement is replaced.

i. When required, the Contractor shall furnish to the Department of Transportation a 100% Performance Bond for the amount of work to be undertaken (dry boring or paving to be cut and replaced) along highways. Bond is required in North Carolina.

j. Unless otherwise indicated, no excavated material shall be placed on the pavement side of the ditch, along State Highways. The least possible amount of trench will be left open when work is not in progress and equipment shall be removed from the pavement and shoulders during shutdown periods.

k. Shoulders of roadways shall be left in good, acceptable condition and all topsoil and grass that is disturbed shall be replaced. The Contractor shall pay the cost of all Department of Transportation inspectors time if required on the job.

E. TRENCH EXCAVATION

a. Trenches for pipe shall be dug true to line and grade and to the following requirements: Depth of cover shall not be less than 3'-0" for pipe up to 8" in diameter and 3'-6" for pipe 10" and larger in diameter, measured to the top of pipe, unless shown differently on the profile or authorized by the Engineer.

b. Sides of trenches shall be kept as nearly vertical as possible. They shall be at least 12" and not more than 18" wider at the top of the pipe than the outside diameter of the pipe, plus sheathing where it is necessary. Where paving is to be cut, it shall be cut in advance of trenching 1' wider than the specified width of the trench.

c. Where soil conditions prohibit vertical walls, the trench width at the bottom and at 1' above the top of the pipe shall be as specified above with the remainder being held to the least possible width greater than that specified. Where soil conditions prevent ditch excavation without excessive widths, or where directed by the Engineer, wood sheeting, as hereinafter specified, shall be driven to support the trench walls, or a suitably reinforced steel trench box shall be employed.

d. Trench bottoms shall be hand graded to provide uniform and continuous bearing for the pipe along its entire length, with bell holes being dug for pipe bells. No ridges, sags, or undercutting will be allowed. Excess excavating below grade shall be backfilled at the Contractor's expense with suitable material which shall be thoroughly stamped.

e. If approved by the Engineer and subject to suitable soil conditions, the trench may be excavated a few inches below the established subgrade and backfilled with selected material (from the excavation, if available) well compacted and so shaped as to give the pipes uniform bearing throughout their lengths at the established grade. Bell holes shall be dug to relieve the bells of load and to provide for completing the joints.

f. Where the material at grade is unstable, soft, and incapable of supporting the pipe, the trench shall be excavated below grade, as directed by the Engineer, and refilled to grade with crusher-run stone or gravel to form a firm foundation for the pipe. Stone shall be compacted and graded to provide a stable foundation and a uniform bearing for pipe. Bell holes shall be provided as in other types of foundations.

g. When authorized by the Engineer, the Contractor shall dispose of material excavated from the trench that is unsuitable for backfill material. The Contractor shall provide the place select borrow material to replace unsuitable material for backfilling the trench as directed.

h. Should ground water be encountered in the bottom of the trench, causing the trench bottom to be unstable, the material, as directed by the Engineer, shall be excavated below grade sufficiently to allow a bed of crushed rock or gravel to be place in which to bed the pipe. The work shall be done as for unstable foundations. The depth of cut below grade shall be only the minimum amount to accomplish the purpose, and shall be as directed by the Engineer.

i. The Contractor shall furnish all machinery for pumping, bailing, and/or well pointing and shall pump, bail, or otherwise remove any water which may be found or shall accumulate in the trenches, and shall perform all work necessary to keep them clear of water while the pipe is being laid. The disposal of water after removal shall be satisfactory to the Engineer.

j. Whenever necessary, the side of the trench shall be braced and rendered secure and either open or closed sheeting used to the satisfaction of the Engineer; such sheeting and bracing to be left in place until the trench is refilled to a safe limit, not less than 2' above the top of the pipe. The top portion may then be cut off, but the lower portion shall remain undisturbed. In lieu of

sheeting, suitable trench boxes may be employed. All sheeting, bracing, trench boxes, and trench construction methods shall conform to the latest Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970. No extra payment will be made for sheeting and bracing. Such cost shall be included in the cost of installing the pipe.

k. All existing water, sewer, and gas lines, buried electrical and telephone cable, and other known utilities intersecting the lines of construction, if requested by the Engineer, shall be uncovered by the Contractor at his expense and exposed to the Engineer at least 100' ahead of pipe laying operations of insure the correctness of grades. Existing utilities shown on the Plans are as accurately located as existing records and field surveys allow; however, the Contractor shall verify with the various utility companies before excavating and shall save harmless the Owner from any claims for damages as a result of this work.

l. The Contractor shall at all times take necessary precautions in preventing gutters, catch basins, ditches and other drainage facilities from being clogged that might cause flooding conditions and damage to public or private properties.

m. Rock Removal, Blasting

i. In rock or other unyielding material, the excavation shall be made at least 6" below subgrade elevation. The trench shall be refilled with select material compacted in place as specified for ordinary excavation. Suitable material from excavation may be used, if available. If not, it shall be hauled in.

ii. If rock is encountered, it shall be paid for at the unit price set forth in the Bid. Only solid rock requiring blasting or drilling for its removal will be classified as rock excavation. Allowance will be made for a width of the trench not in excess of 16" greater than the outside diameter of the bell of the pipe and a depth from the surface of the rock to be established subgrade of the pipeline. Rock excavated in excess of these limits will not be paid for. The Engineer shall measure the amount of rock excavation to be classified as such before the trench is backfilled. No payment will be made for rock excavation which is backfilled before measurement by the Engineer.

iii. All blasting, where required, shall be done under the personal supervision of a man thoroughly skilled in this class of work. All necessary measures to protect life and property shall be taken. When in close proximity to buildings, transmission lines, telephone lines or other facilities, timber mats or other means of preventing damage from flying debris shall be used. Ample and suitable signals shall be given in proximity to the work before each blast, and flagmen shall be placed on all roads, beyond the danger zone, in every direction to warn traffic. All responsibility for damage rests on the Contractor.

F. PIPE INSTALLATION

a. The Contractor shall haul the pipe and appurtenances to the site of the work and distribute them neatly along the trench prior to laying. The pipe shall be carefully handled to prevent damage. Mechanical hoists or other approved methods shall be used in the handling. Depth of cover shall not be less than 3'-6" for pipes 8" in diameter or 3'-6" for pipes 10" and larger in diameter, measured to the top of pipe, except where shown differently on a profile or specifically authorized by the Engineer.

b. Pipe and appurtenances shall be kept clean and open ends securely plugged when pipe and bell and spigots shall be thoroughly inspected and cleaned prior to lowering into the ditch and care shall be exercised after the pipe is in place to prevent dirt or other extraneous material from getting into the pipe or bells and into the spigot.

c. Spigots shall be fully seated in the bells and the pipe shall be uniformly bedded on the bottom of the trench for its entire length with bells lying in previously dug bell holes sufficiently large to allow proper bedding and jointing. Fitting, valves, and other appurtenances shall be located where shown on the Plans or directed by the Engineer, with the pipe being cut where necessary. After joining, a reasonable amount of deflection may be made in the joint. Such deflection shall not exceed the allowable amount specified by the manufacturer for each size of pipe.

d. Cast iron pipe shall be laid in accordance with the manufacturer's instructions, applicable portions of AWWA Specification C600, and the following:

   i. For mechanical joint pipe, Type II, the rubber rings shall be properly lubricated and spigots and bells cleaned before assembling the joint. Units of bolted joints shall be tightened with special torque limiting wrenches set to provide the proper strain on the bolt, and all nuts tightened to that limit.

   ii. Rubber ring joints, Type III, shall be assembled in accordance with the manufacturer's instructions. The bell and spigot shall be absolutely clean prior to the seating of the gasket. The gasket shall be wiped clean, flexed and properly inserted into the socket and seated evenly and properly. Care shall be taken to eliminate any bulges which might interfere with the proper entry of the spigot. A thin film of lubricant shall be applied to the inside surface of the gasket. The joint shall then be completed by forcing the spigot into the bell until it makes contact with the bottom of the gasket. This shall be done by use of a pipe jack and assembly, or other methods as approved by the Engineer.

e. PVC pipe shall be installed to all applicable portions of requirements for other pipe material and to the exact instructions of the manufacturer. Adapters shall be furnished and installed as necessary when connections are made to other types of pipe.

f. Fittings shall be installed where shown on the Plans or directed by the Engineer. They shall be handled and installed in the same manner as the pipe and all shall be well blocked as hereinafter specified.

g. Valves shall be installed at the locations shown on the Plans. They shall be carefully handled, cleaned, and checked for operation prior to backfilling. Care shall be taken to insure that no dirt, rock, or other obstacles that would interfere with the valve operation are left in the valve.

h. A valve box shall be installed with each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The base shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be furnished where depth of bury places operating not in excess of 4' beneath finished grade.

i. Irrigation hydrants shall be installed in the locations shown on the Plans, or as directed by the Engineer. A minimum of four cubic feet of stone shall be placed under and around the bottom of each hydrant to facilitate its drainage. Hydrants shall be well blocked with concrete and connected back to the main with tie rods as hereafter specified.

j. Concrete for blocking and protection shall be poured in accordance with the following requirements: All fittings, bends, dead ends, fire hydrants, etc., shall be acceptably blocked with concrete having bearing on undisturbed earth in the side and/or bottom of the trench. Bearing area shall be equal to that shown on the Plans and greater if deemed necessary by the Engineer. No concrete shall be poured or splattered on fitting bells, glands, or bolts.

G. BACKFILLING

a. All trash, forms, debris, and other foreign material shall be cleared from around all pipes and structures before backfilling.

b. Backfilling of trenches shall be completed after the installation of each section of pipe. Backfilling shall be kept up with the pipe laying to the satisfaction of the Engineer.

c. Backfilling around the pipe and to a depth of at least 1' above the top of pipe shall be placed by hand in layers of not over 6". Only select material containing no rocks or other objectionable material shall be used for this portion of the backfill. As fast as the material is placed, it shall be cut under the haunches of the pipe with a shovel and thoroughly compacted with mechanical tamps for the full width of the trench to provide support for the bottom and sides of the pipe. Filling shall be carried up evenly on both sides.

d. The balance of the backfill shall be placed and tamped to prevent excessive settlement in a manner satisfactory to the Engineer. If the trench backfill is located under miscellaneous paved areas, areas to be paved, or unpaved streets, the trench shall be backfilled with suitable material free from large stones

or clods in 8" layers (loose measurement) and thoroughly tamped and compacted to 95% of maximum as established by AASHTO Specification T99, Method A, with mechanical tampers, so as to avoid future settlement. Where applicable, the compaction shall be acceptable to the Department of Transportation or Owner. For trenches located in streets and highways, trench backfilling shall be in accordance with the requirements of item 11 of this section, Cutting and Replacing Pavement.

e. For pipe outside street limits, compaction shall be at least 90% of maximum as established by AASHTO Specification T99, Method A.

f. Excess material shall be promptly removed from the site, and the pavement or road surface cleaned of objectionable material. The pavement and/or road surface shall be cleaned daily with a mechanical broom and/or washed if requested by the Engineer or Department of Transportation officials.

g. In unpaved streets and shoulders of roads, the top 6" of trench shall be filled with well compacted topsoil. In paved areas, the top of the trench shall be filled with the specified base for pavement, well mixed and compacted. Any settlement of backfill below finish grade shall be promptly corrected.

h. The Contractor will be responsible for all final subsidence of all trenches and shall leave the same flush with the original ground after all settlement has taken place. Trenches must be protected against scour due to surface drainage. The Contractor shall correct any future settlement within the guarantee period at his own expense.

H. DUST CONTROL

a. The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. The Contractor will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items. The Contractor will provide dust control measures as directed by the Engineer.

I. CUTTING AND REPLACING PAVEMENT

a. Where pavement is to be cut for installation of pipe or other utilities, the Contractor shall cut it neatly in advance of trenching and shall replace the pavement with base and new pavement.

b. All pavement shall be neatly cut to a straight edge in advance of trenching with the method of cutting being subject to approval of the Engineer. Pavement shall be cut 12" wider than the excavated area on each side. Ragged or irregular edges will not be allowed and work completed with barred edges shall be redone. Concrete pavement shall be sawed with suitable concrete saw cutting equipment.

c. Trench backfilling shall be done in layers not over 6" thick and thoroughly compacted. Compaction shall be such as to prevent future settlement and shall be done by acceptable means, approved by the Engineer. Rolling with rubber tired vehicles or track-type equipment will not be allowed. Compaction shall be at least 95% of maximum as established by AASHTO Specification T99, Method A.

d. Base for pavement shall be crusher run stone for all non-NCDOT maintained streets, HB binder for all secondary highways, and reinforced concrete for all primary highways. All base shall be placed in accordance with plan and/or encroachment permit details. Base width shall be shown on the plans and/or encroachment permits for various types of pavement cuts.

i. Crusher run stone shall conform to the requirements of Section 02231. It shall be well mixed and compacted by tamping and rolling. Compaction shall be to such degree as to preclude settlement. Crusher run base material shall be placed at the same time that the trench is backfilled. Backfilling to top of ditch, to be cut out and replaced with base material at a later date, will not be allowed.

ii. Crusher run base for highway pavement and adjacent drives shall be 8" of stone, stabilized with 5% Portland Cement. It shall be thoroughly mixed prior to compacting.

iii. Crusher run base for non-highway pavement and drives shall be 8" of stone without the addition of cement.

iv. Binder base for secondary roads shall be a minimum of 6" HB binder conforming to specifications of the Department of Transportation.

v. Concrete base shall consist of 8" of concrete, reinforced with #4 reinforcing steel bars placed at 8" on center in the transverse direction and #4 tie bars in the longitudinal direction. Concrete shall be designed to produce a compressive strength of 3000 psi at 28 days. The design of the mix and source of supply shall be subject to approval of the Engineer.

vi. Pavement shall be replaced with the same type of pavement that exists prior to cutting and shall consist of either bituminous surface course (double treatment), 2" of hot plant mix asphaltic concrete, or 8" of Portland Cement concrete; all conforming to specifications of the Department of Transportation for each type.

1. All pavement shall be repaired within the same week that it is cut. Should inclement weather delay pavement replacement, the Contractor shall not cut additional pavement until he has notified the Engineer and received specific permission and instructions.

2. For asphalt pavement or bituminous surfacing, the entire area to be resurfaced (including edges of existing pavement) shall be

primed with an acceptable asphalt prime coat just prior to placing new pavement.

J. CONNECTIONS TO EXISTING MAINS

a. Connections to existing facilities shall be made where shown on the plans or directed by the Owner. Wet taps, using tapping sleeves and valves, shall generally be made; except as otherwise directed or planned in which case the main shall be cut and the connections made with fittings and valves. In no case shall the Contractor shut off the water or operate valves in the existing systems without the expressed permission of the Owner. In event such instructions or permissions given by the Owner delays the cutoff, such instructions shall be followed without recourse.

b. In making connections to the existing distribution system, valves shall be set as shown on the Plans, or at such designated places as the Engineer may direct. If due to unforeseen conditions, these locations have to be change or additional valves or fittings added, the Contractor shall install the valves or fittings at the new locations at the unit bid price therefor. The Contractor shall make no claim for additional payments due to the changes unless he has performed some work at the original location before the Owner is informed of the change.

K. REPAIRS TO DAMAGED SERVICES AND UTILITIES

a. Repairs to damaged utilities shall be promptly made at the Contractor's expense. The Contractor shall use every effort to avoid damaging or breaking water, sewer, gas, power, telephone, or other utility service. Utility lines shall be properly supported across the pipe trench until backfilling is completed. Should damage occur, immediate action shall be initiated to affect satisfactory repairs. All repair work shall be satisfactory to the Engineer and Owner of the damaged utility.

L. CLEANUP

a. All pipeline rights-of-way and pipe work areas shall be cleaned up and left in satisfactory condition.

b. Cleanup of work along highways or roads shall be made immediately upon completion of the backfill operation. Ditching and pipe laying shall be stopped at any time that cleanup work lags and shall not be resumed until cleanup progress is satisfactory to the Engineer. Final cleanup and condition of the work area shall be subject to the approval of the State Highway Representative, the Owner, and the Engineer.

c. Cleanup of work for cross-county locations shall follow immediately upon the completion of any major part of the work or upon instructions by the Engineer. Topsoil shall be replaced on all areas disturbed by the pipeline work throughout the length of the water main, and to the full satisfaction of the property owner. Topsoil may be removed from the line of work and stockpiled for future use. It shall be carefully removed, stockpiled, protected, respread, dressed off, and the

entire right-of-way left in condition acceptable to the Engineer and property owner. If topsoil is not stockpiled and protected, suitable, approved material from other sources shall be provided. Where the line is located on pasture land, grassed areas, or roadway shoulders, grass shall be replaced.

d. All disturbed pipeline areas shall be seeded in accordance with Section 02480.

M. INSPECTION AND ACCEPTANCE

a. All work shall be subject to inspection and approval prior to final acceptance and payment. Final acceptance shall be contingent upon the following:

i. All pressure and leakage tests shall yield satisfactory results.

ii. Final cleanup will meet the approval of the Engineer, the Owner, and property owner where applicable, with all defects in trench settlement, pavement patches or other deficiencies being promptly corrected.

PART 4 – PAYMENT

4.1 General

The various items of the reclaimed water irrigation system construction will be paid for at the respective contract prices, which shall include the cost of all equipment, labor, material, and other items required to complete them as specified. No additional compensation will be considered, other than for the extension of unit price quantities beyond those shown in the Bid, Work Clause of these specifications. Measurement and payment shall be as follows:

A. Pipe, in place, at the unit price per linear foot, for different classes and sizes, measured overall, which shall include all cost of excavation, handling, hauling, installing, connections to the system, testing, backfilling and clean-up.

B. Ductile cast iron pipe fittings, in place, will be paid for at the unit price per pound, which shall include joint assemblies material, concrete blocking and placing. Fitting weights shall be based on manufacturer's weight for standard weight fittings not including the follower ring, bolts and gaskets.

C. Concrete blocking for fittings, valves, dead ends, and other items shall be included with the cost of the item for which it is used and no additional payment will be made therefore.

D. Protection concrete, at the price per cubic yard of concrete in place.

E. Connections to the system will be paid for on the basis that pipe, fittings, and valves required for the connection will be paid for at their respective prices; but no additional payment will be made for the connection, unless otherwise noted on the Bid.

F. Repairing damaged utilities will be at the Contractor's expense and no compensation therefore will be allowed.

G. Crushed stone for pipe trench bottom stabilization will be paid for at the unit price per ton or linear foot, which required trench stabilization, which shall include all cost of material, placing, and spreading.

H. Clean-up and grassing of the completed pipeline route will be included in the cost of the pipe and no additional payment will be made therefore.

I. Silt fences for sedimentation and erosion control will be paid for at the unit price per linear foot as stated in the Bid. Hay bales for sedimentation and erosion control will be paid for at the unit price for each in the Bid.

J. Borrow material for backfilling pipe trench when existing excavated material is unsuitable for backfilling shall be paid for at the unit price per cubic yard, which price shall include removing, hauling away and disposal of all excess unsuitable material and furnishing and compacting select borrow material in place. Borrow material shall be as field measured or by totaling truck volume tickets and reducing by 20% to allow for shrinkage.

K. Sheeting, shoring, bracing, etc. installed where required for trench stabilization and protection of adjacent roads, utilities, and properties shall be included in the cost of the pipe and no separate payment will be made therefore.

L. Solid rock excavation (requiring blasting or drilling) shall not be paid for. All excavation is unclassified. Rock excavation cost shall be included in the cost of the pipe and no additional payment will be made therefore.

M. Gate valves and plug valves, in place, at the unit price for each of various sizes and classes, which shall include other specified appurtenances, including valve boxes, valve markers, and extensions for operator.

N. Valve boxes and concrete collars, in place for each valve, shall be included in the cost of the valve and no additional payment will be made therefore.

O. Combination air relief/vacuum relief/pressure air release valve shall be paid, in place, at the unit price for each, which shall include manhole, manhole ring and cover.

P. Hydrant assemblies, in place, shall be paid at the unit price for each which shall include all hydrant fittings and appurtenances with the exception of the combination air relief/vacuum relief/pressure air release valve. The combination air relief/vacuum relief/pressure air release valve shall be paid, in place, at the unit price for each.

END OF SECTION 02999

APPENDIX A
EROSION CONTROL PERMIT

State of North Carolina
Department of Environment and Natural Resources
Raleigh Regional Office

Michael F. Easley, Governor
William G. (Bill) Ross, Secretary

NCDENR
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Tim Bloom

DIVISION OF LAND RESOURCES
LETTER OF APPROVAL
November 7, 2001

Rick Hester
P. O. Box 1049
Smithfield, NC 27577

RE: Project Name: Landfill Reclaimed Effluent
County: Johnston
Submitted by: Johnston Co, Dept. Public Utilities
Date Received: October 18, 2001
Date Processing Initiated: October 18, 2001
Watershed: Neuse #1/03-04-02
New Submittal (X) Revised ( )

Dear Mr. Hester:

This office has reviewed the subject Erosion and Sedimentation Control Plan. We find the plan to be acceptable and hereby issue this letter of approval. If any modifications, performance reservations, or recommendations are applicable, a list is enclosed and is incorporated as a part of this letter of approval. The enclosed Certificate of Approval should be posted at the job site. In addition, it should be noted that this plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, in accordance with Title 15A, North Carolina Administrative Code (NCAC) 4B.0029.

If any modifications are not incorporated into the plan and implemented in the field, the site will be in violation of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute (NCGS), 113A-61.1).

15A NCAC 4B.0018(a) requires that a copy of the approved plan be on file at the job site. Also, this letter gives the notice required by NCGS 113A-61.1(a) concerning our right to perform periodic inspections to ensure compliance with the approved plan.

North Carolina's sedimentation pollution control program is performance oriented, requiring protection of the natural resources and adjoining properties. If at any time during this project it is determined that the Erosion and Sedimentation Control Plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (NCGS 113A-51 through 66), this office may require revisions in the plan and its implementation to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with applicable federal and state water quality laws, regulations and rules. This could include the Division of Water Quality under stormwater or other specific water quality standards, and the U.S. Army Corps of Engineers under Article 404 jurisdiction. Our approval does not supersede any other required permit or approval.

Since this project disturbs five or more acres, one such approval relates to the stormwater that will discharge from your project. This runoff is permitted pursuant to the National Pollutant Discharge Elimination System (NPDES) administered in North Carolina by the Division of Water Quality (DWQ). Attached is the General Stormwater NPDES Permit, NCG010000, as revised July 1, 1995, covering your activity. You are responsible for complying with the General Permit requirements and are subject to enforcement by DWQ for any violations of the General Permit.

Due to the location of this project, it should be noted that a rule to protect and maintain existing buffers along watercourses in the Neuse River Basin became effective on July 22, 1997. The Neuse River Riparian Area Protection and Maintenance Rule (15A NCAC 2B .0233) applies to all perennial and intermittent streams, lakes, ponds and estuaries in the Neuse River Basin with existing vegetation on the adjacent land or "riparian area". In riparian areas with existing vegetation in the first 30 feet directly adjacent to the stream, the rule prohibits land disturbance or new development within the first 30 feet of land next to the water (the remaining 20 feet of the total buffer must be revegetated upon completion of any proposed land-disturbing activity). In riparian areas with existing vegetation that is less than 30 feet wide, the rule prohibits land disturbance or new development within the area that contains the existing vegetation (but not the entire 50 foot riparian area). For more information about this riparian area rule, please contact the Division of Water Quality's Wetland/401 Unit at 919-733-1786, or a Division of Water Quality representative at this regional office.

Please note that this approval is based in part on the accuracy of the information provided concerning financial responsibility. You are requested to file an amended Financial Responsibility Form if any changes become necessary. In addition, it would be helpful if you would notify this office when the proposed land-disturbing activity covered by this plan is initiated.

Your cooperation is appreciated and we look forward to working with you on this project. If there are any questions, please do not hesitate to contact this office.

Sincerely,

Wyatt L. Brown
Asst. Regional Engineer
Land Quality Section

WLB/clm
cc: Chandra Cox, EI, Johnston County
Mr. Ken Schuster, P.E., Division of Water Quality

CERTIFICATE OF PLAN APPROVAL

The posting of this certificate certifies that an erosion and sedimentation control plan has been approved for this project by the North Carolina Department of Environment and Natural Resources in accordance with North Carolina General Statute 113A - 57 (4) and 113A - 54 (d) (4) and North Carolina Administrative Code, Title 15A, Chapter 4B.0007 (c). This certificate must be posted at the primary entrance of the job site before construction begins and until establishment of permanent groundcover as required by North Carolina Administrative Code, Title 15A, Chapter 4B.0027 (b).

Landfill Reclaimed Effluent - Johnston County

Project Name and Location

November 7, 2001

Date of Plan Approval

NCDENR

Regional Engineer

CERTIFICATE OF PLAN APPROVAL

The posting of this certificate certifies that an erosion and sedimentation control plan has been approved for this project by the North Carolina Department of Environment and Natural Resources in accordance with North Carolina General Statute 113A - 57 (4) and 113A - 54 (d) (4) and North Carolina Administrative Code, Title 15A, Chapter 4B.0007 (c). This certificate must be posted at the primary entrance of the job site before construction begins and until establishment of permanent groundcover as required by North Carolina Administrative Code, Title 15A, Chapter 4B.0027 (b).

Landfill Reclaimed Effluent - Johnston County

Project Name and Location

November 7, 2001

Date of Plan Approval

NCDENR

Regional Engineer

APPENDIX B

Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of $300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
   a. Black, that is, a person having origins in any of the black racial groups in Africa;
   b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
   c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
   d. American Indian, that is, a person having origins in any of the original peoples of North America; or
   e. Female

2. Minority Business - means a business:
   a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
   b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.

3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".

4. Public Entity - means State and all public subdivisions and local governmental units.

5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.

7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.

9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.

10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

a. Identify those areas of work for which there are minority businesses, as requested.
b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

(1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
(2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
(3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
(4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
(5) The HUB Office also oversees the minority business program by:
    a. Monitoring compliance with the program requirements.
    b. Assisting in the implementation of training and technical assistance programs.
    c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
    d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office

The State Construction Office will be responsible for the following:

a. Furnish to the *Historically Underutilized Business Office* a minimum of twenty-one days prior to the bid opening the following:
    (1) Project description and location;
    (2) Locations where bidding documents may be reviewed;
    (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
    (4) Date, time and location of the bid opening.
    (5) Date, time and location of prebid conference, if scheduled.

b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
d. Reviewing of minority business requirements at Preconstruction conference.
e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
f. Provide statistical data and required reports to the HUB Office.
g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner
Before awarding a contract, owner shall do the following:

a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
b. Attend the scheduled prebid conference.
c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
    1. A description of the work for which the bid is being solicited.
    2. The date, time, and location where bids are to be submitted.
    3. The name of the individual within the owner's organization who will be available to answer questions about the project.
    4. Where bid documents may be reviewed.
    5. Any special requirements that may exist.
d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer
Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

e. During construction phase of the project, review "MBE Documentation for Contract Payment" – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
f. Make documentation showing evidence of implementation of Designer's responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors
Under the single-prime bidding, the separate-prime biding, construction manager at risk and alternative contracting methods, contractor(s) will:

a. Attend the scheduled prebid conference.
b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
   (1) A description of the work for which the subbid is being solicited.
   (2) The date, time and location where subbids are to be submitted.
   (3) The name of the individual within the company who will be available to answer questions about the project.
   (4) Where bid documents may be reviewed.
   (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

   If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.
d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), "MBE Documentation for Contract Payment" – (Appendix E), for designer's review.
j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities
While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES
It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 733-7962, Website: http://interscope2.doa.state.nc.us/main.htm.

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of theses guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 733-7962, Website: http://interscope2.doa.state.nc.us/main.htm.

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

(1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.

(2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.

(3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.

(4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.

(5) Attending any prebid meetings scheduled by the public owner.

(6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.

(7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.

(8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

(9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

(10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

State of North Carolina AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

County of _____

********(NOTE: THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL)*********

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within 72 hours after notification of being low bidder.

Affidavit of:_____ I do hereby certify that on the
(Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority Businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

Attach additional sheets if required.

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of_____
Subscribed and sworn to before me this _____day of _____20____
Notary Public_____
My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts

(Bidder

Affidavit of: _____)

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. Examples of documentation shall include the following evidence:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority businesses in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public _____

My commission expires_____

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments to be made to minority business contractors on this project for the above-mentioned period.

Firm Name	*Minority Category	Payment Amount	Owner Use Only

*Minority categories: Black, African American **(B)**, Hispanic **(H)**, Asian American **(A)** American Indian **(I)**, Female **(F)** Socially and Economically Disadvantaged **(D)**

Date: _____ Approved/Certified By: _____

Name

_____

Title

_____

Signature

****THIS DOCUMENT MUST BE SUBMITTED WITH EACH PAY REQUEST & FINAL PAYMENT****

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

Identification of Minority Business Participation

I,_____
(Bidder)

do hereby certify that on this project we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*Minority Category

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

The total value of minority business contracting will be ($)_____.

MBForm 2002

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

State of North Carolina AFFIDAVIT A – Listing of the Good Faith Effort

County of _____

Affidavit of_____
(Bidder)

I have made a good faith effort to comply under the following areas checked:
(A minimum of 5 areas must be checked in order to have achieved a "good faith effort")

- ☐ **1** - Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ☐ **2**.-Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ☐ **3** - Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4** - Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ☐ **5** - Attended prebid meetings scheduled by the public owner.
- ☐ **6** - Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7** - Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ☐ **8** - Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ☐ **9** - Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ☐ **10** - Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

In accordance with GS143-128.2(d) the undersigned will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

State of North Carolina AFFIDAVIT B – Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of_____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date:_____Name of Authorized Officer_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____day of _____20___

Notary Public _____

My commission expires_____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

County of _____

**********(NOTE: THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL)***********

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within 72 hours after notification of being low bidder.

Affidavit of _____ (Bidder) I do hereby certify that on the

_____ (Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

(Bidder)

Affidavit of: _____

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. Examples of documentation include, but are not limited to, the following evidence:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Date:_____ Name of Authorized Officer_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

Operations Manual

January, 2002

Johnston County Landfill

Attachment 4

Operations Manual
Appendix E: Irrigation of Reclaimed Wastewater

Johnston County Landfill Facility
Johnston County, North Carolina

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CONSTRUCTION GRANTS & LOAN SECTION

Prepared for:
Johnston County
Department of Public Utilities

January 2002

PERMIT ISSUE DOCUMENTS

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
425 N. Boylan Avenue
Raleigh, North Carolina 27603

JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER

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JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER

1.0 OVERVIEW

This Operations Manual Addendum was prepared for the Johnston County MSW Landfill located off of Highway 210 on County Home Road for the purpose of describing the operation of an irrigation system for reclaimed wastewater, which is proposed for the site. The system will be owned and operated by Johnston County.

2.0 CONTACT INFORMATION

All correspondence and questions concerning the operation of the reclaimed wastewater irrigation system should be directed to the appropriate County personnel listed below:

Johnston County Department of Public Utilities
204 S. Second Street, P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 989-5075 (Downtown); (919) 934-4576 (Landfill)
Fax: (919) 934-7174 (Downtown); (919) 989-7152 (Landfill)

Solid Waste Manager:	Rick Proctor
Public Utilities Director:	Haywood Phthisic
Director of Engineering:	Tim Broome, P.E.

3.0 IRRIGATION SYSTEM OPERATION

3.1 Areas to be Irrigated

Areas to be irrigated and order of priority (1 being the highest) include the following:

Priority 1:

- Wooded area behind (east of) NC Forest Service building (Field 1) (Not on Solid Waste Permit Site;
- Agricultural fields to the south of the landfill office and yard waste area on newly acquired land (Field 2) (majority not on Solid Waste Permit Site);
- Area behind (west of) landfill office including the current yard waste processing area (Fields 3 & 4); and
- Wooded area south of the leachate storage lagoon (future Phase 7 and Phase 8 area) (Fields 6, 7, & 8).

Priority 2:

- Closed landfill areas on Phase 1&2, 3, and 4 (Also, Phase 5 in future) (LF Cap 1&2, LF Cap 3, and LF Cap 4).

Priority 3:

- Inactive borrow areas (Fields 5, 9, & 10).

In addition to these areas, the County plans to use reclaimed wastewater for the control of dust within the facility. **Figure 1** presents the location of the various planned irrigation areas.

3.2 Periods of Operation

The irrigation system will be operated during the months of April through October. In addition, irrigation will be discontinued on any day that rainfall exceeds 0.2 inches.

3.3 Irrigation Amounts

Irrigation amounts off the landfills will be in accordance with the agronomic rates determined for the landfill site (based on "wettest" year amounts) in an analysis performed by Robert Evans, Ph.D., P.E. of N.C. State University and entitled "Hydrologic Wastewater Reuse Irrigation Analysis for Johnston County". Irrigation amounts on the landfill final covers will be in accordance with HELP model evaluations performed by G.N. Richardson & Associates. A tabulation of these amounts is given in **Table 1**. Restrictions to these amounts are as stated herein. Note that based on site monitoring of the irrigation program (see **Section 3.5**), future increases to these amounts may be allowed.

3.4 Irrigation Restrictions

3.4.1 Monitoring Wells

No irrigation will occur within 100 feet of an actively monitored site monitoring well.

3.4.2 Closed Landfill Areas

Irrigation over closed landfill areas shall only take place over closed areas which have at least 2 feet of soil cover or at least 1.5 feet of soil cover and a synthetic barrier.

3.4.3 Future Landfill Areas

Irrigation over areas designated as future landfill areas (or areas within 300 feet of future landfill areas) will be discontinued within 2 years before the anticipated start of construction for that area unless it is demonstrated by use of piezometers, monitoring wells, or other method (see **Section 3.5**) that irrigation rates are not creating an artificial rise in groundwater levels. Closed landfill areas, if to be lined over as part of a future landfill area (i.e. Phases 6, 7, & 8) may be irrigated in accordance with **Section 3.4.2** within 2 years prior to construction.

3.4.4 Borrow Areas

No irrigation will be performed in active borrow areas. Irrigation may be performed in inactive borrow areas as long as the ground surface is prepared to promote vegetation (soil type, nutrients, etc.).

3.5 Site Monitoring of Irrigation Program

In order to monitor the effect of the irrigation program both to ground water quality and to the ground water table a monitoring program will be implemented. This program will consist of two elements. One will be the addition of sampling and testing of the treated irrigation water as part of the regular Spring and Fall ground water sampling/testing events already performed as part of site operations. After sampling, the irrigation water will be tested for the same detection monitoring parameters as for the other site samples.

In addition, the second element of the monitoring program will be the installation of piezometers in each future landfill area to be irrigated (i.e. Phases 6, 7, and 8). At a minimum, one piezometer will be installed roughly in the central portion of the proposed future landfill phase before irrigation can begin over that area. The water elevations in these piezometers will be measured and recorded both during the spring and fall, concurrent with regular site ground water monitoring, and in the mid-summer. These levels will be evaluated in order to determine if there appears to be a rise in ground water elevations due to the irrigation activities. Should ground water elevations be maintained within a couple of feet of initial levels or levels that might otherwise be considered normal considering other factors such as weather, etc., the irrigation amounts for that area may be increased. Likewise, if there appears to be a significant (more than a couple of feet) increase in ground water elevation, which cannot be otherwise explained, irrigation activities in this area will be reduced or suspended. Also, as stated in **Section 3.4.3**, irrigation in future landfill areas will be halted at least two years prior to planned construction activities in that area.

3.6 System Maintenance and Inspections

Inspection of the irrigation system during periods of operation will be performed by landfill staff on a weekly basis for the closed landfill areas. Other areas may be inspected

less frequently, but not less than once per month. As much of the proposed system will be above ground, inspection for damaged piping, valves, sprinklers, etc. will be done on a mostly visual basis. Should maintenance be required to any portion of the irrigation system, that part of the system will be shut off until adequate repairs are made.

Table 1: Recommended Irrigation Amounts

Field Type	Max. Daily Application Rate cm/day (inch/day)	Annual Application Rate cm/year (inch/year)
Field with Trees	0.60 (0.25)	36 (14)
Field with Grass	0.60 (0.25)	40 (16)
Landfill Final Cover[1]	0.25 (0.1)	12 (5)
Fields 1 and 2	0.60 (0.25)	50 (20)

Note:

1) At a rate less than that which would cause saturation of the upper 9 inches of soil cover. This will be controlled by the use of soil moisture devices, which will automatically shut off the irrigation system if the upper 9 inches becomes saturated.

Operations Manual

Johnston County Landfill Facility
Johnston County, North Carolina

Prepared for:
Johnston County
Department of Public Utilities

April 2000
Revised: January 2002

PERMIT ISSUE DOCUMENTS

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
425 N. Boylan Avenue
Raleigh, North Carolina 27603

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JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL

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SECTION 1.0
GENERAL FACILITY OPERATIONS

1.1 OVERVIEW

This Operations Manual was prepared for operations of the Johnston County Landfill facility located off of Highway 210 on County Home Road. This document discusses the operation of the following:

- Phase 5 (Lined Subtitle D MSW Landfill Unit - Existing);
- Phase 4A (Lined Subtitle D MSW Landfill Unit - Proposed);
- C&D Vertical Expansion (Existing);
- Yard Waste Processing Area (Existing);
- Citizen's Convenience Center (Existing);
- Leachate Recirculation Within Phase 5 Unit (Existing); and
- Irrigation of Reclaimed Wastewater (Proposed).

A companion Facility and Engineering Plan (**Attachment A** of the Permit to Construct Application) presents a detailed discussion and calculations for the individual components of the planned Phase 4A MSW landfill unit. The information contained herein was prepared to provide landfill personnel with a clear understanding of how the Design Engineer assumed that the completed facility would be operated. While deviations from the operations outlined here may be acceptable, they should be reviewed and approved by the Design Engineer.

1.2 CONTACT INFORMATION

All correspondence and questions concerning the operation of the Johnston County Landfill should be directed to the appropriate County and State personnel listed below. For fire or police emergencies dial 911.

1.2.1 Johnston County

Johnston County Department of Public Utilities
204 S. Second Street, P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 989-5075 (Downtown); (919) 934-4576 (Landfill)
Fax: (919) 934-7174 (Downtown); (919) 989-7152

Solid Waste Manager:	Rick Proctor
Public Utilities Director:	Haywood Phthisic
Director of Engineering:	Tim Broome, P.E.

1.2.2 North Carolina Department of Environment and Natural Resources

North Carolina Department of Environment and Natural Resources
225 Green Street, Suite 714
Fayetteville, NC 28301
Phone: (910) 486-1541
Fax: (910) 486-0707

Division of Waste Management (DWM) - Solid Waste Section:

Eastern Area Supervisor:	Mark Fry
Eastern Area Engineer:	Jim Barber
Waste Management Specialist:	Robert Hearn

Division of Land Resources - Land Quality Section:

Raleigh Office:

3800 Barrett Drive
Raleigh, NC 27611
Phone: (919) 571-4700
Fax: (919) 571-4718

Regional Engineer: John Holley, P.E.

1.3 ACCESS CONTROL

Limiting access to the Johnston County Landfill is important for the following reasons:

- Unauthorized and illegal dumping of waste materials is prevented;
- Trespassing, and injury resulting therefrom, is discouraged; and
- The risk of vandalism is greatly reduced.

Access to active areas of the landfill will be controlled by a combination of fences and natural barriers, such as the creeks, and strictly enforced operating hours. A landfill attendant will be on duty at all times when the facility is open for public use to enforce access restrictions.

1.3.1 Physical Restraints

The site will be accessed by the existing entrance on County Home Road. Scales and a scale house are provided at the entrance. All waste will have been weighed prior to being placed in the landfill. The entrances have gates which will be securely locked during non-operating hours.

1.3.2 Security

Frequent inspections of gates and fences will be performed by landfill personnel. The County will arrange for a random security patrol of the main gate to further discourage trespassing. Evidence of trespassing, vandalism, or illegal operation will be reported to the County Solid Waste Manager.

1.4 SIGNAGE

A prominent sign containing the information required by DWM will be placed just inside the main gate. This sign will provide information on operating hours, operating procedures, and acceptable wastes. Additional signage will be provided within the landfill complex to distinctly distinguish the roadway to the various active landfill units, as well as the route to the facility's citizen convenience center. Service and maintenance roads for use by operations personnel will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be provided as required.

1.5 COMMUNICATIONS

Two way radio communication will be maintained between the operations personnel and the landfill scale house and office. The scale house and office have telephones in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house and office.

1.6 FIRE AND SAFETY

1.6.1 Fire Control

The possibility of fire within the landfill or a piece of equipment must be anticipated in the daily operation of the landfill. A combination of factory installed fire suppression systems and/or portable fire extinguishers will be operational on all heavy pieces of equipment at all times. For larger or more serious outbreaks, the local fire department will respond.

Fires within the landfill will be limited by the use of daily and intermediate cover as a fire break and control of "hot" loads entering the landfill. Landfill personnel at the scale house will turn away all trucks containing waste that is suspected to be hot. If a hot load is placed on the working face, then the load will be spread as thin as possible and daily cover soil will be immediately placed on the waste to extinguish the fire.

In general, fires that break out close to the surface of the disposal area should be dug out and smothered with cover material. Deep fires should be smothered out by placing moist soil on the surface and by constructing soil barriers around the fire. Where the smothering technique fails, the burning material must be excavated and smothered or quenched with water once the burning material is brought to the surface. Water is usually not effective unless it can be directly applied to the burning material.

For the MSW landfill units, in the event a fire occurs in the first lift of MSW immediately above the protective cover layer, the possibility of damage to geosynthetics and collection piping exists. Once the fire is extinguished, the residue must be removed to allow limited inspection of the geosynthetics and piping. Damaged sections of geosynthetics, piping, etc. must be removed and replaced with new items of the same or equal material. The new materials must be placed in accordance with the technical specifications and construction quality assurance (CQA) documents prepared for this facility.

The County will verbally notify DWM (see Section 1.2.2) within 24 hours of discovery of a fire within any landfill disposal area. In addition, written documentation describing the fire, the actions carried out to extinguish the fire, and a strategy for preventing future occurrences will be provided to DWM within 15 days following any such occurrence.

1.6.2 Safety

All aspects of the Johnston County Landfill operation were developed with the health and safety of the landfill's operating staff, customers, and neighbors in mind. As part of normal operations, a member of the landfill operating staff will be designated site safety officer. This individual, together with the facility's management will modify the site safety and emergency response program to remain consistent with National Solid Waste Management Association and Occupational Safety and Health Administration (OSHA) guidance.

Safety equipment provided includes equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Landfill personnel will be encouraged to complete the American Red Cross Basic First Aid Course. Other safety requirements as designated by the County will also be implemented.

1.7 SEVERE WEATHER CONDITIONS

Unusual weather conditions can directly affect the operation of the landfill facility. Some of these weather conditions and recommended operational responses are as follows.

1.7.1 Ice Storms

An ice storm can make access to the landfill dangerous, prevent movement or placement of daily cover, and, thus, may require closure of the landfill until the ice is removed or has melted.

1.7.2 Heavy Rains

Exposed soil surfaces can create a muddy situation in some portions of the landfill during rainy periods. The control of drainage and use of crushed stone on unpaved roads should provide all-weather access for the site and promote drainage away from critical areas. In areas where the aggregate surface is washed away or otherwise damaged, new aggregate should be used for repair.

Intense rains can affect newly constructed drainage structures such as swales, diversions, cover soils, and vegetation. After such a rain event, inspection by landfill personnel will be initiated and corrective measures taken to repair any damage found before the next rainfall.

1.7.3 Electrical Storms

The open area of a landfill is susceptible to the hazards of an electrical storm. If necessary, landfilling activities will be temporarily suspended during such an event. To guarantee the safety of all field personnel, refuge will be taken in the on-site buildings or in rubber-tired vehicles.

1.7.4 Windy Conditions

The proposed operational sequence minimizes the occurrence of unsheltered operations relative to prevailing winds. If this is not adequate during a particularly windy period, work will be temporarily shifted to a more sheltered area. When this is done, the previously exposed face will be immediately covered with daily cover.

1.7.5 Violent Storms

In the event of hurricane, tornado, or severe winter storm warning issued by the National Weather Service, landfill operations may be temporarily suspended until the warning is lifted. Daily cover will be placed on exposed waste and buildings and equipment will be properly secured.

1.8 EQUIPMENT REQUIREMENTS

The County will maintain on-site equipment required to perform the necessary landfill activities. Periodic maintenance of all landfilling equipment, and minor and major repair work will be performed at designated maintenance zones outside of the landfill.

1.9 PERSONNEL REQUIREMENTS

At least one member of the landfill supervisory staff will be certified as a Manager of Landfill Operations (MOLO) by the Solid Waste Association of North America (SWANA). Each landfill employee will go through an annual training course (led by supervisory staff) and is certified by SWANA as Landfill Operations personnel. As part of this training, personnel learn to recognize loads which may contain regulated hazardous waste or wastes containing PCB's.

1.10 UTILITIES

Electrical power, water, telephone, and restrooms will be provided at the scale house and/or office.

1.11 RECORD KEEPING PROGRAM

The County shall maintain the following records in an operating record at the landfill:

A. Waste inspection records (see **Section 2.4**);
B. Daily tonnage records - including source of generation;
C. Waste determination records;
D. Quantity, location of disposal, generator, and special handling procedures for all special wastes disposed of at the site;
E. List of generators and haulers that have attempted to dispose of restricted wastes;
F. Employee training procedures and records of training completed;
G. Documentation of cell activation (see **Section 2.5.2.2**)
H. Leachate records (see **Section 3.3.4**);
I. Gas monitoring results and remediation measures as required (see **Section 3.4.2**);
J. All ground water monitoring and surface water quality information (See the current **Ground Water Sampling and Analysis Plan**) including:
    1. Monitoring well construction records;
    2. Sampling dates and results;
    3. Statistical analyses; and
    4. Results of inspections, repairs, etc.
K. Annual landfill reports;
L. All closure and post-closure information (see **Attachment E** to the Permit to Construct Application), where applicable, including:
    1. Testing;
    2. Certification; and
    3. Recordation.
M. Cost estimates or financial assurance documentation (see **Attachment E** to the Permit to Construct Application).

The operating record will be kept up to date by the Solid Waste Manager or his designee. It will be presented upon request to DWM for inspection. A copy of this Operations Manual will be kept at the landfill and will be available for use at all times.

SECTION 2.0
WASTE HANDLING OPERATIONS

2.1 OVERVIEW

This section describes the required waste handling operations for the Johnston County Landfill facility.

2.2 ACCEPTABLE WASTES

2.2.1 MSW Landfill Units

The Johnston County MSW landfill units will only accept for disposal solid waste as defined by 15A NCAC 13A .0101(36) generated within approved areas of service. In addition, the special wastes described in **Section 2.5.4** may also be accepted at this facility.

2.2.2 C&D Landfill Unit

The Johnston County C&D landfill unit will only accept for disposal the following wastes generated within approved areas of service:

- Construction and Demolition Debris Waste: (Waste or debris from construction, remodeling, repair, or demolition operations on pavement or other structures)
- Inert Debris Waste: (Concrete, brick, concrete block, uncontaminated soils and rock, untreated and unpainted wood, etc.)
- Other Wastes as Approved by the Solid Waste Section of the Division of Waste Management

In addition, the special wastes (asbestos only) described in **Section 2.5.4** may also be accepted at this facility.

2.2.3 Yard Waste Processing Area

The Johnston County yard waste processing area will only accept for processing solid waste resulting from landscaping and yard maintenance, including grass, tree limbs (up to 3 feet in diameter), stumps (up to 10 feet in diameter), and similar material generated within approved areas of service.

2.3 PROHIBITED WASTES

2.3.1 MSW Landfill Units

The following wastes are prohibited from disposal within the MSW landfill units:

- Whole Scrap Tires

- Used Oil
- White Goods
- Lead Acid Batteries
- Yard Waste
- Construction and Demolition Debris (C&D)
- Aluminum Cans

In addition, operating criteria prohibit other materials from disposal at the MSW landfill unit. These materials include:

- Hazardous waste as defined by 15A NCAC 13A .0101(11), including hazardous waste from conditionally exempt small quantity generators.
- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761 with the exception of trace amounts found in materials such as consumer electronics.
- Bulk or non-containerized liquid wastes unless the waste is household waste other than septic waste and waste oil; or the waste is leachate or gas condensate derived from the MSW landfill unit. A liquid determination will be performed by the paint filter test (see **Appendix A** for apparatus and procedure).
- Containers holding liquid wastes unless the waste is household waste.

2.3.2 C&D Landfill Unit

Only C&D waste, as defined in **Section 2.2.2** above will be accepted. No other wastes will be accepted.

2.3.3 Yard Waste Processing Area

Only yard waste, as defined in **Section 2.2.3** above will be accepted. No other wastes will be accepted.

2.4 WASTE SCREENING PROGRAMS

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the landfill. Waste received at both the scale house entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placarding or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and "chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes are an ongoing part of the landfill operation.

2.4.1 Waste Receiving and Inspection

All vehicles must stop at the scale house located at the entrance of the facility and visitors

are required to sign-in. All waste transportation vehicles are weighed and the content of the load assessed. The scale attendant(s) requests from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The attendant(s) then visually checks the vehicle as it crosses the scale. Signs informing users of the acceptable and unacceptable types of waste are posted at the scale house. Once passing the scales, the vehicles are routed to the appropriate landfill unit or to the citizen's convenience center in the case of small loads, recyclables, white goods, and/or tires.

Vehicles are randomly selected for screening at a rate of approximately 1% of industrial, commercial, and institutional vehicles entering the landfill. However, if something looks suspicious is spotted in any waste load, that load is inspected further. The number of loads inspected is determined by the total vehicle count as per scales tickets. Each calendar year the number is recalculated (For example, for 2001, 1% was equal to 252 vehicles; 264 vehicles were actually inspected. The target for 2002 is 267 vehicles (= 23 vehicles/month)).

Vehicles selected for inspection are directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded. Waste is carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill inspects the waste discharged at the screening site. If unacceptable waste is found, including wastes generated from outside of the service area, the load will be isolated and secured by berming off the area. For unacceptable wastes that are non-hazardous, the Solid Waste Manager will then notify officials of DWM (see **Section 1.2.2**) within 24 hours of attempted disposal of any waste the landfill is not permitted to receive in order to determine the proper course of action. For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 2.4.2** will be followed. The hauler is responsible for removing unacceptable waste from the landfill property.

If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell. All random waste inspections will be documented by landfill staff using the waste screening form provided in **Appendix B**.

In addition to random waste screening described above, waste unloaded on the active face will be inspected by the equipment operators, trained to spot unacceptable wastes, before and during spreading and compaction. Any suspicious looking waste is reported immediately to the designated primary inspector for further evaluation.

2.4.2 Hazardous Waste Contingency Plan

In the event that identifiable hazardous waste or waste of questionable character is detected at the landfill, appropriate equipment, protective gear, personnel, and materials as necessary will be employed to isolate the wastes. DWM will be notified immediately (see **Section 1.2.2**) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, all attempts will be made to

prevent that vehicle from leaving the site or, if the vehicle has left the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

The County will assist DWM as necessary and appropriate in the removal and disposition of the hazardous waste and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with either on-site soils or other tarping material until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps hazardous waste in the landfill may be barred from using the landfill.

Should an incident where hazardous waste is found at the landfill occur, the event will be documented by landfill staff using the waste screening form provided in **Appendix B**.

Records of information gathered as part of the waste screening programs will be maintained at the landfill site during its active life and as long as required by Johnston County and DWM.

2.5 WASTE DISPOSAL

2.5.1 Access

Traffic will be clearly directed to the appropriate active access road. For the active MSW landfill unit, all vehicles entering the unit will use the active ramp to avoid damaging the liner system. Traffic speed on the ramp should be less than 10 MPH. Rutting of the gravel roadway surfaces must be repaired by placement of additional gravel on the roadway and not solely by grading the rut. This will maintain the separator geotextile placed below most gravel roadway surfaces.

The location of access roads during waste placement will be determined by operations personnel in order to reflect waste placement strategy.

2.5.2 Waste Disposal - MSW Landfill Units

2.5.2.1 Cell Operations and Phasing

In order to facilitate leachate/stormwater separation and to allow more efficient construction and waste placement operations, Phase 4A has been divided into three cells. Each cell will be filled in sequence until the entire Phase 4A footprint is covered with waste. The cell layout is shown on **Drawing E4** (Phase 4A - Composite Liner Grading Plan). Phasing drawings for Phase 4A are presented on **Drawings P1 - P4** (Phase 4A Phasing Plan).

Cell 1 is located in the center of Phase 4A. Phase operation will initiate here. Once Cell 1 is filled with its effective capacity, operations will continue into Cell 2 and then Cell 3. It is anticipated that Cells 1-3 will be constructed separately.

It is advantageous to begin to establish final cover grades along the perimeter berms as soon as is possible. This will allow earlier construction of intermediate or final cover to promote "clean" runoff and to spread out final cover construction costs.

2.5.2.2 Cell Activation

Waste placement will begin in Cell 1. Before placing waste in a particular area, that area must be isolated from the stormwater system by removing all geosynthetic rain cover (GRC) from that area by operations personnel. With the activation of each area of the landfill, the removal of the GRC shall be documented by landfill staff using the cell activation form provided in **Appendix C**. If the GRC is not removed up to a gravel column, then small 2 to 3 foot high soil berms will be placed by operations personnel ahead of the downstream toe of the active area to keep leachate confined to the active area and minimize the potential for leachate to mix with clean stormwater runoff. Waste will be placed from the topographic high end to the topographic low end of the cell.

Note that the Type GT-S geotextile overlying gravel columns may be left in place after removal of the GRC, but shall be removed prior to the placement of waste over that portion of gravel column. This will aid to prevent sediment from clogging the gravel columns.

Once an area has reached its effective capacity, operations will move to the next scheduled area. Prior to placing waste in a new area, it must be isolated from the stormwater system as described above.

2.5.2.3 Placement of Initial Lift

During waste placement operations, the landfill liner systems are most vulnerable during the placement of the first lift of waste. In addition to the protective cover layer, the first lift of waste should be comprised of select loads spread on top of the protective cover layer. These select loads must be free of long or large pieces of waste that may push through the protective cover layer and damage the liner system. Workers will be positioned near the working face to check for any waste which could possibly penetrate the protective cover layer. The first lift should be a minimum of four (4) feet thick and provide sufficient area for at least one day's operation without placing other areas of the liner in jeopardy.

Another area of the liner system that is vulnerable during placement of the first lift of waste is the perimeter berms. As with the bottom liner, the first lift of waste

against the liner side walls should be comprised of select loads.

In the event that the landfill staff identifies any damage to any part of the landfill's liner system, they should immediately effectuate its repair. Additionally, they should document the damage and the repair as a part of the operating record.

2.5.2.4 General Procedures

Waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, a certain number of vehicles will be allowed on the working face at a time. The actual number will be determined by the truck spotter. This procedure will be used in order to minimize the potential of unloading unacceptable waste and to control disposal activity. Operations at the working face will be conducted in a manner which will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of waste.

The approach to the working face will be maintained such that two or more vehicles may safely unload side by side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed will be provided adjacent to the unloading area. The vehicles will back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles will immediately leave the working face area. Personnel will direct traffic necessary to expedite safe movement of vehicles.

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and length of the working face will be maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of cover required each day. Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either daily, intermediate, or final cover, as appropriate. Within the active working face area, appropriate size berms (approximately 2 feet high) will be constructed to control surface water from entering the working face area and coming into contact with the waste. These berms will be relocated as waste cell development continues.

The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e. 5H:1V max.) using a landfill compactor and a minimum number of three full passes.

The use of portable signs with directional arrows and portable traffic barricades

will facilitate the unloading of wastes to the designated disposal locations. These signs and barricades will be placed along the access route to the working face of the landfill or other designated disposal areas which may be established.

2.5.2.5 Equipment Operations Within the Landfill Phase

Both the facility's operational vehicles and waste transportation vehicles must be restricted as follows within the lined landfill:

- Equipment operation directly on the protective cover will be limited to rubber-tired vehicles having a maximum ground contact, i.e., tire pressure, of less than 32 psi.
- A minimum vertical separation of 3 feet will be maintained between the geomembrane liner and all waste transportation vehicles.
- A minimum vertical separation of 5 feet will be maintained between the geomembrane liner and waste compactors.

The operation of vehicles within those portions of the landfill not actively receiving waste should be restricted to activities associated with erosion and sedimentation control.

2.5.3 Waste Disposal - C&D Landfill Unit

Waste will be placed in such a manner that the active face is minimized. The waste lift should be relatively thick in order to minimize the active face and the distance waste is spread by the compactor.

C & D waste will be unloaded at the upper limit of the working face and inspected (according to Section 2.4.2) prior to being spread on the face and compacted.

The active working face for each day shall be less than 1/4 acre in size and have a slope no greater than 5H:1V. The surface of the active area must be graded to drain.

Waste spread over the working face will be placed in lifts at least 5-ft thick and will receive a minimum of five passes of the compaction equipment over each lift. The 5 foot thick lift layer will be placed over the entire active area to be used that day. Once the area has received a full lift layer, subsequent lift layers that day will be placed above the previous lift. Each lift layer will be no more than 3 feet thick in compacted thickness. The entire day's lift should be approximately 8-10 feet thick at the end of a given working day.

2.5.4 Special Waste Management

2.5.4.1 Asbestos Management (MSW or C&D Landfill Units)

The County may dispose of asbestos within either the MSW or C&D landfill units. Asbestos will only be accepted if it has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Asbestos will arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator.

Once the hauler brings the asbestos to the landfill, the hauler will be directed to the designated asbestos disposal area by operations personnel. The designated disposal area will be prepared by operations personnel by leveling a small area using a dozer or loader. Prior to disposal, the landfill operators will stockpile cover soil near the designated asbestos disposal area. The volume of soil stockpiled will be sufficient to cover the waste and to provide any berms, etc. to maintain temporary separation from other landfill traffic.

Once placed in the prepared area, the asbestos waste will be covered with a minimum of 18 inches of daily cover soil placed in a single lift. The surface of the cover soil will be compacted and graded using a tracked dozer or loader. The landfill compactor will be prohibited from operating over asbestos disposal areas until at least 18 inches of cover are in-place.

The landfill staff will record the approximate location and elevation of the asbestos waste once cover is in-place. The Solid Waste Manager will then review pertinent disposal and location information to assure compliance with regulatory requirements and enter the information into the Operating Record.

Once disposal and recording for asbestos waste is completed, the disposal area may be covered with waste. No excavation into designated asbestos disposal areas will be permitted.

In general, for the proposed Phase 4A, no asbestos will be stored over gravel columns or in the sump area in order to minimize the potential for future disturbance.

2.5.4.2 Sewage Sludge Management (MSW Landfill Units)

Sewage sludge may be accepted for disposal within the MSW landfill units in accordance with Federal and State requirements. Sewage sludge will be co-disposed along with other wastes if the sludge passes the liquids restriction criteria (i.e., the Paint Filter Test) and has an acceptable Toxicity Characteristic Leaching Procedure (TCLP) test. Such testing will be the responsibility of the generator, but landfill staff may conduct spot testing.

In order to minimize the potential for clogging of the leachate collection and removal system, sewage sludge will not be placed within the first lift of waste. Sewage sludge may also be used as a soil conditioner incorporated into the vegetative soil layer of the final cover.

2.5.4.3 Spoiled Food and Animal Waste (MSW Landfill Unit)

The disposal of spoiled foods, animal carcasses, and other animal wastes within the MSW landfill unit will be handled as follows. The generator of the material must call in advance to the landfill, and a determination will be made as to whether or not the waste will be accepted. If the waste is approved, the generator will present the waste at a predetermined time. An area for disposal will already have been prepared and the waste will be covered immediately.

2.5.5 Daily Cover

2.5.5.1 MSW Landfill Units

At the completion of waste placement each day, a 6 inch layer of earthen material or approved alternate daily cover (i.e. a geotextile) will be placed over the working face. This daily cover is intended to control vectors, fire, odors, and blowing litter. The County intends to utilize a tarping system (Tarpomatic) as alternate daily cover, as they have for Phase 5, to conserve air space and to increase the efficiency of MSW landfill operations. Appropriate demonstration of any new alternate daily cover materials will be made to DWM.

2.5.5.2 C&D Landfill Unit

At the completion of waste placement each week, or sooner if the area of exposed waste exceeds one acre in size, a 6-inch layer of earthen material will be placed over the exposed waste. This periodic cover is intended to control vectors, fire, odors, and blowing debris.

2.5.6 Intermediate Cover

A 12 inch layer of soil cover should be placed on all waste surfaces that have not received waste in 30 days but are below final elevation. This intermediate cover should be seeded immediately and graded such that all precipitation run-off is channeled to the surface water systems.

2.5.7 Height Monitoring

On a weekly basis, the landfill staff will monitor landfill top and side slope elevations. Typically this is done with a level. Also, landfill compactors and dozers are equipped with slope indicators to monitor grades on side slopes. When such elevations approach the

grades shown on **Drawing FC1** (Final Cover Grading Plan), the final top-of-waste grades will be staked to limit over-placement of waste.

2.6 YARD WASTE PROCESSING AREA OPERATIONS

The operation of the yard waste processing area is as follows:

Acceptable wastes in accordance with **Section 2.2.3** are stockpiled to an approximate height of 10 feet over an area of approximately 1 acre (approximate weight of 1,500 to 2,000 lbs.). At that time a contractor is brought in to grind the waste. Once the waste is ground and becomes mulch, it is used either around the site, primarily for surface stabilization, or placed in windrows to be given to the public or otherwise used in the future. A full time attendant looks over both the yard waste processing area and the convenience center operations.

2.7 CONVENIENCE CENTER OPERATIONS

The operation of the citizen's convenience center is as follows:

The convenience center is set up with up to eight 40 yard roll-off containers for the collection of MSW (small loads) and recyclables. The County currently typically separately collects aluminum cans, newspaper, cardboard, mixed no. 1 and no. 2 plastics, and brown, green, and clear glass. The convenience center also includes collection facilities for white goods, used tires, waste oil, and batteries.

The white goods area currently occupies approximately a 50 foot by 100 foot area. County personnel remove the freon, as necessary, and load the white goods into three to four 40 yard roll-off containers. Typically, every Wednesday, the County hauls the full containers to a local salvage yard, where the white goods can be recycled.

Used tires are collected at the convenience center in up to three tire trailers. Once one or more trailers are full, the used tires are taken to Central Carolina Tire in Cameron for recycling.

A full time attendant looks over both the convenience center and yard waste processing area operations.

SECTION 3.0
ENVIRONMENTAL MANAGEMENT

3.1 OVERVIEW

This section reviews the overall environmental management tasks required for the successful operation of the landfill facility. Emphasis is given to the supplemental tasks required for the planned Phase 4A MSW landfill unit. The definition of "surface water" as used herein is water which results from precipitation or site run-on that has not contacted the MSW.

3.2 SURFACE WATER CONTROL

Proper control of surface water at the landfill will accomplish the following goals:

- Prevent the run-on of surface water into the lined Subtitle D MSW landfill units or the active face,
- Prevent the run-off of surface water that has come into contact with the waste,
- Limit the erosion caused by surface waters,
- Limit sediments carried off-site by surface waters, and
- Maximize the SEPARATION of SURFACE water from LEACHATE.

Separate erosion and sedimentation control plans have been provided for the various landfill units. These plans describe both short and long term engineered features and practices for preventing erosion and controlling sedimentation at this site. The following is a brief discussion of some of these features and practices, focusing more on the landfill units.

3.2.1 Surface Water Run-On Control

The perimeter berms and/or perimeter drainage channels around the landfill units are designed to prevent the run-on of surface water from adjacent land into the landfill. Additional structures such as diversion berms, channels, down pipes, etc. carry surface water away from the landfill.

3.2.2 Active Face Run-Off Control - MSW Landfill Units

Particular care is required to ensure that surface water coming from the active face, e.g. having potential contact with the waste, is captured by the leachate collection and recovery system. Only run-off from waste surfaces that have received adequate cover is not considered leachate and should be directed to the stormwater drainage system where practical.

3.2.3 Erosion Control

The serviceability of the landfill facility relies heavily on soil berms, barrier layers, and agricultural layers that are readily eroded by flowing water. Erosion control provisions incorporated in the landfill include the following:

- The slope of the working face must be no steeper than 5H:1V where practical to limit erosion of the daily cover,
- Intermediate cover placed over daily cover that has been exposed for more than 30 days must be seeded immediately and repaired when erosion features are identified,
- Diversion berms and/or drainage swales are provided every 20 to 30 vertical feet on the final cover to limit the flow length of run-off,
- Water collected by each drainage swale is routed to stormwater drainage channels or down pipes so that the run-off volume does not accumulate going down the slope.
- The vegetative soil layer placed over the final cover must be seeded immediately.

Additional erosion control measures have been taken within the drainage swales and at points of stormwater discharge. All final cover should be inspected regularly for erosion damage and promptly repaired.

3.2.4 Sedimentation Control

Stormwater run-off from the landfill units is conveyed to one of numerous sediment basins located around the site. These basins should be inspected regularly for sediment build-up or erosion damage. The basins should be cleaned out when sediments fill the lower half of the basin.

3.2.5 Separation of Stormwater/Leachate - Phase 4A Landfill Unit

The stormwater separation system is an additional non-regulatory system that is provided over top of the leachate collection system to reduce the volume of leachate generated and prevent impoundment of stormwater within the landfill. The separation system allows stormwater in cells which have not yet received waste to run off and drain out of the landfill. This quick removal of the precipitation limits the amount of stormwater which can infiltrate into the leachate collection system. The stormwater separation system consists of three components:

- Gravel Columns, which separate the phase into smaller areas, thereby

dividing the total volume of stormwater into much smaller, easily controlled volumes.

- Geosynthetic Rain Cover (GRC) which will cover the entire Phase 4A. The GRC will be removed in small increments ahead of waste placement such that stormwater falling on areas which have not yet received waste can runoff to the low end of each cell.

- At the low end of each cell, a temporary stormwater pump will be used to pump stormwater runoff from all inactive areas to site erosion and sedimentation control devices.

3.3 LEACHATE MANAGEMENT - MSW LANDFILL UNITS

The leachate management system for the existing and proposed MSW landfill units consists of the leachate collection and recovery (LCR) system, the leak detection system (LDS) (Phase 4A only), the leachate discharge piping, manholes, pumps, valves, and the existing lined leachate storage lagoon.

Leachate from Phase 5 is collected in the leachate sump on the northern end of the landfill as shown on **Drawing E1** (Existing Site Conditions). Leachate collected in the sump gravity drains to the leachate storage lagoon via an existing HDPE gravity line.

Leachate from Phase 4A is collected in the leachate sump on the northern end of the landfill as shown on **Drawing E6** (Leachate Management Systems - Primary Collection Piping). Leachate collected in the sump is pumped into the existing gravity line via a HDPE force main.

Once reaching the lagoon, the leachate drains to an existing pump station. From the pump station, the leachate is pumped to a County-owned wastewater treatment plant (WWTP) or back into the Phase 5 landfill unit as part of an approved leachate recirculation plan (See **Appendix C**).

3.3.1 Leachate Collection and Recovery (LCR) System

A blanket drainage layer covers the HDPE geomembrane liner to collect and remove leachate draining from the waste. This blanket drain consists of a 12 inch layer of drainage aggregate on the flatter portions of the landfill and a layer of geonet drainage media on the side slopes. In addition, a large flow capacity network of perforated pipe and gravel drains is constructed in the blanket drain. For Phase 4A, this perforated pipe and gravel drainage system is shown on **Drawing E6** (Leachate Management Systems - Primary Collection Piping) of the Project Drawings. The LCR system is designed to remove inflow from a 25-year, 24-hour rainstorm. As such, its capacity is very large compared to that required to accommodate routine leachate generation rates after closure.

The LCR system has been designed to minimize the impact of long-term biological clogging as follows:

- Cleanouts are provided on the major perforated leachate collection pipes,
- No geotextiles will be used between the waste and the gravel columns, and
- The use of No. 57 stone around collection pipes allows hydrowashing of the pipe and gravel to remove biological growth.

3.3.1.1 Gravel Column Maintenance

The exposed surface of the gravel columns should be inspected monthly and after each large rain storm to check for buildup of sediment on the aggregate or on the adjacent leachate collection system on the sidewall. Sediment buildup must be periodically removed carefully with a backhoe. Aggregate that is removed must be replaced with new clean material. Per **Section 2.5.2.2**, the Type GT-S geotextile overlying gravel columns may be left in place after removal of the GRC, but shall be removed prior to the placement of waste over that portion of gravel column. This will aid to prevent sediment from clogging the gravel columns.

3.3.1.2 Collection Pipe Cleanout

If an abnormal reduction in leachate production is observed, a remote camera inspection of the major leachate collection pipes will be performed. Based on the results of remote camera inspection, those locations of the major perforated pipe system that have sediment or biological growth buildup will be cleaned using high pressure water jetting equipment. The water jetting system should generate greater than 2,000 psi water pressure. Use of the high pressure water jetting equipment should be limited to only those portions of the piping system with buildup.

3.3.1.3 Leachate Removal

As constructed, leachate is collected in a sump at the low end of the landfill and is removed from landfill via a side riser pump and HDPE discharge pipe. The leachate is routed to the existing leachate storage lagoon via either gravity piping (Phase 5) or a force main (Phase 4A). The forcemain from Phase 4A ties into the gravity piping from Phase 5.

Under normal conditions, the County will remove (via force main) leachate from the storage lagoon at a rate to maintain a typical volume of 1,500,000 gallons (approximate 6 foot depth), or less, of leachate in the lagoon. This allows ample volume in the lagoon to handle the anticipated "surge" event caused by a design storm and minimize the potential for ponding within the landfill. Additional draw-down of the lagoon will be performed in advance of predicted heavy rainfall (tropical storm, hurricane, etc.).

3.3.2 Leak Detection System - Phase 4A MSW Landfill Unit

A leak detection system (LDS) has been incorporated into the design of the liner system on piggyback slopes. The purpose of the LDS is to provide rapid detection of a major breach in the primary liner system and to limit the head on the secondary liner to less than the thickness of the LDS.

For Phase 4A the LDS consists of a layer of geonet drainage media directly overlying the secondary LLDPE geomembrane, a series of four leak detection trenches, and one leak detection side riser pump placed within the sump. Flow that is collected in the leak detection trenches is routed through 4 inch diameter HDPE piping to the LDS pump station. Flow collected in the leak detection side riser in the sump is pumped to the LDS pump station via 2 inch diameter HDPE piping. The LDS pump station consists of a prefabricated HDPE manhole, valving, and submersible pumps. Leachate collected in the LDS pump station will be metered separately and pumped to the existing leachate storage lagoon via the same force main as leachate collected in the LCR system described below.

The LDS has been designed with an Action Leakage Rate (ALR) of 3,000 gallons per day (see **Appendix A**). The selected ALR is much less than the saturated flow capacity of the geonet component to be used; however, it is above the leakage that would be expected through a typical composite geomembrane/GCL primary liner system. Should leakage collected in the LDS exceed the ALR, the County will take steps (placement of soil cover, tarps, etc.) to limit leachate generation from in-place waste.

3.3.3 Leachate Quality Sampling

Semi-annual leachate quality sampling and analysis will be performed during operation of the Subtitle D MSW landfill units. Samples will be recovered as grab samples from the following locations:

- Phase 5: Sample from existing gravity line;
- Phase 4A (Leachate Collection System): Sample from side risers;
- Phase 4A (Leak Detection System): Sample from leak detection pump station.

The parameters to be analyzed will include BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, Appendix I constituents, sulfates, and nitrates.

Note that during active operation of the leachate recirculation system in the Phase 5 MSW landfill unit, quarterly leachate quality sampling of the leachate from this unit will be performed (see **Appendix D**).

3.3.4 Record Keeping

Accurate records for the following will be maintained at the landfill in accordance with **Section 1.11**.

Leachate Generation (Monthly):

- Phase 5 (Leachate storage lagoon pump station flowmeters minus flow from Phase 4A);
- Phase 4A (Leachate collection system flowmeter); and
- Phase 4A (Leak detection system pump station flowmeter).

Leachate Quality (Quarterly and/or Semi-Annual):

- Phase 5 (Quarterly during active leachate recirculation);
- Phase 4A (Leachate Collection System); and
- Phase 4A (Leak Detection System).

3.3.5 Leachate Contingency Plan

In the unlikely event that leachate levels within the storage lagoon approach the freeboard capacity, due to unforeseen events, the DWM will be verbally notified (see **Section 1.2.2**) and the leachate flow will be valved off to the lagoon and temporarily stored in the landfill until the level of leachate in the lagoon can be lowered by pumping operations. Written documentation describing the unforeseen events, the actions carried out to remove the stored leachate, and a strategy for preventing future occurrences will be provided to DWM within 30 days following any such occurrence.

3.4 LANDFILL GAS MANAGEMENT

A landfill gas (LFG) management system is included for each landfill unit at this facility. For the proposed Phase 4A landfill unit, landfill gas management devices both under the Phase 4A liner system on piggyback slopes and as part of the final cover are shown on **Drawings LFG1-LFG4** (Landfill Gas Management Plans and Details).

3.4.1 Methane Monitoring Program

The County will implement a routine methane monitoring program to ensure that methane concentrations do not exceed 25 percent of the lower explosive limit (LEL) in facility structures, or 100 percent of the LEL at property boundaries. Gas monitoring wells will be sampled on a quarterly basis. Monitoring of facility structures will be performed continually.

3.4.2 Record Keeping

Results of the methane monitoring program will be placed in the facility operating record as described in **Section 1.11**.

3.4.3 LFG Contingency Plan

In the event methane concentrations exceed allowable limits, the emergency response plan will be as follows:

Open Air Areas

1. For 100% LEL at distances less than 250 feet from structures:

    a. Recalibrate equipment and recheck reading.
    b. Immediately take all necessary steps to ensure protection of human health (i.e. remove sources of ignition and limit access to the area).
    c. Call Fire Department.
    d. Notify DWM (see **Section 1.2.2**).
    e. Notify the Consulting Engineer.
    f. Note the current weather and ground moisture conditions.
    g. 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.
    h. 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 DWM that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

2. For 100% LEL at distances greater than 250 feet from structures:

    a. Recalibrate equipment and recheck reading.
    b. Immediately take all necessary steps to ensure protection of human health (i.e. remove sources of ignition and limit access to the area).
    c. Notify DWM.
    d. Notify the Consulting Engineer.
    e. Note the current weather and ground moisture conditions.

Structures

1. For structures with greater than 25% LEL:

    a. Recalibrate equipment and recheck reading.
    b. Immediately take all necessary steps to ensure protection of human health as above - including immediate evacuation leaving all doors open.

c. Call Fire Department.
d. Notify DWM.
e. Notify the Consulting Engineer.
f. Note the current weather and ground moisture conditions.
g. 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.
h. 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 DWM that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

2. For structures with 0-25% LEL:

a. Recalibrate equipment and recheck reading.
b. Discuss with the Consulting Engineer.

3.5 VECTOR CONTROL

3.5.1 MSW Landfill Units

Control of insects, rodents, and birds will be accomplished by compaction of the waste and the use of daily cover. Spilled or wind-blown debris along the access road will be cleaned up daily and placed in the landfill. If vector control becomes a problem, additional measures will be taken to ensure the protection of human health.

3.5.2 C&D Landfill Unit

Due to the nature of the waste disposed in this landfill, vector control will not be of concern. Note that the use of periodic cover will discourage animals from nesting in the waste.

3.6 ODOR CONTROL

3.6.1 MSW Landfill Units

Odorous or potentially odorous materials will be covered as soon as possible to avoid odor problems. If odor control becomes a problem, additional measures will be taken to ensure odor control.

3.6.2 C&D Landfill Unit

Due to the nature of the waste disposed in this landfill, odor control will not be of concern.

3.7 DUST CONTROL

Dust related to waste hauler traffic on the access roads will be minimized by using a water truck to limit dust on the gravel portion of the road. Dust generated by excavation of cover soil will be limited by watering the cut soil areas if accessible to the water truck.

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Appendix A

EPA Method 9095

Paint Filter Liquids Test

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METHOD 9095
PAINT FILTER LIQUIDS TEST
From EPA SW-846

1.0 SCOPE AND APPLICATION

1.1 This method is used to determine the presence of free liquids in a representative sample of waste.

1.2 The method is used to determine compliance with 40 CFR 264.314 and 265.314.

2.0 SUMMARY OF METHOD

2.1 A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the 5 minute test period, the material is deemed to contain free liquids.

3.0 INTERFERENCES

3.1 Filter media were observed to separate from the filter cone on exposure to alkaline materials. This development causes no problem if the sample is not disturbed.

4.0 APPARATUS AND MATERIALS

4.1 Conical paint filter: Mesh number 60 (fine meshed size). Available at local paint stores such as Sherwin-Williams and Glidden for an approximate cost of $0.07 each.

4.2 Glass funnel: If the paint filter, with the waste, cannot sustain its weight on the ring stand, then a fluted glass funnel or glass funnel with a mouth large enough to allow at least 1 inch of the filter mesh to protrude should be used to support the filter. The funnel is to be fluted or have a large open mouth in order to support the paint filter yet not interfere with the movement, to the graduated cylinder, of the liquid that passes through the filter mesh.

4.3 Ring stand and ring or tripod.

4.4 Graduated cylinder or beaker: 100-mL.

5.0 REAGENTS

5.1 None.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must be collected according to the directions in Chapter Nine of EPA SW-846.

6.2 A 100 mL or 100 g representative sample is required for the test. If it is not possible to obtain a sample of 100 mL or 100 g that is sufficiently representative of the waste, the analyst may use larger size samples in multiples of 100 mL or 100 g, i.e., 200, 300, 400 mL or g. However, when larger samples are used, analysts shall divide the sample into 100-mL or 100-g portions and test each portion separately. If any portion contains free liquids, the entire sample is considered to have free liquids.

7.0 PROCEDURE

7.1 Assemble test apparatus as shown in Figure 1.

7.2 Place sample in the filter. A funnel may be used to provide support for the paint filter.

7.3 Allow sample to drain for 5 minutes into the graduated cylinder.

7.4 If any portion of the test material collects in the graduated cylinder in the 5-min. period, then the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314.

8.0 QUALITY CONTROL

8.1 Duplicate samples should be analyzed on a routine basis.

9.0 METHOD PERFORMANCE

9.1 No data provided.

10.0 REFERENCES

10.1 None required.

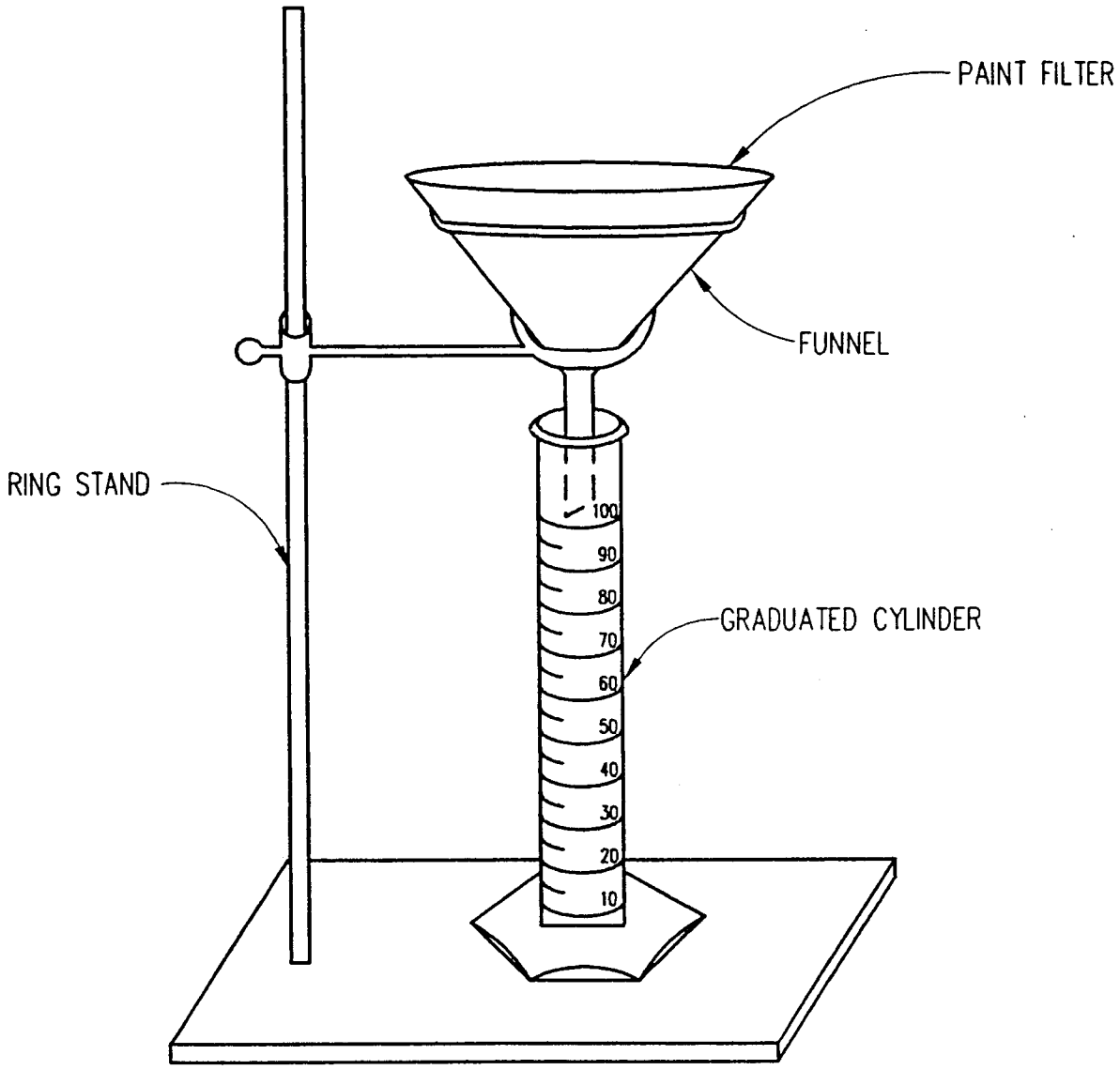

FIGURE 1. PAINT FILTER TEST APPARATUS.

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Appendix B

Waste Screening Form

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Johnston County Department of Public Utilities
Johnston County Landfill Facility
(919) 934-4576

WASTE SCREENING FORM

Day / Date: _____ Time Weighed in: _____
Truck Owner: _____ Driver Name: _____
Truck Type: _____ Vehicle ID / Tag No: _____
Weight _____ Tare: _____
Waste Generator / Source: _____

Reason Load Inspected: Random Inspection _____ Staff Initials _____
Detained at Scales _____ Staff Initials _____
Detained by Operating Staff _____ Staff Initials _____

Inspection Location: _____

Approved Waste Determination Form Present? Yes _____ No _____ N/A _____

Description of Load: _____

Load Accepted (signature) _____ Date _____
Load Not Accepted (signature) _____ Date _____

Reason Load Not Accepted (complete only if load not accepted)

Description of Suspicious Contents: Color _____ Haz. Waste Markings _____
Texture _____
Drums Present _____ Smell _____
Est. Cu. Yds. Present in Load _____
Est. Tons Present in Load _____

Johnston County Emergency Management Contacted? Yes _____ No _____

Company or Authority Contacted? _____
Hazardous Materials Present: _____

Hauler Notified (if waste not accepted) Phone: Time Contacted:
Other Observations: _____

Final Disposition
Signed _____ Date _____
Waste Screening Inspector or Solid Waste Manager

Attach related correspondence to this form.
File completed form in Operating Record.

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Appendix C

Cell Activation Form

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JOHNSTON COUNTY MSW LANDFILL - PHASE 4A
CELL ACTIVATION FORM

Date: _____

Cell: _____

Size of Geosynthetic Rain Cover Removed (Length/Width): _____

Length of Type GT-S Geotextile Removed from Gravel Column(s): _____

Remarks: _____

_____

_____

_____

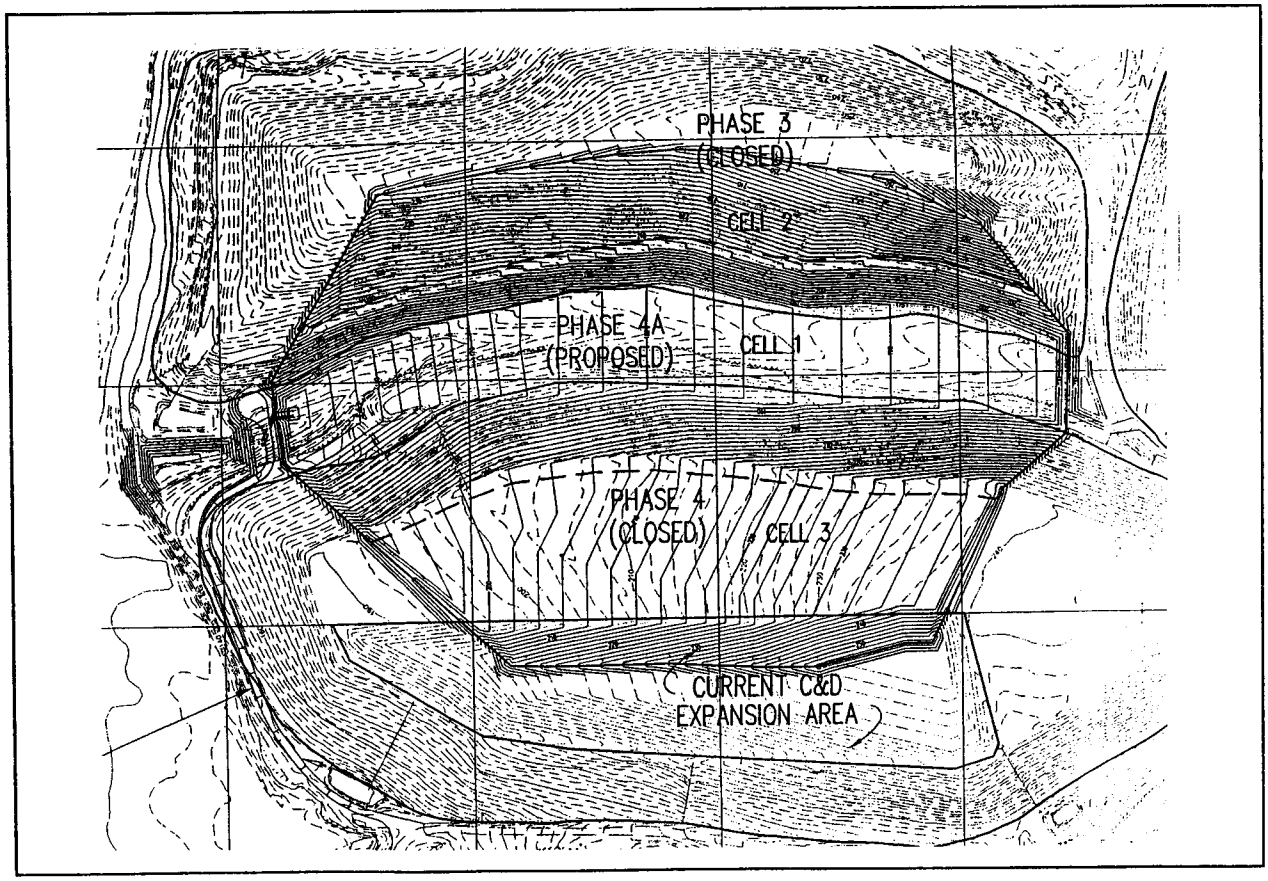
_____

_____

_____

Signed: _____

Sketch:



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Appendix D

Leachate Recirculation Plan

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Operations Manual
Appendix D: Leachate Recirculation Plan

Johnston County Landfill Facility
Johnston County, North Carolina

Prepared for:
Johnston County
Department of Public Utilities

January 2002

PERMIT ISSUE DOCUMENTS

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JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX D: LEACHATE RECIRCULATION PLAN

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- 120-Day Trial Period Monthly Reporting Form
- Leachate Recirculation Monthly Reporting Form
- Leachate Recirculation Daily Log
- Horizontal Well Installation Log

PROJECT DRAWINGS Refer to the approved drawing set entitled "Leachate Recirculation Plan, Permit Drawings, dated February 2001, by G.N. Richardson & Associates, Inc., Raleigh, NC).

JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX D: LEACHATE RECIRCULATION PLAN

1.0 OVERVIEW

Water is the most significant factor influencing waste stabilization and leachate quality. Moisture addition has been demonstrated repeatedly to have a stimulating effect on methanogenesis (Barlaz et al, 1990), although some researchers indicate that it is the movement of moisture through the waste as much as it is water addition that is important (Klink and Ham, 1982). Moisture within the landfill serves as a reactant in the hydrolysis reactions, transports nutrients and enzymes, dissolves metabolites, provides pH buffering, dilutes inhibitory compounds, exposes surface area to microbial attack, and controls microbial cell swelling (Noble, et al, 1991). Lu, et at, (1985) stated that high moisture flow rates can flush soluble organics and microbial cells out of the landfill and in such cases microbial activity plays a lesser role in determining leachate quality. Also, high moisture application rates can remove the majority of waste contaminants early in the life of the fill. Under low flow rate conditions, anaerobic microbial activity is the significant factor governing leachate organic strength (McBean et al, 1995). The quantity of moisture is important because it directly affects stabilization rates within the landfill. Sulfita et al, (1992) and Miller, et al, (1994) both noted the important role of moisture in supporting methanogenic fermentation of solid waste when examining samples removed from operating landfills. Relatively dry landfills (i.e. 20-40% water) have very slow stabilization rates because there is only a small quantity of moisture for biological degradation. Recommended moisture content reported in the literature ranges from a minimum of 25 percent (wet basis) to optimum levels of 40 to 70 percent (Barlaz, et al, 1990; Chen and Bowerman, 1974).

Leachate is recirculated in MSW landfills for one or more of the following reasons:

- as an alternative to leachate treatment,
- to promote biodegradation of the waste as detailed above to produce a smaller and more stable waste mass, and
- to accelerate the production of landfill gas (LFG).

Johnston County's plan to recirculate leachate within the Phase 5 area of their Subtitle D landfill is based on a desire to stabilize the waste and associated contaminants prior to placement of the final cover. The County facility is presently equipped with a leachate force main to a County owned and operated wastewater treatment plant (WWTP) so that disposal of leachate is not a concern. As such, this recirculation plan is developed with the goal of maximizing the rate of degradation of the waste and not for the purpose of leachate disposal.

2.0 REGULATORY REQUIREMENTS

The recirculation of leachate within lined MSW landfills is provided for in Federal RCRA Subtitle D regulations and not prohibited in North Carolina regulations. It is anticipated that design and operational requirements for recirculation will evolve from guidance provided by the Solid Waste Section of the North Carolina Division of Waste Management (DWM).

2.1 40 CFR 258 RCRA Subtitle D

Federal regulations provide both specific and implied requirements that must be met by landfills recirculating leachate. Relevant sections of the Federal regulations are as follows:

§258.28 (a): Bulk or non-containerized liquid waste may not be placed in the MSWLF units unless: (1) The waste is household waste other than septic waste; or (2) The waste is leachate or gas condensate from the MSWLF unit and the MSWLF unit, whether it is a new or existing MSWLF, or lateral expansion, is designed with a composite liner and leachate collection system as described in §258.40(a)(2) of this part...

§258.40(a)(2): With a composite liner, as defined in paragraph (b) of this section and a leachate collection system that is designed and constructed to maintain less than a 30-cm depth of leachate over the liner. (b) For purposes of this section, *composite liner* means a system consisting of two components: the upper component must consist of a minimum 30-mil flexible membrane liner (FML), and the lower component must consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec...

2.2 North Carolina Rule NCAC T15A: 13B.1600

North Carolina regulations mirror the above referenced Federal regulations in Rule .1624(b)(1) related to design and construction, Rule .1624(b)(2)(A) related to maximum head, and Rule .1626(9)(a)(ii) related to recirculation of leachate. Currently, however, implementation of leachate recirculation is administered using policy established in DWM guidance for leachate recirculation. This guidance establishes basic elements that must be incorporated into a leachate recirculation plan prior to implementation of a 120-day trial period and eventual long-term operation. Key elements of this guidance are listed on **Table 1** along with the location in this manual where the element is addressed.

3.0 FACILITY LIQUIDS CONTROL - ENGINEERED PERFORMANCE

Significant engineering effort has been expended to ensure that the maximum head acting on the liner system during routine recirculation does not exceed 30 cm and that the recirculation system itself does not adversely affect the integrity or stability of the landfill. This section provides a general description of these systems and the technical evaluation performed to ensure adequate performance.

3.1 Leachate Recirculation System

The leachate recirculation system uses a network of horizontal porous galleries to both inject leachate into the waste and to vent landfill gas (LFG) generated by the degradation of the waste. The galleries are designed to minimize leachate short circuiting of the waste and the potential for landfill fires in the LFG collection system. Each gallery consists of a family of parallel trench drains that are individually fitted with a leachate injection pipe. The **Project Drawings** show the general geometry and placement of the injection/LFG galleries and details for their construction. The galleries are placed at an approximate 30 foot vertical spacing and a maximum 80 foot horizontal spacing. Each successive vertical gallery is staggered to provide for more uniform leachate distribution and gas collection. The porous LFG collection and leachate distribution media can be constructed using gravel, tire chips, or other relatively inert media having a permeability greater than 1×10^{-2} cm/sec. The leachate injection and LFG collection pipes are high density polyethylene (HDPE) fusion welded pipe having a maximum SDR of 11. Leachate is injected under a minimum 10 psi pressure through a series of 1/8 inch holes spaced 10 feet apart. Field tests by GNRA have confirmed that this hole size and spacing allows for a very uniform release of leachate from each hole for pipe lengths up to 800 feet in length. For this project, lengths were designed up to $\pm$400 feet in length. Installation details for each injection/LFG gallery are recorded using the form provided in **Appendix D1**.

Significant settlement of the waste is anticipated during the service life of the recirculation system. HDPE was selected for use in the injection/LFG pipes due to both its chemical resistance and its low coefficient of friction which minimizes potential tensile forces caused by differential settlement of the waste. The selected SDR of the pipes is based on anticipated maximum tensile forces related to differential settlement and not the stresses generated by the leachate pressure.

3.2 Leachate Collection and Recovery (LCR) System

The leachate collection and recovery (LCR) system for Phase 5 was modified by the County as follows. The modification consisted of removal of 12 inches of sand and a geotextile that had originally been placed between the primary leachate collection pipes and the waste. This material was replaced with a NC DOT #57 stone that provides a significant increase in the transmissivity of the pipe/stone drain and resistance to bioclogging of the drain. This conversion of the primary collection pipe system is performed just in advance of the placement of waste immediately on the #57 stone to ensure that the stone remains free of fines from the protective cover.

The HELP (v. 3.07) Model was used to evaluate the impact of leachate recirculation on the head acting on the composite liner system. This analysis indicates that the average head acting on the liner system is less than 12 inches when a minimum of 30 feet of waste is in place prior to initiating recirculation. The short-term HELP evaluations are conservative in that only a single 30 foot lift of waste is modeled for a 5 year period. As the height of waste is increased, the storage capacity within the waste increases and the

resulting head on the liner system decreases. For example, modeling a 60 foot layer of waste under intermediate cover reduces the short term head from 10.2 inches to 5.4 inches.

4.0 FACILITY EQUIPMENT AND OPERATING PRACTICES

Leachate recirculation must be performed in a manner that does not create odor or stability problems and produces heads on the liner system less than 30 cm. Odor problems are minimized in the proposed system by the use of leachate injection galleries such that raw leachate is not applied to the surface of the waste. The permanent system for injection of leachate is shown in the **Project Drawings** and requires operational steps as follows:

- Leachate to be recirculated is collected in the existing leachate pump station located adjacent to the existing leachate storage lagoon.

- Leachate is pumped from the pump station to the injection galleries using a submersible high-head pump capable of maintaining a minimum 10 psi pressure at the inlet of the injection gallery. Each injection gallery is provided with a positive on-off ball valve as shown in the **Project Drawings**.

- Leachate is pumped into individual injection galleries in metered ±6,000 gallon slugs designed to prevent localized saturation of the waste and stability problems. Injection is sequenced between the galleries and recorded using the form provided in **Appendix D1**.

- A backup system can be provided using a water truck that receives leachate from the leachate lagoon and then transports it back to the top of Phase 5 and injects it directly from the truck to one of the injection galleries. This system may be utilized in the event of a shutdown of the recirculation pump.

The general recirculation philosophy is to avoid visible discharge of leachate, e.g., spraying into the air by truck, sprinklers, or hoses, to minimize the potential for odor problems and excessive discharge in one zone of waste to minimize stability and seep related problems. This section discusses the facility hardware and operational procedures employed to successfully recirculate leachate to the waste.

4.1 Leachate Injection Gallery

Each injection gallery extends horizontally from the face of the final cover into the waste a distance of no more than about 400 (±10%) feet in length. Each injection gallery consists of a granular windrow or trench drain containing a HDPE leachate injection pipe. The details of this system are discussed in **Section 3.1**. Each leachate injection gallery pipe is fitted at its exposed end with a positive on-off valve connected to the supply line. A check valve and cleanout are also provided for each injection gallery pipe.

The injection pipe diameter and pressure are selected to ensure that leachate flow velocities are sufficient to prevent fouling of the injection pipe and the perforations. It is not anticipated that the leachate injection pipes will require servicing during their estimated 5-8 year service life. The granular drain surrounding the injection pipe is designed to both allow a more uniform distribution of the leachate and for the collection of LFG within the waste. The size and permeability of the granular trench drain is based on the desire to maintain internal LFG pressures less than 6-inches H_2O (0.22 psi). All injection gallery installation details will be recorded using the form provided in **Appendix D1**.

4.2 Leachate Injection Equipment

One submersible pump will be provided in the existing pump station for recirculating leachate. This pump is rated for a flow of 50 gpm at a head of 210 feet. This pump was selected to provide the required minimum inlet pressure to the leachate injection gallery of 10 psi and approximately 2 hours pumping time to inject 6,000 gallons of leachate. The injection pump is equipped with on-off controls within the pump station.

4.3 Leachate Amendment

With time it is anticipated that the leachate draining from Phase 5 will become increasingly acidic. Research by Barlaz (1990) has shown that the rate of waste decomposition actually decreases with increasing acidity. Therefore it may be necessary to buffer the leachate prior to future recirculation. This will be accomplished using a liquid lime injector as needed. Currently there are no plans for leachate amendment other than buffering.

5.0 FACILITY MONITORING PRACTICES

The facility must be monitored to ensure that the combination of leachate recirculation and natural precipitation does not produce excessive head on the liner system, side slope seeps, or stability problems. This section reviews a monitoring system to be installed at Phase 5 to monitor both weather and leachate quantities.

5.1 Weather Monitoring

Daily weather monitoring will be obtained using a rain gauge and tell-tale equipped thermometer located at the landfill office. Daily readings would be obtained for the maximum temperature, total rainfall, and general weather conditions. This information would be recorded on the form provided in **Appendix D1**. This data allows an accurate evaluation of the water-balance over time within the waste.

5.2 Leachate Monitoring

Leachate from Phase 5 gravity drains to the leachate lagoon. The cumulative flow through the gravity drain line will be monitored via flowmeters for all pumps. Calculations commonly performed to determine action leakage rates (ALR) for leak detection systems show that the flow rate will be 130,600 gallons per day when the maximum head acting on the liner is 30 cm. The cumulative flow monitoring will provide verification that the head acting on the liner system is less than 30 cm.

Landfill personnel will pay particular attention to sudden increases in leachate generation during or immediately after recirculation activities. Sudden increases in rate of leachate generation from the facility not accompanied by precipitation indicates that injected leachate is moving through the waste faster than normal. This may imply either saturation of the waste due to over injection of leachate or short circuiting (via voids in the waste) of the waste by a single injection. Both situations require a cessation of injection to the injection gallery in question and a modification of the injection sequence.

6.0 REPORTS

The following reports will be prepared:

- Pre-Operational Report;
- 120-Day Trial Period Reporting (Progress and Final Reports); and
- Quarterly Operational Reports.

Reporting forms proposed in this pre-operational report will be revised with experience.

6.1 Pre-Operational Report

The pre-operational report provides sufficient information to justify the 120-day trial recirculation period. This Leachate Recirculation Plan is the pre-operational report for the Johnston County Phase 5 leachate recirculation program.

6.1.1 Weather Monitoring

A daily rain gauge and thermometer will be installed at the landfill office to allow daily recording of total rainfall and maximum temperature. This data will be recorded at the end of each working day.

6.1.2 Baseline Leachate Sampling

Baseline leachate quality data for Phase 5 will be provided within the last 30 days prior to the initiation of leachate recirculation. This data will include test results

for BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, metals, and volatiles.

6.1.3 Operational Procedures

Johnston County plans on proceeding with the installation of the recirculation pump and force main. Thus, the operational procedures during the 120-day trial recirculation period will be the same as for long-term operations as previously described in **Section 4**.

6.1.4 Operational Equipment

The operational equipment during the 120-day trial will include the recirculation pump and force main and a portion of the first level of injection galleries as shown in the **Project Drawings** and installed at a nominal elevation of 30 feet of waste.

6.1.5 Record Keeping

Daily readings for rainfall, maximum temperature, quantity of leachate generated/recirculated, and leachate injection galleries used will be maintained using the form provided in **Appendix D1**. This form provides for a week of data and allows comments on the daily weather conditions and unusual operating conditions, e.g., odor or seeps. These data sheets will be provided to the State as part of the technical report submitted to DWM in support of implementation of the long-term leachate recirculation program.

6.2 120-Day Trial Period Reporting

6.2.1 Progress Report

After a minimum of 60 days, a progress report will be prepared which describes and documents the monitoring activities since initiation of the 120-day trial period, presents observed difficulties and/or operational modifications, and presents leachate quality data. Leachate quality data will include test results for BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, metals, and volatiles.

6.2.2 Final Report

At the completion of the 120-day trial period, a final report will be prepared which describes and documents the monitoring activities for the entire trial period, presents observed difficulties and/or operational modifications, and presents leachate quality data. Leachate quality data will include test results for BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, metals, and volatiles. The most critical aspect of this report is confirmation that the proposed

leachate injection sequence results in acceptable performance. Final drawings and specifications for the facility modifications will also be submitted with this report. Based on this report, Johnston County will request approval by DWM to implement the long-term leachate recirculation program.

6.3 Quarterly Operational Reports

Quarterly leachate recirculation operational reports will be submitted to DWM after the 120-day trial period. These reports will provide the daily log sheets provided in **Appendix D1**, identify all leachate injection galleries in service, and provide updated leachate quality data.

7.0 REFERENCES

1- Barlaz, M.A., R.K. Ham, and D.M. Schaefer, 1990. "Methane Production from Municipal Refuse: A review of Enhancement Techniques and Microbial Dynamics," Critical Reviews in Environmental Control, 19(6): 557.

2- Chen, K.Y. and F.R. Bowerman, 1974. "Mechanisms of Leachate Formation in Sanitary Landfills," in: Recycling and Disposal of Solid Wastes: Industrial, Agricultural, Domestic., Yen, T.F. editor, Ann Arbor, Ann Arbor Science Publication.

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7- Noble, J.J. and A.E. Arnold, 1991. "Experimental and Mathematical Modeling of Moisture Transport in Landfills," Chemical Eng. Comm., 100: 95-111.

8- Sulfita, J., C. Gerba, R. Ham, A. Palmisano, W. Rathje, and J. Robinson, 1992. "The World's Largest Landfill," Environmental Science & Technology, 26(8): 1486-1495.

TABLE 1: NC DWM POLICY ELEMENTS FOR LEACHATE RECIRCULATION

Conditions	Policy Element	Section(s)
Preoperative Conditions	A rain gauge and thermometer shall be placed on the site.	6.1.1
	A Baseline sampling of leachate shall be performed.	6.1.2
	An outline of expected operational procedures shall be submitted.	4.0
	A brief description of the equipment and its' associated specifications shall be submitted.	4.0 & Specs.
	A brief description of record-keeping forms shall be submitted including: • daily/weekly record of leachate generated • daily/weekly record of leachate recirculated • weather conditions and other pertinent daily information • a log for reporting operating or other unusual problems, and their subsequent rectification • any other forms or procedures, etc., that the owner/operator will use.	5.0/6.0
	An estimation of height of waste in the cell where leachate is anticipated to be applied.	Project Drawings
	An analysis of the field capacity of the waste where leachate is to be applied, such that the gallons per unit area does not exceed the field capacity of the waste volume.	3.2
Operating Conditions	Records shall be kept or a daily/weekly basis as outlined.	6.0
	No leachate shall be applied on less than one lift (10 feet) of waste.	3.1
	No leachate shall be spray applied or surface circulated when it is raining, or when the waste is too wet.	4.0
	No run-off or side seepage will be allowed.	4.0
	Odors will be controlled.	4.0
	Leachate depth shall be monitored in the manhole to ensure that the head on the liner does not exceed one foot for more than 24 hours.	5.2
	Leachate will be spray applied or surface circulated during daylight hours only.	N/A
	The application system will be properly maintained and documented.	5.0/6.0
	Subsurface distribution systems will be outlined.	4.1
	Operation and maintenance of subsurface systems will be proposed.	4.0

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Appendix D1

Reporting Forms and Logs

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JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
120-DAY TRIAL PERIOD MONTHLY REPORTING FORM

Start Date (Day 1): _____

Day	Rain (Inch)	Max. Temp.	Leachate Generated	Leachate Recirculated	Injection Galleries Used	Problems/Weather (Use Extra Sheet if Required)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
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29						
30						
31						

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JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
LEACHATE RECIRCULATION MONTHLY REPORTING FORM

Start Date (Day 1): _____

Day	Rain (Inch)	Max. Temp.	Leachate Generated	Leachate Recirculated	Injection Galleries Used	Problems/Weather (Use Extra Sheet if Required)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
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29						
30						
31						

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JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
LEACHATE RECIRCULATION DAILY LOG

Date: _____

Time	Injection Gallery	Volume Pumped	Remarks

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JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
HORIZONTAL WELL INSTALLATION LOG

Well Number: _____

Date(s) Installed: _____

Length Installed: _____

Elevation: _____

Number of Holes/Spacing: _____

Hole Size: _____

Coordinates:

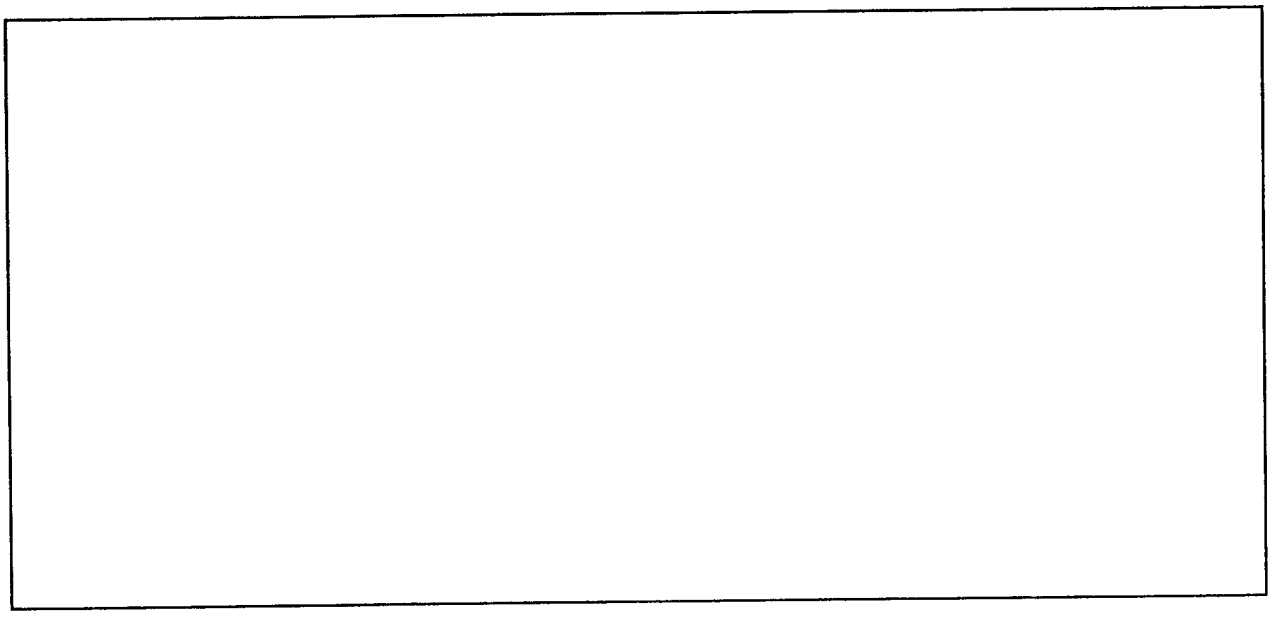
Point #: _____ X: _____ Y: _____ Z: _____

Point #: _____ X: _____ Y: _____ Z: _____

Point #: _____ X: _____ Y: _____ Z: _____

Remarks: _____

Installation Sketch:



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Appendix E

Irrigation of Reclaimed Wastewater

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Operations Manual
Appendix E: Irrigation of Reclaimed Wastewater

Johnston County Landfill Facility
Johnston County, North Carolina

Prepared for:
Johnston County
Department of Public Utilities

January 2002

PERMIT ISSUE DOCUMENTS

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
425 N. Boylan Avenue
Raleigh, North Carolina 27603

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JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER

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JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER

1.0 OVERVIEW

This Operations Manual Addendum was prepared for the Johnston County MSW Landfill located off of Highway 210 on County Home Road for the purpose of describing the operation of an irrigation system for reclaimed wastewater, which is proposed for the site. The system will be owned and operated by Johnston County.

2.0 CONTACT INFORMATION

All correspondence and questions concerning the operation of the reclaimed wastewater irrigation system should be directed to the appropriate County personnel listed below:

Johnston County Department of Public Utilities
204 S. Second Street, P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 989-5075 (Downtown); (919) 934-4576 (Landfill)
Fax: (919) 934-7174 (Downtown); (919) 989-7152 (Landfill)

Solid Waste Manager:	Rick Proctor
Public Utilities Director:	Haywood Phthisic
Director of Engineering:	Tim Broome, P.E.

3.0 IRRIGATION SYSTEM OPERATION

3.1 Areas to be Irrigated

Areas to be irrigated and order of priority (1 being the highest) include the following:

Priority 1:

- Wooded area behind (east of) NC Forest Service building (Field 1) (Not on Solid Waste Permit Site;
- Agricultural fields to the south of the landfill office and yard waste area on newly acquired land (Field 2) (majority not on Solid Waste Permit Site);
- Area behind (west of) landfill office including the current yard waste processing area (Fields 3 & 4); and
- Wooded area south of the leachate storage lagoon (future Phase 7 and Phase 8 area) (Fields 6, 7, & 8).

Priority 2:

- Closed landfill areas on Phase 1&2, 3, and 4 (Also, Phase 5 in future) (LF Cap 1&2, LF Cap 3, and LF Cap 4).

Priority 3:

- Inactive borrow areas (Fields 5, 9, & 10).

In addition to these areas, the County plans to use reclaimed wastewater for the control of dust within the facility. **Figure 1** presents the location of the various planned irrigation areas.

3.2 Periods of Operation

The irrigation system will be operated during the months of April through October. In addition, irrigation will be discontinued on any day that rainfall exceeds 0.2 inches.

3.3 Irrigation Amounts

Irrigation amounts off the landfills will be in accordance with the agronomic rates determined for the landfill site (based on "wettest" year amounts) in an analysis performed by Robert Evans, Ph.D., P.E. of N.C. State University and entitled "Hydrologic Wastewater Reuse Irrigation Analysis for Johnston County". Irrigation amounts on the landfill final covers will be in accordance with HELP model evaluations performed by G.N. Richardson & Associates. A tabulation of these amounts is given in **Table 1**. Restrictions to these amounts are as stated herein. Note that based on site monitoring of the irrigation program (see **Section 3.5**), future increases to these amounts may be allowed.

3.4 Irrigation Restrictions

3.4.1 Monitoring Wells

No irrigation will occur within 100 feet of an actively monitored site monitoring well.

3.4.2 Closed Landfill Areas

Irrigation over closed landfill areas shall only take place over closed areas which have at least 2 feet of soil cover or at least 1.5 feet of soil cover and a synthetic barrier.

3.4.3 Future Landfill Areas

Irrigation over areas designated as future landfill areas (or areas within 300 feet of future landfill areas) will be discontinued within 2 years before the anticipated start of construction for that area unless it is demonstrated by use of piezometers, monitoring wells, or other method (see **Section 3.5**) that irrigation rates are not creating an artificial rise in groundwater levels. Closed landfill areas, if to be lined over as part of a future landfill area (i.e. Phases 6, 7, & 8) may be irrigated in accordance with **Section 3.4.2** within 2 years prior to construction.

3.4.4 Borrow Areas

No irrigation will be performed in active borrow areas. Irrigation may be performed in inactive borrow areas as long as the ground surface is prepared to promote vegetation (soil type, nutrients, etc.).

3.5 Site Monitoring of Irrigation Program

In order to monitor the effect of the irrigation program both to ground water quality and to the ground water table a monitoring program will be implemented. This program will consist of two elements. One will be the addition of sampling and testing of the treated irrigation water as part of the regular Spring and Fall ground water sampling/testing events already performed as part of site operations. After sampling, the irrigation water will be tested for the same detection monitoring parameters as for the other site samples.

In addition, the second element of the monitoring program will be the installation of piezometers in each future landfill area to be irrigated (i.e. Phases 6, 7, and 8). At a minimum, one piezometer will be installed roughly in the central portion of the proposed future landfill phase before irrigation can begin over that area. The water elevations in these piezometers will be measured and recorded both during the spring and fall, concurrent with regular site ground water monitoring, and in the mid-summer. These levels will be evaluated in order to determine if there appears to be a rise in ground water elevations due to the irrigation activities. Should ground water elevations be maintained within a couple of feet of initial levels or levels that might otherwise be considered normal considering other factors such as weather, etc., the irrigation amounts for that area may be increased. Likewise, if there appears to be a significant (more than a couple of feet) increase in ground water elevation, which cannot be otherwise explained, irrigation activities in this area will be reduced or suspended. Also, as stated in **Section 3.4.3**, irrigation in future landfill areas will be halted at least two years prior to planned construction activities in that area.

3.6 System Maintenance and Inspections

Inspection of the irrigation system during periods of operation will be performed by landfill staff on a weekly basis for the closed landfill areas. Other areas may be inspected

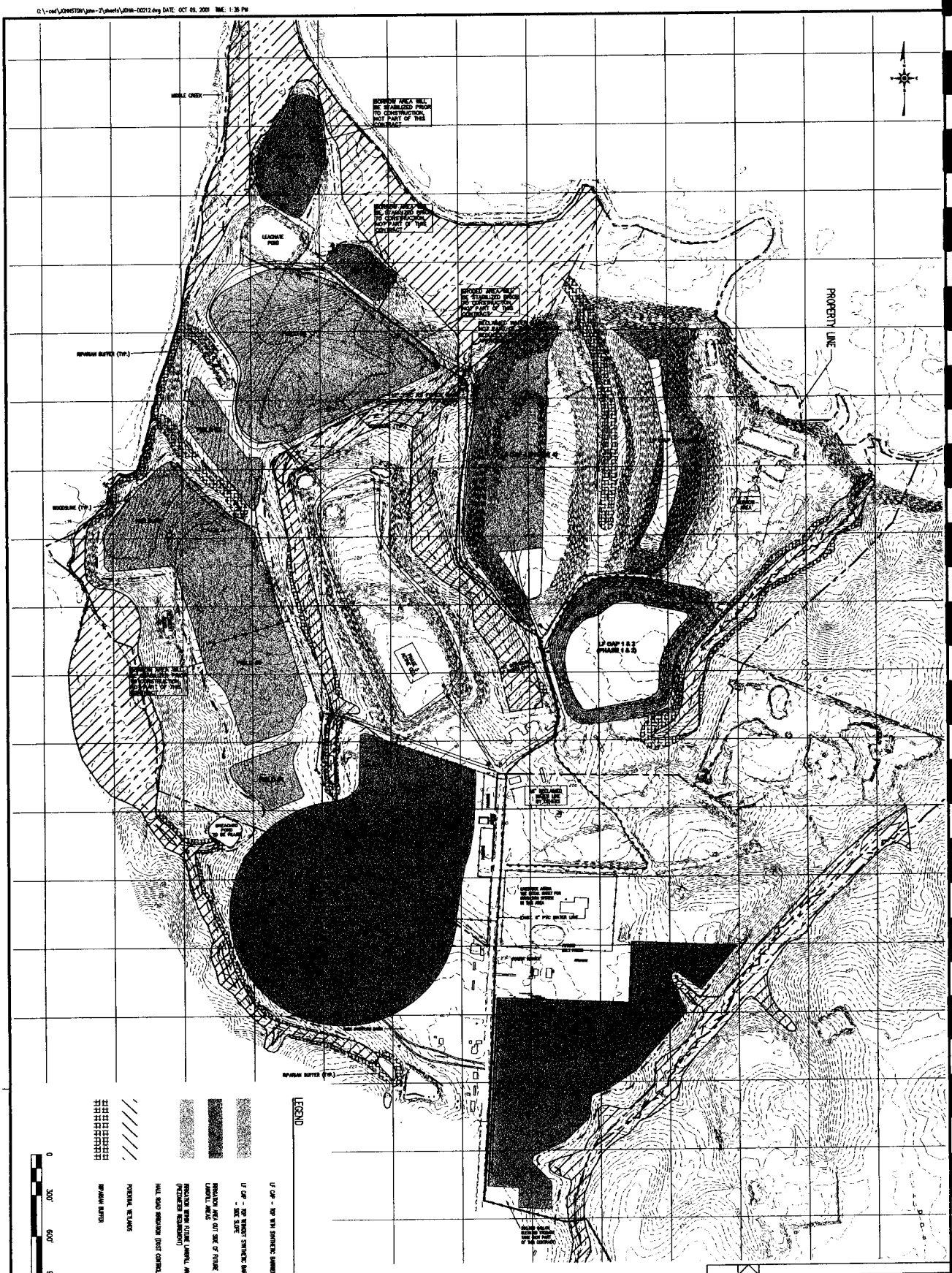
less frequently, but not less than once per month. As much of the proposed system will be above ground, inspection for damaged piping, valves, sprinklers, etc. will be done on a mostly visual basis. Should maintenance be required to any portion of the irrigation system, that part of the system will be shut off until adequate repairs are made.

Table 1: Recommended Irrigation Amounts

Field Type	Max. Daily Application Rate cm/day (inch/day)	Annual Application Rate cm/year (inch/year)
Field with Trees	0.60 (0.25)	36 (14)
Field with Grass	0.60 (0.25)	40 (16)
Landfill Final Cover[1]	0.25 (0.1)	12 (5)
Fields 1 and 2	0.60 (0.25)	50 (20)

Note:

1) At a rate less than that which would cause saturation of the upper 9 inches of soil cover. This will be controlled by the use of soil moisture devices, which will automatically shut off the irrigation system if the upper 9 inches becomes saturated.



DATE	NO.	REVISION

DRAWING TITLE:

LANDFILL SITE
IRRIGATION PLAN

PROJECT TITLE:

JOHNSTON COUNTY LANDFILL
IRRIGATION OF RECLAIMED
WASTEWATER

SEAL

SEAL

G.N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services
425 N. BOYLAN AVENUE RALEIGH, N.C. 27603
PHONE-919-828-0677 FAX-919-828-3899 WWW.GNRA.COM

DESIGNED BY:	P.K.S.
DRAWN BY:	C.L.J.
CHECKED BY:	G.N.R.
PROJECT NO:	JOHN-2
SCALE:	AS SHOWN
DATE:	OCT. 2001
FILE NAME:	JOHN-00212
DRAWING NO.	FIG. 1
SHEET NO.	

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