Permit No.	Date	Document ID No.
41-17	**February 28, 2011**	**12796**

APPROVED DOCUMENT
Division of Waste Management
Solid Waste Section
Received Dated: November 2010 revised through January 2011
Date: **February 28, 2011** By: **Ming-Tai Chao**

David Garrett & Associates
Engineering and Geology

January 26, 2011

Mr. Ming Chou, PE
NC DENR Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

Permit No.	Date	Document ID No.
41-17	**January 26, 2011**	**12795**

RECEIVED
January 26, 2011 via an e-mail
Solid Waste Section
Raleigh Central Office

RE: Subgrade Inspection Follow Up
A-1 Sandrock, Inc. CDLF Phase 1B PTO
Guilford County, NC (Permit #41-17)

Dear Mr. Chou:

On behalf of A-1 Sandrock, I am pleased to present the following information, pursuant to your comments sent via e-mail on January 18, 2011. Your concern pertains to verification of the soil types in the base grades for Phase 1B. In a subsequent telephone conversation, we discussed the prospects of my forthcoming submittal of follow up information – this document – taken from the original site studies conducted ca. 2002, which show the consistency and continuity of the soil in and around Phase 1B. Said documentation is considered (by me) to be sufficient for demonstrating that the upper two feet soil subgrade within Phase 1B, which is entirely within a cut section, meets the soil-type requirements of Rule 15A NCAC 13B.0540(2)(b), which stipulates the soil types SC, SM, ML, CL, MH or CH.

Please find attached a table summary showing the soil types based on original laboratory data, correlated to the relative subgrade elevations at various test borings. Based on the lab data, the soils expected to be found at subgrade were classified as silty sand (SM) mixed with slightly clayey and sandy silt (ML). Please also find attached a map showing the boring locations, original ground surface and approved subgrade contours, along with copies of the relevant test borings to demonstrate the continuity of these soil types.

Please contact me if you have questions or require further clarification.

Sincerely,

G. David Garrett, P.G., P.E.
Consulting Engineer

cc: Ronnie Petty – A-1 Sandrock, Inc.

5105 Harbour Towne Drive • Raleigh • North Carolina • 27604
919-418-4375 (Mobile) • 919-231-1818 (Office fax) • E-mail: david@davidgarrettpe.com

Summary of Laboratory Testing and Test Borings
A-1 Sandrock CDLF Phase 1B Subgrade Evaluation
NC Solid Waste Permit #41-17

Test Boring	Sample No.	Sample Elev.	Subgrade Elev.[1]	USCS Classification
B-11	S3	786.5	788	SM
B-21	S4	789	781	SM-ML
B-22	B3 [2]	773	776	SM
B-23	--	--	766 [3]	Silty sand (visual)
B-26	--	--	781.5	Silty sand (visual)

[1]Approved grades from 2006 PTC, rounded to the nearest half-foot
[2]Bulk sample collected surface to 20 feet
[3]Subgrade left 2 feet higher than approved in this area

Please refer to following laboratory data and test boring records

Table 2
Geotechnical Laboratory Data

Sample Types: S = Split spoon sample
B = Bulk sample
U = Undisturbed (Shelby tube)

Grain Size Distributution and Soil Classification

Boring Number	Sample Number	Sample Depth, ft.	% >3"	% Gravel	% Sand	% Silt	% Clay	Liquid Limit	Plasticity Limit	Plasticity Index	USCS Class.	Natural Moisture	% Passing	Hydrogeologic Description****
			>75 mm	75 mm>	4.5 mm>	0.075 mm>	0.005 mm>						#200 Sieve	
				> #4	#4 - #200	#200 >								
												%		
B-13	B1	0.0 - 50.0	0	3.0	68.0	21.0	8.0	NP	NP	NP	SM-ML	5.1	29.0	Gray-Brown Silty Fine to Med SAND
B-21	B2	0.0 -20.0	0	0.0	87.5	6.5	6.0	23	18	5	SM		12.5	Tan Silty Coarse to Fine SAND
B-22	B3	0.0 - 20.0	0	0.0	75.7	19.3	5.0	NP	NP	NP	SM	2.3	24.3	Gray Silty Fine to Medium SAND
B-11	S1	3.5 - 5.0	0	0.0	10.1	58.9	31.0	49	28	21	CL-ML	38.3	89.9	Orange Silty CLAY
B-11	S3	13.5 - 15.0	0	6.5	68.0	24.0	8.0	NP	NP	NP	SM	10.7	32.0	Gray-Tan Silty Fine to Medium SAND
B-12	S2	8.5 - 10.0	0	0.0	86.4	9.6	4.0	NP	NP	NP	SM	4.5	13.6	White-Brown Silty F - C SAND
B-19	S3	13.5 - 15.0	0	0.0	83.4	16.6	0.0	NP	NP	NP	SM		16.6	Silty Fine to Medium SAND
B-21	S1	3.5 - 5.0	0	0.0	39.5	43.5	17.0	33	24	9	SM-ML		60.5	Tan Fine Sandy SILT
B-21	S2	8.5 - 10.0	0	0.0	40.7	41.3	18.0	41	28	13	SM-ML		59.3	Fine Sandy SILT
B-21	S3	13.5 - 15.0	0	0.0	55.8	38.2	6.0	28	23	5	SM-ML		44.2	Silty Fine SAND
B-21	S4	18.5 - 20.0	0	0.0	54.0	38.0	8.0	NP	NP	NP	SM-ML		46.0	Silty Fine SAND

Notes to Above:

Moisture Contents are Dry Unit Weight Based

Moisture data for bulk samples acquired from individual jar samples collected with the bulk sample. Samples were oven-dried.
These data are considered representative of in-situ moisture conditions for earth work considerations.

Samples tested by Geotechnologies. Inc., Raleigh, NC

Table 2 - Continued
Geotechnical Laboratory Data

Compaction Data Bulk Samples

Boring Number	Sample Number	Sample Depth, ft.	Max. Dry Density, pcf	Optimum Moisture, %
B-13	B1	0.0-50.0	125.5	12.0%
B-21	B2	0.0-50.0	128.7	9.8%
B-22	B3	0.0-20.0	127.8	11.1%

Hydraulic Conductivity Data Bulk Samples

Boring Number	Sample Number	Sample Depth, ft.	Compaction % MDD	Tested Moisture, %	K cm/sec	Porosity %
B-13	B1	0.0-50.0	92.0%	16.3%	1.11E-05	30.2%
B-21	B2	0.0-50.0	99.8%	13.7%	3.66E-07	22.4%
B-22	B3	0.0-20.0	90.2%	15.5%	5.02E-06	31.6%

SED TRAP "A-2"

SED TRAP "A"

DITCH A2

UNAMED TRIBUTARY "NORTH"

GATE

PIPE #1

DITCH E

CHANNEL 6

MW-5

MW-5

(741.54)

DITCH B1

SED TRAP "B-2"

SED TRAP "C-1"

STREAM "A"

DITCH C1

SED TRAP "B-3"

SED TRAP "

50' BUFFER

50'

B-23

B-20

B-19

SED TRAP "G"

DOWN CHANNEL #1

DITCH S1

CHANNEL 5

B-9

B-28

B-22

PHASE 1C

PHASE 1B

PHASE 1A

B-27

B-26

CHANNEL 4

B-10

B-21

B-11

B-12

B-17

CHANNEL 7

DITCH F

B-7

B-16

B-29

SED TRAP "E"
(NON-DISCHARGE)

PHASE 2

PHASE 2

200' BUFFER

David Garrett, P.G., P.E.

Engineering and Geology

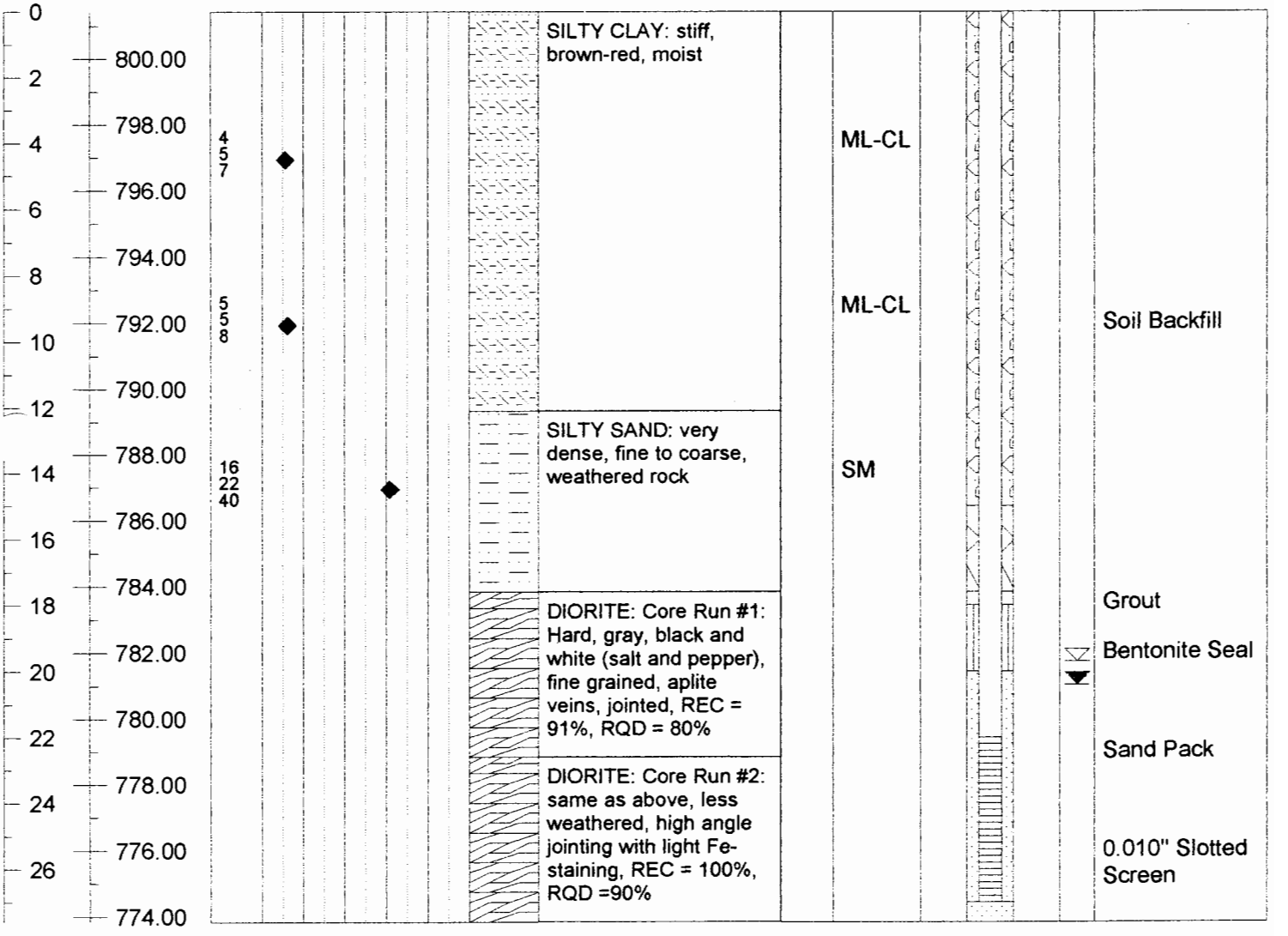
Boring No. B-11

Page 1 of 1

Client and Project	**A-1 Sandrock CDLF (Guilford County)**			Collar Elevation	**801.44**
Equipment	**Dietrich D50 ATV**	Drilling Method	**HSA/NQWL core**	Water Level, TOB	**19.7**
Date Started	**5/7/02**	Date Ended	**5/7/02**	Water Level, 24 Hr.	**20.4**
Drilling Firm	**Bore & Core (Seiler)**	Logged by	**David Garrett**	Stabilized Level	**20.4**
Comments	**Cleared access road through woods**	Total Depth	**27.6**	Date of Observation	**5/28/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-21

Client and Project	**A-1 Sandrock CDLF (Guilford County)**			Collar Elevation	**807.94**
Equipment	**Dietrich D50 ATV**	Drilling Method	**HSA**	Water Level, TOB	**51.1**
Date Started	**4/30/02**	Date Ended	**4/30/02**	Water Level, 24 Hr.	**42.1**
Drilling Firm	**Bore & Core (Seiler)**	Logged by	**David Garrett**	Stabilized Level	**42.0**
Comments	**Cleared access road through woods**	Total Depth	**60.4**	Date of Observation	**5/28/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data
0		SILTY SAND: Very dense, tan-yellow, gravelly	
2 — 806.00			
4 — 804.00	27 41 50/.4	SILT: Hard, tan-yellow, hard "slatey" layers, weathered granite	SM
6 — 802.00			
8 — 800.00			
10 — 798.00	11 15 25		SM Soil Backfill
12 — 796.00			
14 — 794.00	50/.4		SM
16 — 792.00			
18 — 790.00			
20 — 788.00	28 50/.3	SILTY SAND: Dense, tan, fine to coarse, quartz stringers	SM
22 — 786.00			
24 — 784.00	50/.4		SM
26 — 782.00			
28 — 780.00	50/.2		SM
30 — 778.00			Soil Backfill
32 — 776.00			
34 — 774.00	50/.3	PWR: Very dense, weathered granite with numerous hard layers	SM
36 — 772.00			

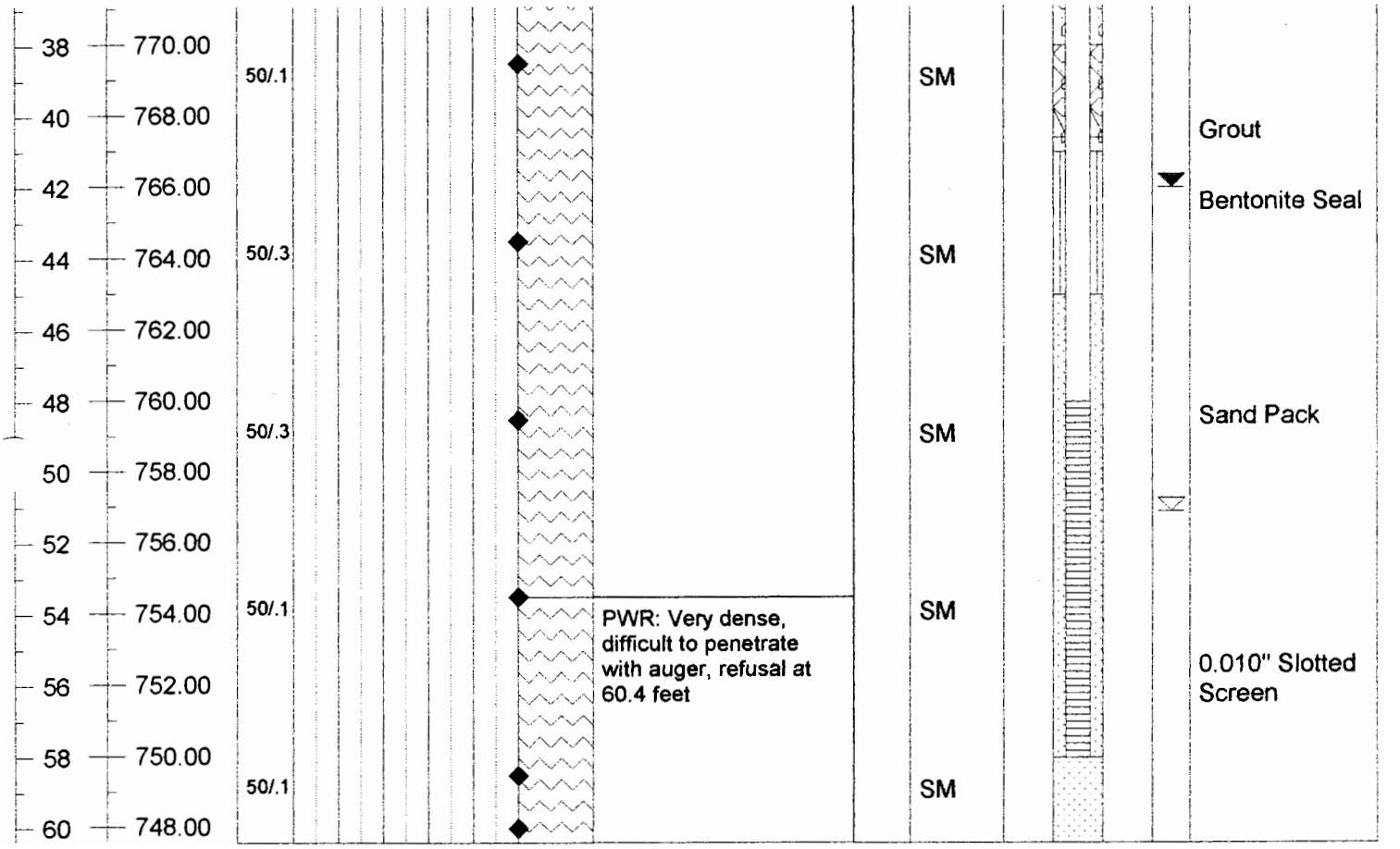
David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-21

Client and Project **A-1 Sandrock CDLF (Guilford County)**
Equipment **Dietrich D50 ATV** Drilling Method **HSA**
Date Started **4/30/02** Date Ended **4/30/02**
Drilling Firm **Bore & Core (Seiler)** Logged by **David Garrett**
Comments **Cleared access road through woods** Total Depth **60.4**
All depths are given in feet and referenced b.g.s.

Collar Elevation **807.94**
Water Level, TOB **51.1**
Water Level, 24 Hr. **42.1**
Stabilized Level **42.0**
Date of Observation **5/28/02**

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-22

Client and Project **A-1 Sandrock CDLF (Guilford County)**

Equipment **Dietrich D50 ATV** Drilling Method **HSA/NQWL core**

Date Started **5/6/02** Date Ended **5/6/02**

Drilling Firm **Bore & Core (Seiler)** Logged by **David Garrett**

Comments **Cleared access road through woods** Total Depth **31.6**

All depths are given in feet and referenced b.g.s.

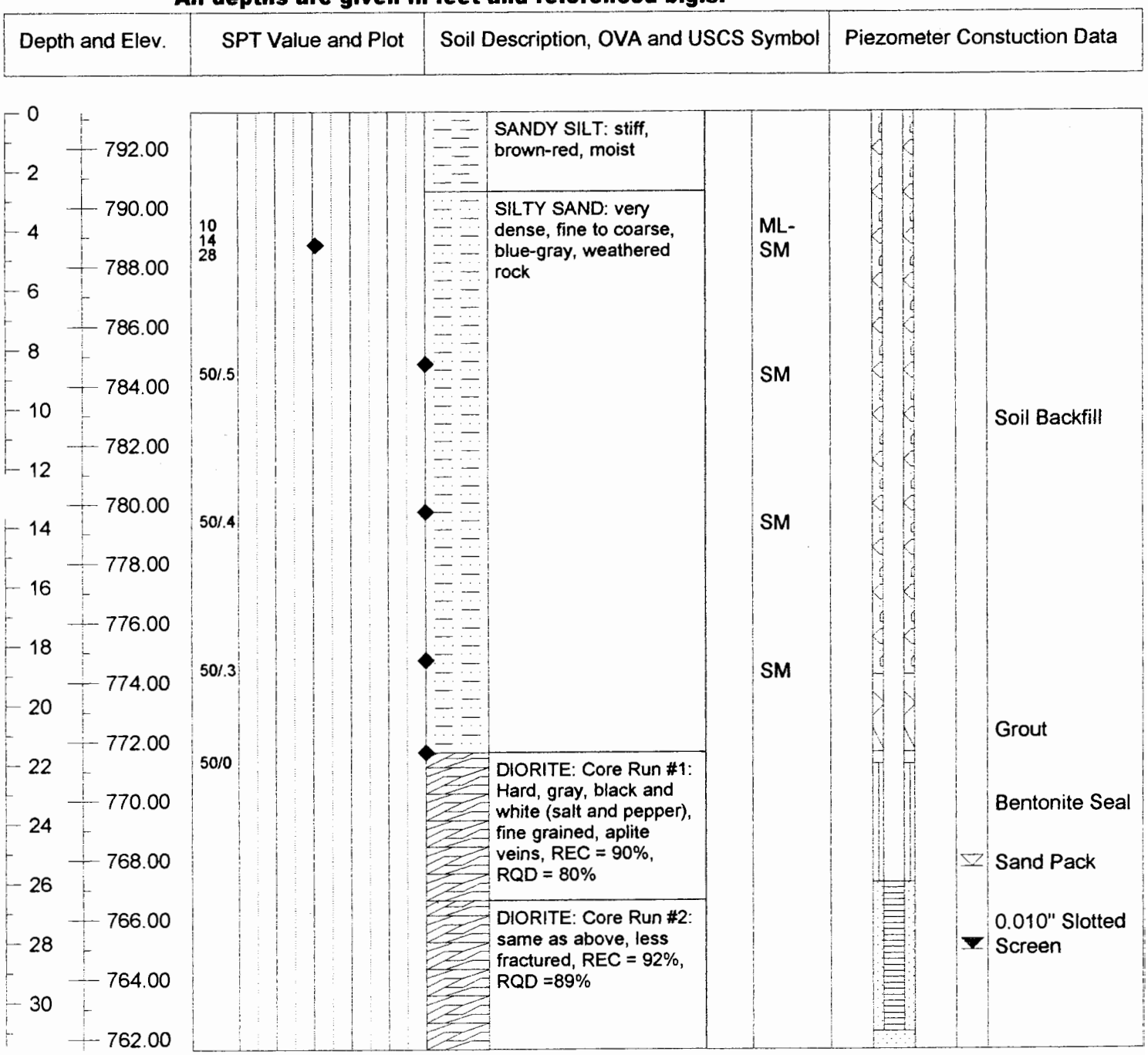
Collar Elevation **793.23**

Water Level, TOB **25.5**

Water Level, 24 Hr. **26.7**

Stabilized Level **28.3**

Date of Observation **5/28/02**



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-23

Client and Project	**A-1 Sandrock CDLF (Guilford County)**			Collar Elevation	**780.11**
Equipment	**Dietrich D50 ATV**	Drilling Method	**HSA**	Water Level, TOB	**Dry**
Date Started	**5/20/02**	Date Ended	**5/20/02**	Water Level, 24 Hr.	**Dry**
Drilling Firm	**Bore & Core (Seiler)**	Logged by	**David Garrett**	Stabilized Level	**Dry**
Comments	**Cleared access road through woods**	Total Depth	**12.5**	Date of Observation	**5/28/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data
0 — 780.00		SILTY SAND: Dense, tan	
2 — 778.00			
4 — 776.00			
6 — 774.00			
8 — 772.00		PWR: Dense, blue-green, auger refusal at 12.5 feet, offset boring refused at 13 feet	
10 — 770.00			
12 — 768.00			

David Garrett, P.G., P.E.

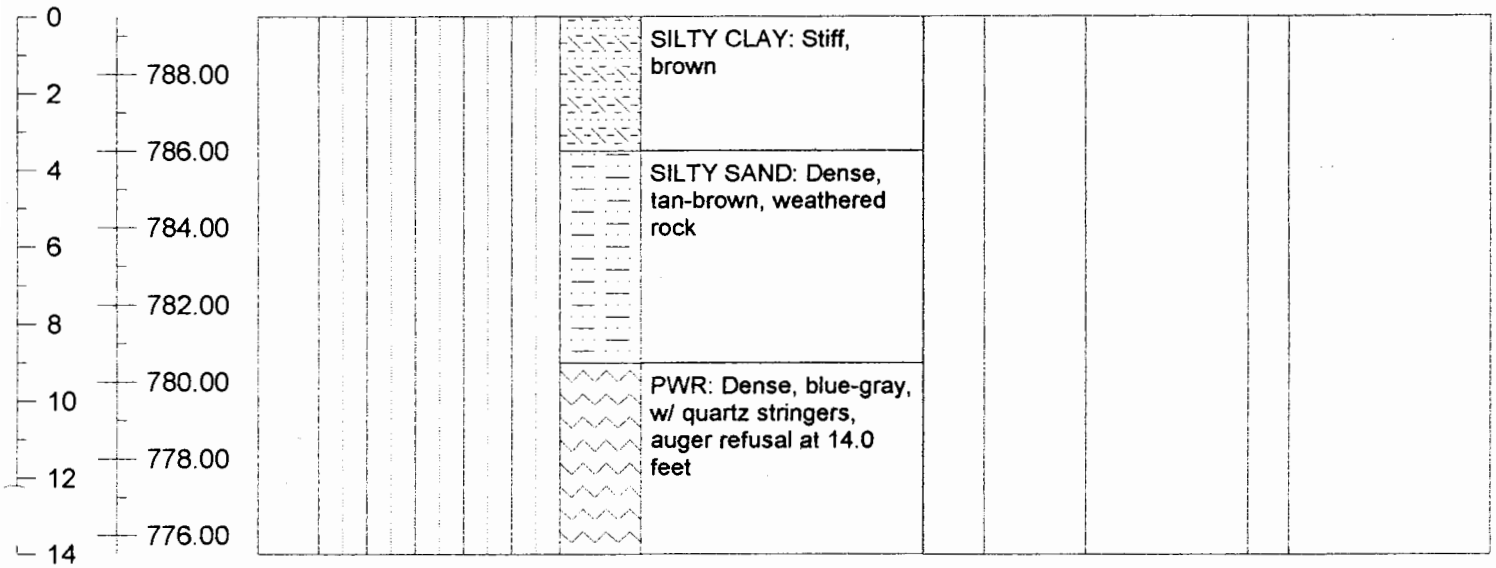
Engineering and Geology

Boring No. B-26

Client and Project	**A-1 Sandrock CDLF (Guilford County)**			Collar Elevation	**789.50**
Equipment	**Dietrich D50 ATV**	Drilling Method	**HSA**	Water Level, TOB	**Dry**
Date Started	**5/22/02**	Date Ended	**5/22/02**	Water Level, 24 Hr.	**Dry**
Drilling Firm	**Bore & Core (Seiler)**	Logged by	**David Garrett**	Stabilized Level	**Dry**
Comments	**Cleared access road through woods**	Total Depth	**15.0**	Date of Observation	**5/28/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



Chao, Ming-tai

From: David Garrett, P.G., P.E. [davidgarrettpgpe@mindspring.com]
Sent: Wednesday, January 26, 2011 1:39 PM
To: Chao, Ming-tai
Cc: Ronnie Petty; Mike McFeeley
Subject: Re: Phase 1, Cell B CQA Report, A-1 Sandrock C&DLF, Permit # 41-17
Attachments: Subgrade Inspection Follow Up.pdf

Please see the attached documentation of subgrade conditions in Phase 1B, per our telephone conversation. Thank you. David

-----Original Message-----
>From: "Chao, Ming-tai" <ming.chao@ncdenr.gov>
>Sent: Jan 18, 2011 4:15 PM
>To: "David Garrett, P.G., P.E." <davidgarrettpgpe@mindspring.com>
>Cc: "Mussler, Ed" <ed.mussler@ncdenr.gov>
>Subject: Phase 1, Cell B CQA Report, A-1 Sandrock C&DLF, Permit # 41-17
>
>David:
>After completing a review of the 1/14/2011 responses to my comment dated 11/30/2010, I have one concern of the response to the Comment No. 3 iii regarding the CQA testing results on the in-situ soils making up the upper two feet of the bottom (subgrade) of Phase 1, Cell B. The Table 4A of the approved CQA Plan (on Page 33) specified two approaches to identify if the upper two feet soil consisting the soil types - SC, SM, ML, CL, MH or CH met the requirements stated in Rule 15A NCAC 13B.0540(2)(b).
>The Record Test from Table 4A is summarized below:
>Property
>
>Test Method
>
>Min. Test Frequency
>
>Subgrade Consistency within upper 24 inches
>
>Visual
>
>4 tests per acre
>
>Subgrade Consistency within upper 24 inches
>
>ASTM D 422, ASTM D 4318
>
>I test per acre
>
>
>The Note 4 of the Table 4A indicated that all testing locations, testing types, and test results shall be recorded on a site map and made part of the construction record. Please provide the construction record to demonstrate that the Rule required soil types exist in the top of two feet of the of the bottom of Phase 1, Cell B. Thanks.
>Ming-Tai Chao, P.E.
>Environmental Engineer II
>Permitting Branch, Solid Waste Section
>Division of Waste Management
>1646 Mail Service Center

>Raleigh, NC 27699-1646
>401 Oberlin Road, Suite 150, NC 27605
>Tel: 919.508.8507, Fax 919.733.4810
>ming.chao@ncdenr.gov<mailto:ming.chao@ncdenr.gov>
>http://portal.ncdenr.org/web/wm/sw
>
>E-mail correspondence to and from this address may be subject to the
>North Carolina Public Records Law and may be disclosed to third parties.
>
>
>
>
>

David Garrett, PG, PE
Engineering and Geology
5105 Harbour Towne Drive
Raleigh, NC 27604
Tel. 919-418-4375 Direct

David Garrett & Associates
Engineering and Geology

January 14, 2011

Permit No.	Date	Document ID No.
41-17	**January 14, 2011**	**12725**

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

RECEIVED
January 14, 2011 via an e-mail
Solid Waste Section
Raleigh Central Office

RE: Response to Review Comments
A-1 Sandrock, Inc. – Phase 1 Cell B
Permit to Operate Application
C&D Landfill and Processing Facility
Guilford County, NC (Permit #41-17)

Dear Mr. Chao:

On behalf of A-1 Sandrock, I am pleased to present the following response to your comments of November 30, 2010, made pertaining to my Application for a Permit to Operate for Phase 1B. The responses are made in order of receipt. Your comments are presented in italics print.

> *1. According to the drawings in the approved PTC applications, there are five soil borings located in the Cell B – B12, B-22, B-23, B-26, and B-28. In compliance with Permit Condition No. 10 in Attachment 2 of PTC for the Phase 1 issued on June 1, 2006, the borings shall be properly abandoned. Please provide the documentations and records to demonstrate these borings are properly abandoned.*

Piezometer abandonment records for B-21 and B-22 are provided in Attachment 1, along with a map of the original piezometer locations and abandonment completed thus far. Please note that three test boring locations in Phase 1B (identified as "Cell 2" in the Figure), did not have piezometers. A slight difference in depths between the abandonment records and the original data reflects minor surface grade changes due to the mining operations; for instance, grades near B-21 were lowered by a few feet, leaving the piezometer on an isolated soil pedestal, and the difference was not included in the abandonment footage. All piezometers in the requested disposal areas have been properly abandoned. The other borings were excavated.

I have recommended to A-1 that the remaining piezometers within the approved landfill footprint (a total of 10) be abandoned prior to further grading work.

5105 Harbour Towne Drive • Raleigh • North Carolina • 27604
919-418-4375 (Mobile) • 919-231-1818 (Office/fax) • E-mail: david@davidgarrettpe.com

2. The final base grades of the Cell B – 785-ft amsl to 765-ft amsl as shown on Drawing E1A is changed from the original proposed ones – 790-ft amsl to 758-ft amsl as shown in "Phase 1 –Stage 2" on Drawing E1/Sheet No. 2 in the approved Facility and Operations Plan Updated dated February 2009. This variation was described in the Attachment 2 - the Geologist's Subgrade Report. Will this variation of final base grade result in the change of total gross capacity of the Phase 1 and the C&DLF as described in the Sections 1.3.2 & 8.2.2 in the updated PTC applications (Attachment 1)? Please clarify.

A comparison of the "as-built" grades and original design grades is shown in Attachment 2. Based on the calculations, the as-built grades are an average of 2 feet higher than design grades over a 1.9 acre area (excluding the sediment trap). This equates to a volume loss of 6,228 cubic yards, which shall be subtracted from the projected volumes for Phase 1B, all of Phase 1, and the entire facility, respectively. Please note that this volume loss represents approximately 1.3% of Phase 1 and less than 0.3% of the total permitted capacity of the facility. The table presented on Page 4 of the Updated Facility Plan (Rev. 0.2, 11/15/2010) has been revised accordingly, and Sections 1.3.2. and 1.3.4 (Page 3) and 8.2.2 (Page 75) are revised (see Attachment 2).

3. (Section 4 – Construction Quality Assurance) Please address the following concerns:

i. The Tables 7A, 7B, & 7C are likely typos because the QA/QC testing requirements are stated in Tables 4A, 4B, and 4C. Please conduct a global search in this Section 4 and make necessary correction.

References to table numbers have been corrected on Pages 21, 23, and 25 (see Attachment 3).

ii. In Table 4A, the referenced testing method – ASTM D4138 is incorrect. The correct method is D4318.

The reference to the ASTM standard on Table 4 has been corrected on Page 33 (Attachment 3).

iii. Please provide CQA testing results as specified in Table 4A. The test locations in Cell B need to be documented on the as-built drawings in accordance with Sections 4.4 and 4.5.

The earthwork specifications presented on Table 4A pertain to structural fills, e.g., large embankments and fill sections within the subgrade areas. Phase 1B (and most of Phase 1) is within a cut section, thus the rigorous testing required for embankment stability is not needed. There was some fill placed over a rocky area encountered during the mining operation to provide 4 feet of separation, hence the grades are slightly higher than the design grades. I made a judgment call regarding the compaction of the fill soil by observing the movement of earthwork equipment during my subgrade inspection. In my opinion, the soils are adequately compacted to prevent excess settlement – there are no groundwater separation issues at stake – and the soil types are appropriate to meet the regulations. Proof of both issues is provided in the photographs of the test pits – notice the smearing of the sidewalls, indicating the relative density and soil type. On that basis, in my professional opinion the scheduled soil density and classification tests are not needed and should be suspended for Phase 1B.

I have recommended to A-1 that full-scale testing of the embankment between the disposal area and the sediment basin will be required for certification of Phase 1C.

> *4. (Section 8.1.2) To consistent with the approved 3 (H) to 1(V) side slopes for the final cover system, the post-settlement surface slopes described in Section 8.1.2 shall range from 5% to 33.3%, not 25%.*

The reference to the slope ratio has been corrected on Page 70 (Attachment 3).

Please contact me at your earliest convenience if you have questions or comments, or if I may be of further service. Thank you.

G. David Garrett, PG, PE
Project Consultant

cc: Ronnie Petty, III – A-1 Sandrock, Inc.

Attachment 1
Piezometer Abandonment Records

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2579

1. WELL CONTRACTOR:

DANNY SUMMERS
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD.

STATESVILLE NC 28625
City or Town State Zip Code

(704) - 872-7686
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) PZ-1 B-21

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☑ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION:

COUNTY GUILFORD QUADRANGLE NAME
NEAREST TOWN: GREENSBORO
2091 BISHOP ROAD 27406
(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE
LONGITUDE
May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable)
NAME OF FACILITY A-1 SANDROCK LANDFILL
STREET ADDRESS 2091 BISHOP ROAD
GREENSBORO NC 27406
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME A-1 SANDROCK LANDFILL
STREET ADDRESS 2091 BISHOP ROAD GREENSBORO, NC 27406

5. WELL DETAILS:

a. Total Depth: 57.0 ft. Diameter: 2.0 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	N/A ft.	in.
b. Casing Removed:	N/A ft.	in.

7. DISINFECTION: N/A
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement -- lb.
Water -- gal.

Sand Cement
Cement -- lb.
Water -- gal.

Bentonite
Bentonite lb.
Type: ☑ Slurry ☐ Pellets
Water gal.

Other
Type material PORTLAND BENTONITE SLURRY
Amount 9.5 GALLONS

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:
VIA TREMIE PIPE WITH PORTLAND BENTONITE SLURRY

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 3/23/10

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 04/05/10

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

DANNY SUMMERS
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06

WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2579

1. WELL CONTRACTOR:

DANNY SUMMERS
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD.

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID # (if applicable) PZ-2 B-22

STATE WELL PERMIT # (if applicable)

COUNTY WELL PERMIT # (if applicable)

DWQ or OTHER PERMIT # (if applicable)

WELL USE (Check applicable use): ☑ Monitoring ☐ Residential
☐ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural
☐ Recovery ☐ Injection ☐ Irrigation
☐ Other (list use)

3. WELL LOCATION:

COUNTY GUILFORD QUADRANGLE NAME

NEAREST TOWN: GREENSBORO

2091 BISHOP ROAD 27406
(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(Check appropriate setting)

LATITUDE
LONGITUDE
May be in degrees, minutes, seconds, or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map
(Location of well must be shown on a USGS topo map and attached to this form if not using GPS.)

4a. FACILITY - The name of the business where the well is located. Complete 4a and 4b. (If a residential well, skip 4a; complete 4b, well owner information only.)

FACILITY ID #(if applicable)
NAME OF FACILITY A-1 SANDROCK LANDFILL
STREET ADDRESS 2091 BISHOP ROAD
GREENSBORO NC 27406
City or Town State Zip Code

4b. CONTACT PERSON/WELL OWNER:

NAME A-1 SANDROCK LANDFILL
STREET ADDRESS 2091 BISHOP ROAD GREENSBORO, NC 27406

5. WELL DETAILS:

a. Total Depth: 35.0 ft. Diameter: 2.0 in.
b. Water Level (Below Measuring Point): ft.
Measuring point is ft. above land surface.

6. CASING:

	Length	Diameter
a. Casing Depth (if known):	N/A ft.	in.
b. Casing Removed:	N/A ft.	in.

7. DISINFECTION: N/A
(Amount of 65%-75% calcium hypochlorite used)

8. SEALING MATERIAL:

Neat Cement
Cement — lb.
Water — gal.

Sand Cement
Cement — lb.
Water — gal.

Bentonite
Bentonite lb.
Type: ☑ Slurry ☐ Pellets
Water gal.

Other
Type material PORTLAND BENTONITE SLURRY
Amount 5.75 GALLONS

9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:

VIA TREMIE PIPE WITH PORTLAND BENTONITE SLURRY

10. WELL DIAGRAM: Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used.

11. DATE WELL ABANDONED 3/23/10

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

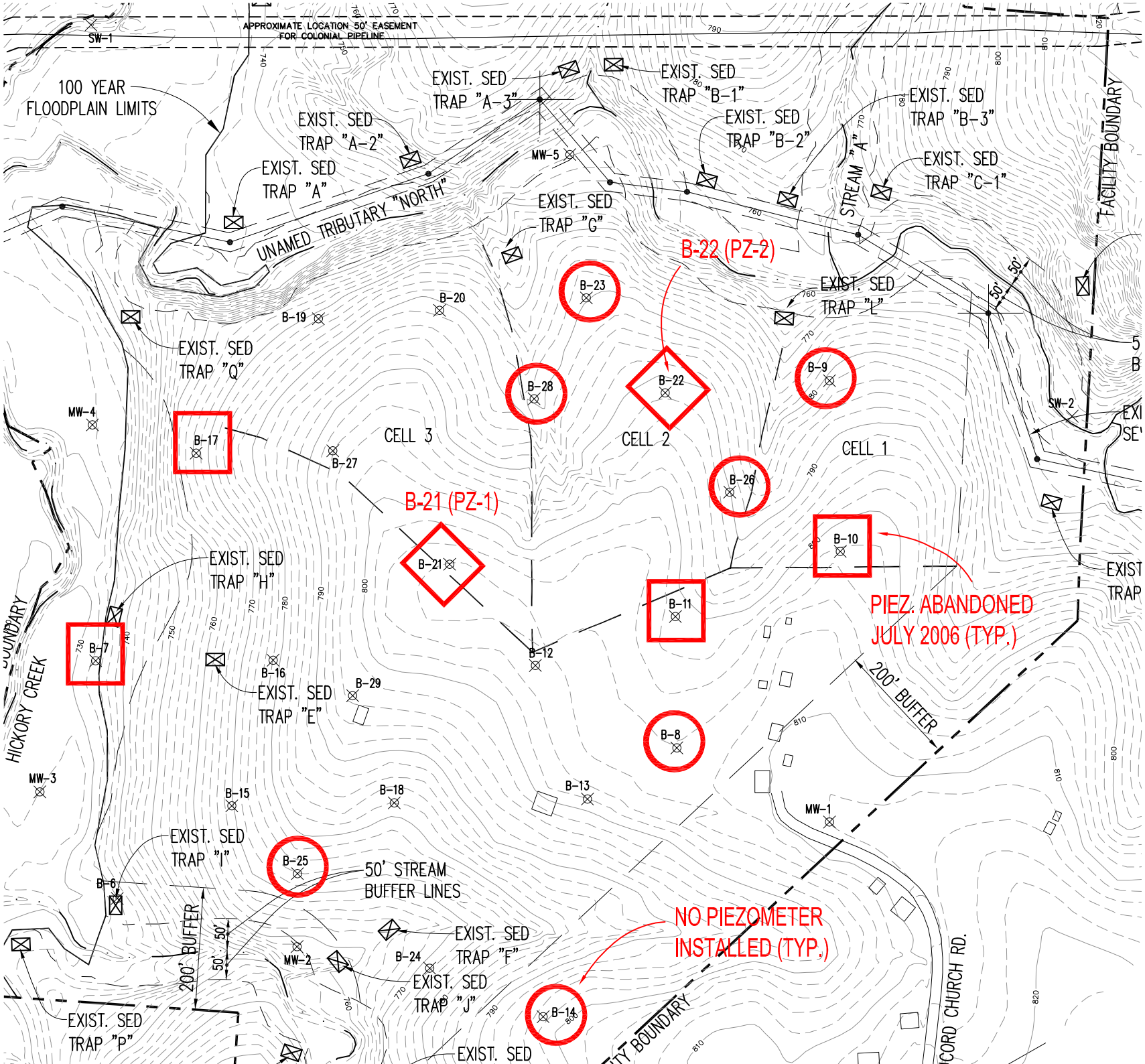
SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE: 04/05/10

SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL — DATE
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

DANNY SUMMERS
PRINTED NAME OF PERSON ABANDONING THE WELL

Submit a copy to the owner and the original to the Division of Water Quality within 30 days.
Attn: Information Management, 1617 Mail Service Center – Raleigh, NC 27699-1617, Phone No. (919) 733-7015 ext 568.

Form GW-30
Rev. 5/06


APPROXIMATE LOCATION 50' EASEMENT FOR COLONIAL PIPELINE
SW-1
100 YEAR FLOODPLAIN LIMITS
EXIST. SED TRAP "A-3"
EXIST. SED TRAP "B-1"
EXIST. SED TRAP "A-2"
EXIST. SED TRAP "B-2"
EXIST. SED TRAP "B-3"
EXIST. SED TRAP "A"
EXIST. SED TRAP "C-1"
MW-5
UNAMED TRIBUTARY "NORTH"
STREAM "A"
FACILITY BOUNDARY
EXIST. SED TRAP "G"
B-22 (PZ-2)
B-23
B-20
B-19
EXIST. SED TRAP "L"
EXIST. SED TRAP "Q"
B-28
B-22
B-9
MW-4
B-17
CELL 3
CELL 2
CELL 1
B-27
B-26
B-21 (PZ-1)
B-21
B-10
EXIST. SED TRAP "H"
B-11
PIEZ. ABANDONED JULY 2006 (TYP.)
B-7
B-12
B-16
EXIST. SED TRAP "E"
B-29
200' BUFFER
B-8
MW-3
B-15
B-18
B-13
MW-1
EXIST. SED TRAP "I"
B-25
50' STREAM BUFFER LINES
B-6
200' BUFFER
50'
50'
EXIST. SED TRAP "F"
MW-2
B-24
EXIST. SED TRAP "J"
NO PIEZOMETER INSTALLED (TYP.)
EXIST. SED TRAP "P"
B-14
EXIST. SED
HICKORY CREEK
CHURCH RD.

Attachment 2
Volumetric Capacity Corrections

1.3.2 Landfill Capacity

A volumetric analysis for the CDLF performed using an AutoCAD Digital Terrain Model (DTM), as presented in the original permitting documents, is discussed below.

> Based on the grading plan and final waste contours (**Drawing E5**), the landfill will have a total volumetric capacity of 2,233,772 cubic yards. Subtracting the final cover (106,000 cy), 10% of the remaining airspace will be lost due to periodic cover (consuming approximately 212,777 c.y.), the net disposal capacity is 1,914,995 c.y., or approximately 1,148,997 tons in place (at 0.5 ton/cy, including an estimated 20% compaction factor). The landfill is being planned to receive an average of 225 tpd, or 450 c.y./day. It is assumed that the landfill will operate 5.5 days per week, with 280 working days per year. These assumptions yield an estimated annual airspace consumption of 100,800 cubic yards, plus 10% for periodic cover, resulting in a total annual airspace consumption equaling 110,880 c.y. ***The planned operational life is approximately 20 years.***

A tabulation of the disposal capacity and life expectancy by phase follows this section.

1.3.3 Special Engineering Features

No seeps, springs, soft ground or other deleterious conditions were identified in the site characterization studies. As such, no special engineering features are required.

1.3.4 Soil Volume Analysis

The following soil data was developed using the airspace calculations (discussed above) and the permitted grading plan (relative to regulatory vertical buffer requirements). The excavated volume may understate the allowable excavation if "beneficial fill" as defined by the Solid Waste Rules is used to restore site grades to design values. These data were presented in the original (2002) Facility Report, adjusted per the recent recalculation of volumes for the current operational sequence and current cover requirements.

Total Proposed Airspace	2,233,772 cy
Final Cover Required	
(3' x 21.89 ac x 1613 cy/ac/ft)	106,000 cy
Intermediate Cover (10% Volume)	212,777 cy
Structural Fill for Construction	16,000 cy
Total Required Soil	334,777 cy
Excavated Volume	*753,772 cy*
Net Soil Balance	**418,995 cy surplus**

PHASE 1 CONDITIONS	**A-1 Sandrock, Inc., CDLF Phase 1 (Permit #41-17)**		
Solid Waste Units Present	C&D Recycling Facility, CDLF		
Other Activities/Infrastructure	Scales/Office, Permitted Mining, LCID Processing		
CDLF Unit Footprint Acreage	21.89 acres		
CDLF Phases/Sub-Phases [1]	1**A**	**1B**	**1C**
New Ground Footprint Acreage [1]	2.54 ac	3.18 ac	2.46 ac
Interim Capacities (Sub-Phases) [2]	62,370 cy	186,242 cy	223,644 cy
Interim Elevations (Sub-Phases)	EL. 810	EL. 830	EL. 840
Volumetric Capacity (Phase 1) [2]	472,256 cy		
Final Elevations (Phase 1) [2]	EL. 840		
Maximum Waste Thickness [2]	60 feet [5]		
Permitted Side Slope Ratios	3H:1V		
Permitted Footprint Acreage [3]	8.18 ac		
Facility Boundary Acreage	75 acres		
Total Permitted Capacity [2, 3]	472,256 cy		
Operational Life Expectancy	4.74 years		

FUTURE CONDITIONS	**Phases 2 through 4 are contiguous with Phase 1**		
Solid Waste Units Present [4]	Unchanged		
Other Activities/Infrastructure [4]	Unchanged		
New CDLF Unit Footprint Acreage [4]	21.9 acres		
New CDLF Phases/Sub-Phases [1]	**2**	**3**	**4**
New Ground Footprint Acreage [1]	7.82 ac	5.89 ac	11.06 ac [5]
Interim Capacities (Sub-Phases) [2, 6]	608,193 cy	647,787 cy	505,536 cy
Interim Elevations (Sub-Phases)	EL. 846	EL. 854	EL. 904
New CDLF Unit Capacity [2, 6]	1,761,516 cy		
Final Elevations (Entire Unit) [2]	EL. 904		
Maximum Waste Thickness [2]	110 feet		
Permitted Side Slope Ratios [4]	3H:1V		
Total CDLF Footprint Acreage [4]	21.89 acres		
Facility Boundary Acreage [4]	75 acres		
Total Permitted Capacity [6]	2,233,772 cy		
Operational Life Expectancy	20.20 years		

1 Corresponding to 5-year Operating Capacity
2 Includes Final Cap System and Operational Cover – Phase 1C volume was adjusted to match the permit issue
3 Covered by current Permit to Construct application
4 Subject to Division approval of future applications
5 Vertical Expansion – not actual ground disturbance (does not add to total footprint area)
6 Consistent with the February 2004 Permit to Construct – Phase 4 volume was adjusted to match permit issue

Intermediate cover shall be used on areas that have achieved final elevations until the final cover is installed. It is fully anticipated that portions of Phase 1 (i.e., Phase 1A) will be closed prior to the opening of Phase 2. An annual adjustment is required by the Division for the open area (and the bond requirement). Based on the volumetric analysis for Phase 1 (**Appendix 1**), the volume of Phase 1 is 472,256 cubic yards (**Section 1.3**).

8.2.3 Closure Schedule

Refer to the requirements outlined in **Section 8.1.5** (above).

8.2.4 Closure Cost Estimate

The foregoing cost estimate is considered suitable for the **Financial Assurance** requirements (see **Section 9.0**).

TABLE 8A
ESTIMATED FINAL CLOSURE COSTS FOR PHASE 1 (2010 dollars) [1]

VSL (topsoil)[2] – 8.18 ac	19,795 c.y.	@	$4 / cubic yard	$ 79,182
CSB (barrier)[2] – 8.18 ac	22,764 c.y.	@	$10 / cubic yard	$227,640
Establish Vegetation	8.18 acres	@	$1,800 per acre	$ 14,724
Storm Water Piping [3]	200 LF	@	$35.00 / LF	$ 7,000
Erosion Control Stone [3]	10 tons	@	$40.00 / ton	$ 400
Cap Gas Vents (3/acre)	24	@	$100 ea	$ 2,400
Testing and Surveying [4]	Estimated 20 percent of above			$ 65,781
Contingency	Estimated 15 percent of above			$ 49,343
	Total Construction Cost (if contracted out)			**$ 446,470**

Notes:

1 Intended to represent likely third-party construction costs (hired contractor, not the Owner/Operator), based on knowledge of local construction costs for similar projects – these estimates provided to meet NC DENR Division of Waste Management financial assurance requirements; actual costs may be lower for construction by the Owner/Operator; final closure work will be performed incrementally, spreading out the costs over the life of the project.

2 Includes soil work for regulatory requirements of the 2006 C&D Rules, i.e., a minimum of 18 inches of compacted soil barrier (max. permeability of 1×10^{-5} cm/sec) and 18 inches of topsoil (total soil thickness is 36 inches). For the compacted soil barrier, use a shrinkage factor of 15%; costs include surface preparation, soil procurement and transport costs, soil placement and compaction, machine/equipment costs, fuel costs

3 Conservative estimate based on similar project history; includes materials and installation

4 Includes Construction document and bidding, construction administrative fee, CQA field monitoring and lab testing, CQA reporting and certification, final survey for as-built drawings, recordation/notation fee

Attachment 3
CQA Reference Corrections

4.1.4 Modifications and Amendment

This document was prepared by the Engineer to communicate the basic intentions and expectations regarding the quality of materials and workmanship. Certain articles in this document may be revised with input from all parties, if so warranted based on project specific conditions. No modifications will be made without the Division's approval.

4.1.5 Miscellaneous

4.1.5.1 Units – In this CQA Plan, and through the plans and specifications for this project, all properties and dimensions are expressed in U.S. units.

4.1.5.2 References – This CQA Plan includes references to the most recent version of the test procedures of the American Society of Testing and Materials (ASTM). **Table 4D** at the end of this text contains a list of these procedures.

4.2 Inspection, Sampling and Testing

The requirements of the General Earthwork (perimeter embankments and subgrade) and Final Cover Systems (soil barrier, vegetative cover, and storm water management devices) differ with respect to continuous or intermittent testing and oversight. The following two sections are devoted to the specific requirements of each work task.

4.2.1 General Earthwork

This section outlines the CQA program for structural fill associated with perimeter embankments, including sedimentation basins, and general grading of the subgrade. Issues to be addressed include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.1.1 Compaction Criteria – All material to be used as compacted embankment shall be compacted to a minimum of **95% of the Standard Proctor Maximum Dry Density (ASTM D-698)**, or as approved by the Engineer or designated QC/QA personnel. Specifically, field observation of the response of soils beneath equipment and the use of a probe rod and/or a penetrometer are other means of determining the adequacy of compaction. Skilled soil technicians working under the supervision of an engineer may make this determination, subject to concurrence by the engineer. Approval is based on visual evaluation for consistency with project specification and objectives. Such material evaluations may be performed either during material handling, i.e., delivery to or upon

intervals, or there may be an exploratory sampling program at some time near the completion of the subgrade with confirmatory testing at specified intervals. The frequency of visual inspection and testing shall conform to **Table 4A**.

4.2.2 General Earthwork Construction

4.2.2.1 Construction Monitoring – The following criteria apply:

A. Earthwork shall be performed as described in the project specifications. The Construction Superintendent has the responsibility of assuring that only select materials are used in the construction, discussed above.

B. Only materials previously approved by the Engineer or his designee shall be used in construction of the compacted embankment. Unsuitable material will be removed and replaced followed by re-evaluation to the satisfaction of the Engineer and retesting, as may be required.

C. All required field density and moisture content tests shall be completed before the overlying lift of soil is placed – as applicable. The surface preparation (e.g. wetting, drying, scarification, compaction etc.) shall be completed before the Engineer (or his designate) will allow placement of subsequent lifts.

D. The CQA Testing Firm and/or the Engineer shall monitor protection of the earthwork, i.e., from erosion or desiccation during and after construction.

4.2.2.2 Control Tests – The control tests, as shown on **Table 4A**, will be performed by the CQA Testing Firm prior to placement of additional compacted embankment.

4.2.2.3 Record Tests – The record tests, as shown on **Table 4A**, will be performed by the CQA Testing Firm during placement of compacted embankment. The CQA Testing Firm may propose and the Engineer may approve an alternative testing frequency. Alternatively, the Engineer may amend the testing frequency, without further approval from the regulatory agency, based on consistent and satisfactory field performance of the materials and the construction techniques.

4.2.2.4 Record Test Failure – Failed tests shall be noted in the construction report, followed by documentation of mitigation. Soils with failing tests shall be evaluated by the Engineer (or his designee), and the soils shall either be recompacted or replaced, based on the Engineer's judgment. Recompaction of the failed area shall be performed and retested until the area meets or exceeds requirements outlined in the specifications.

A. High Density Polyethylene (HDPE) Pipe

(1) Receipt of Contractor's submittals on HDPE pipe.

(2) Review manufacturer's submittals for conformity with project specs.

B. Corrugated Polyethylene (CPE) Pipe

(1) Receipt of Contractor's submittals on CPE pipe.

(2) Review manufacturer's submittals for conformity with project specs.

C. Aggregates (Verify for each type of aggregate)

(1) Receipt of Contractor's submittals on aggregates.

(2) Review manufacturer's submittals for conformity with project specs.

(3) Verify aggregates in stockpiles or borrow sources conform to project specifications. Certifications from a quarry will be sufficient.

(4) Perform material evaluations in accordance with **Table 4B**.

D. Vegetative Soil Layer and Drainage Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Review contractor's submittals on seed specifications.

(3) Perform material evaluations in accordance with **Table 4C**.

E. Compacted Barrier Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Conduct material control tests in accordance with **Table 4C**.

F. Erosion and Sedimentation Control

(1) Review Contractor's submittals on erosion and sedimentation control items (including rolled erosion control products and silt fence).

(2) Review of submittals for erosion and sedimentation control items for conformity to the project specifications.

(3) Perform visual examination of materials for signs of age or deterioration.

TABLE 4A
CQA TESTING SCHEDULE FOR GENERAL EARTHWORK

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
CONTROL TESTS:		
Consistency Evaluation	ASTM D 2488 (visual)[1]	Each Material
RECORD TESTS:		
Lift Thickness	Direct Measure	Each compacted lift
In-Place Density	ASTM D 2922[2]	20,000 ft^2 per lift
Moisture Content	ASTM D 3017[3]	20,000 ft^2 per lift
Subgrade Consistency within the upper 24 inches[4]	Visual	4 tests per acre
Subgrade Consistency within the upper 24 inches[4]	ASTM D 422 ASTM D 4318	1 test per acre

Notes:

1. To be performed by Contractor Superintendent, Engineer, or CQA Testing Firm. Direct measure shall be facilitated with hand auger borings.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device. ***Minimum required soil density is 95 percent of the standard proctor maximum dry density, which is dependent on the moisture-density characteristic developed for the specific soil during initial construction; lower density or incorrect moisture results in a failed test and the lift must reworked and retested.***

2a. If "beneficial fill" materials are used to construct embankments or structural fill, the Contractor shall spread large particles evenly and fill all voids with finer soil – this is referred to as "choking off" the voids; density testing shall be suspended at the discretion of the Engineer, but judgment testing shall be applied and the use of these materials and evaluation thereof shall be documented as would any other soil placement activity

3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every 10 nuclear density-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Subgrade evaluation shall be conducted via continuous inspection with the indicated testing frequency, in order to evaluate the full 24 inch depth, of an intrusive investigation (e.g., hand auger borings) may be performed after portions of the subgrade are completed with the indicated testing frequency – all testing locations, testing types and test results shall be recorded on a site map and made part of the construction record

8.1 Summary of Regulatory Requirements

8.1.1 Final Cap

The final cap design for all phases of the CDLF shall conform to the minimum requirements of the Solid Waste Rules, i.e., the compacted soil barrier layer shall exhibit a thickness of 18 inches and a field permeability of not more than 1.0×10^{-5} cm/sec. The overlying vegetative support layer shall be 18 inches thick. **Drawings E2 – E5** show final contours and **Drawings EC1 – EC3** show final cover cross-section and details.

8.1.2 Construction Requirements

Final cap installation shall conform to the approved plans (see accompanying plan set), inclusive of the approved Sedimentation and Erosion Control Plan. The CQA plan must be followed (see **Section 4.0**) and all CQA documentation must be submitted to the Division. Post-settlement surface slopes must not be flatter than 5% (on the upper cap) and not steeper than 33% (on the side slopes). Per the **2006 C&D Rules**, a gas venting system is required for the cap. A passive venting system will be specified, which will consist of a perforated pipe in crushed stone-filled trench – installed just below the final cap soil barrier layer – with a ***tentative minimum vent spacing of three vents per acre.*** **Drawing EC2** shows the gas vent system details.

8.1.3 Alternative Cap Design

The **2006 C&D Rules** make a provision for an alternative cap design, to be used in the event that the permeability requirements for the compacted soil barrier layer cannot be met. Past experience indicates that on-site soils may not meet the required field permeability of not more than 1.0×10^{-5} cm/sec, as supported by the laboratory data for the soils discussed in **Section 4.0**. Tentative final closure plans have assumed that on-site soils will be used for the compacted barrier layer – alternative cap designs may be researched and submitted for Division approval at a future time.

8.1.4 Division Notifications

The Operator shall notify the Division prior to beginning closure of any final closure activities. The Operator shall place documentation in the Operating Record pertaining to the closure, including the CQA requirements and location and date of cover placement.

Permit No.	Date	Document ID No.
41-17	**January 14, 2011**	**12724**

ISSUED
November 30, 2010 via an e-mail
Solid Waste Section
Raleigh Central Office

Chao, Ming-tai

From: Chao, Ming-tai
Sent: Tuesday, November 30, 2010 3:39 PM
To: 'David Garrett'
Cc: 'Ronnie Petty '; Mussler, Ed
Subject: A-1 Sandrock C&DLF, permit # 41-17

Dear Dave:

On November 18, 2010, I received an e-mail containing the electronic submittals, a cover letter and several attachments, which contains:

- The updated Operations Plan (Attachment 1) incorporates the conclusions and suggested changes of the operating requirements and procedures associated with the C&D and LCID Sorting and Recycling Facility which are based on the December 21 2009 Six-Month Demonstration Report in compliance with the Permit Condition 40 in the PTO dated April 17, 2009. The updated Operations Plan also reflected the suggestions made in the 2010 DWM Facility Compliance Audit Reports.
- The Geologist's Subgrade Report (Attachment 2) and As-Built Survey of Phase 1, Cell B (Attachment 3) – Drawing E1A, which are components of the CQA Certification Report for the Phase 1, Cell B.
- The Updated Facility Plan Map to correct the discrepancy of the Phase 1 footprints (or total acreages) between the text and drawing in the PTC applications. The updated Drawing E1B shows the Phase 1 footprints of 8.18 acres.

I have completed a review and have several comments on the above-referenced submittals.

1. According to the drawings in the approved PTC applications, there are five soil borings located in the Cell B – B12, B-22, B-23, B-26, and B-28. In compliance with Permit Condition No. 10 in Attachment 2 of PTC for the Phase 1 issued on June 1, 2006, the borings shall be properly abandoned. Please provide the documentations and records to demonstrate these borings are properly abandoned.

2. The final base grades of the Cell B – 785-ft amsl to 765-ft amsl as shown on Drawing E1A is changed from the original proposed ones – 790-ft amsl to 758-ft amsl as shown in "Phase 1 –Stage 2" on Drawing E1/Sheet No. 2 in the approved Facility and Operations Plan Updated dated February 2009. This variation was described in the Attachment 2 - the Geologist's Subgrade Report. Will this variation of final base grade result in the change of total gross capacity of the Phase 1 and the C&DLF as described in the Sections 1.3.2 & 8.2.2 in the updated PTC applications (Attachment 1)? Please clarify.

3. (Section 4 – Construction Quality Assurance) Please address the following concerns:
   i. The Tables 7A, 7B, & 7C are likely typos because the QA/QC testing requirements are stated in Tables 4A, 4B, and 4C. Please conduct a global search in this Section 4 and make necessary correction.
   ii. In Table 4A, the referenced testing method – ASTM D4138 is incorrect. The correct method is D4318.
   iii. Please provide CQA testing results as specified in Table 4A. The test locations in Cell B need to be documented on the as-built drawings in accordance with Sections 4.4 and 4.5.

4. (Section 8.1.2) To consistent with the approved 3 (H) to 1(V) side slopes for the final cover system, the post-settlement surface slopes described in Section 8.1.2 shall range from 5% to 33.3%, not 25%.

Please respond the above-mentioned comments and submit a final copy (one hard copy and an electronic copy) of the permit modification document (including Phase 1, Cell B CQA certification report and related drawings) to my attention. You also need sign and seal the Sections 9.6 and 11 of the final permit application as well.

Additionally, A-1 Sandrock, Inc. must pay for the permit modification fee of $1,500 dollars for reviewing the Phase 1, Cell B CQA certification, and the Solid Waste Section has sent the invoice to A-1 Sandrock, Inc. on 11/22/2010.

Upon approval the CQA report for Cell B and updated permit applications, the PTC for Cells B& C and the PTO for Cells A & B [including approval of the processing facility (lifting and removing the interim status)] may be issued pending approval from Ed.

Please call me if you have any questions of the comments and permitting processes. Thanks.

Best regards,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646
401 Oberlin Road, Suite 150, NC 27605
Tel: 919.508.8507, Fax 919.733.4810
ming.chao@ncdenr.gov
http://portal.ncdenr.org/web/wm/sw

David Garrett & Associates

Engineering and Geology

Permit No.	Date	Document ID No.
41-17	**November 18, 2010**	**12259**

November 17, 2010

Mr. Ed Mussler, PE
NC DENR Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

RECEIVED
November 18, 2010 via an e-mail message
Solid Waste Section
Raleigh Central Office

RE: Application for Permit to Construct and Operate
A-1 Sandrock, Inc. – Phase 1 Cell B
C&D Landfill and Processing Facility
Guilford County, NC (Permit #41-17)

Dear Mr. Mussler:

On behalf of A-1 Sandrock, I am pleased to present this application for authorization to expand disposal operations into the second cell (Cell B) within Phase 1 of the referenced landfill. This application is made pursuant Attachment 2 of the **Permit to Operate**, dated April 17, 2009, which states:

> "Modification to the Permit to Construct, issued June 1, 2006, will be required prior to construction of Phase 1, Cell B and Cell C. The application will be subject to the statutes and rules in effect on that date and will be subject to a permitting fee. "

At present, base grades for a substantial portion of Cell B are within a foot of the permitted base grades. This work was completed over the last several months under the auspices of a NC DENR mining permit (#41-22), during which time two Solid Waste compliance audits were conducted on March 17, 2010 and July 14, 2010. No violations were noted, but some requirements pertaining to the **Operations Plan** did warrant a minor modification – refer to the following narrative text and **Attachment 1**.

This document serves as a formal request for authorization to construct Cells B and C as disposal units and to conduct disposal operations within Phase 1 Cell B. Please note that a discrepancy was found between the original PTC drawings (approved June 1, 2006) and the text of the PTC and PTO (issued April 17, 2009), as described in the narrative. This document includes a geologist's statement pertaining to vertical separation and soil types present within the upper 24 inches of the subgrade (**Attachment 2**), as-built survey of Cell B (**Attachment 3**), and an updated **Facility Plan** map (**Attachment 4**).

Please contact me if you have questions or if I can provide any additional data.

Sincerely,

G. David Garrett, P.G., P.E.
Consulting Engineer

cc: Ronnie Petty – A-1 Sandrock, Inc.
Mike McFeeley – A-1 Sandrock, Inc.

5105 Harbour Towne Drive • Raleigh • North Carolina • 27604
919-418-4375 (Mobile) • 919-231-1818 (Office fax) • E-mail: david@davidgarrettpe.com

1.0 Overview of Operations

C&D recycling and disposal activities commenced at A-1 Sandrock, Inc. in April 2009. The facility is unique in two respects: 1) the C&D landfill serves as reclamation for a permitted mining operation – with mining operations set to meet Solid Waste requirements for base grade soil type and vertical separation, and 2) recycling activities are conducted on the working face under a treatment and processing (T&P) permit provision that provides a high percentage of material recovery of wood waste for making mulch and boiler fuel, aggregates, cardboard and both ferrous and non-ferrous metals. The recovered materials are stored in roll-off containers and/or stockpiles per the permit requirements. No substantial changes to the T&P operations or the facility plan are warranted at this time.

A **Six-Month Demonstration Report** was submitted in December 2009 that detailed the recycling operations and suggested minor changes to the Operations Plan. These changes were noted in the regulatory compliance reports and have since been incorporated into a revised Operations Plan. It should be noted that the regulatory compliance reports noted no violations, and the recycling operations conducted on the working face is considered successful. At the time of the Six-Month Report, the recycling percentages were approaching 60% of the total intake, with 35% of the waste intake being processed into usable materials and distributed off-site.

The Permit to Construct issued on June 1, 2006 for Phase 1 included 8.18 acres, divided into Cells A, B, and C, of which only Cell A (covering 2.54 acres) was authorized for operations per the April 17, 2009 PTO. Mining activities commenced in Cells B and C in late 2009, and some waste has inadvertently been placed in Cell B. Now that the mining operation has advanced sufficiently to provide more space between the mining and landfilling activities, future marking of the waste boundary – now required by the Solid Waste Section – in areas previously mined and ready for reclamation will avoid the future placement of waste into unauthorized cells. A-1 Sandrock believes that mining operations can be kept at least one cell ahead of the disposal operations, and the limits of the authorized waste disposal areas will be clearly marked.

A discrepancy exists between the text of the Permit to Construct and the drawings that accompany the PTC application, whereas the permit states that Phase 1 consists of 8.19 acres while the construction drawings (approved June 1, 2006) show Phase 1 covering approximately 10.45 acres. **Drawing E1B** shows a portion of the original limits of Phase 1, as shown on the approved PTC drawings, and a revised footprint for Phase 1 that covers 8.18 acres. A future Permit to Construct application will be prepared for Phase 2, which will take up the discrepancy with footprint acreage. Mining activities are progressing into Phase 2, following the base grading plan and required sedimentation and erosion control measures.

This application requests PTC authorization for the remainder of Phase 1 (Cells B and C) to the 8.18 acre limits shown on **Drawing E1B**, consistent with the 8.18 acres of disposal footprint assumed in the permit documents. This application also seeks authorization for disposal activities within Cell A (continuation) and the completed portion of Cell B, with a combined footprint of 6.16 acres. This action involves no changes from the original permitting with respect to the total volume of waste. A future PTO application will be submitted for the remainder of Cell B and Cell C.

2.0 Changes to Operations Plan

The Facility Compliance Audit Report of August 14, 2010 noted the following comments and recommendations (each is addressed in detail below):

A. Concurrence with the suggested changes as submitted on Page 5, Section 4.0 of the report *(i.e., the Six-Month Demonstration Report)*.
B. Submittal of a site plan showing actual and potential storage/processing areas within the site, with site plan modifications as new landfill cells are constructed and permitted to operate.
C. The daily facility inspection checklist is not necessary. A weekly inspection checklist is sufficient.
D. Co-mingling of concrete from LCID and C&D sources is acceptable. Separate processing of wood waste should be continued.
E. Permit to Operate, Attachment 3, Part IV, Conditions of Operating Permit, Permit Condition #36 should be amended for clarity along with Section 6.4.3 of the Operations Plan. The intent of the permit condition is not clear.
F. Permit to Operate, Attachment 2, Conditions of Permit to Construct, Permit Condition #1 should be clarified. Construction approval was issued for entire Phase 1 of the C&D Landfill in the February 7, 2004 Permit to Construct.
G. Recommend continued approval in the Permit to Operate for the Treatment and Processing/Recycling Operation.

Item A – Section 4.0 of the Six-Month Demonstration Report presented the following three issues that the Owner/Operator believes need to be changed at this time (see Item A above):

1. The layout of the processing facility, which keeps the LCID and C&D processing areas separate but which allows C&D recycling near the working face should be acknowledged in future permit documents – a revision of the Operations Plan will be prepared at the end of the extended Demonstration project. This innovative technique is enhancing the recycling percentages (see Table 1) and improving the overall safety and compliance of the facility, as well as enhancing efficiency and waste density.
2. Voluntary completion of inspections forms should be changed to a weekly form, rather than a daily form – the Operator is experienced and has established a good daily routine for maintaining compliance; the form was originally intended to serve as a supplemental guideline during start up for the facility – now this level of record keeping is no longer considered needed.
3. Co-mingling of concrete debris only from LCID and C&D sources is considered needed to make the handling and processing of this unique material more efficient; rather than two processing areas – one for the C&D concrete and one for the LCID concrete – the Owner desires to bring all concrete debris to a central, stationary processing area; no other interim-stage products will be co-mingled in this manner.

The Operations Plan was modified prior to issuance of the PTO in April 2006 to reflect a minimum 50-foot separation between the tipping areas and the processing areas or the working face (**Sections 5.4.1, 5.9.2**, **5.11.2**, and **6.4.3**); the drawings were modified for the Six-Month Report to reflect this separation – no further adjustment of the Operations Plan is needed.

Section 5.7 of the Operations Plan has been modified to reflect weekly – rather than daily – voluntary inspections. The O&M Checklist example form (**Appendix 4D**) has also been modified to reflect weekly documentation of routine inspection items, including those that still require daily attention.

References to the concrete stockpile and processing activities that take place outside the CDLF footprint in a designated area are made in Sections **5.3, 5.4.1, 6.4.2**, and **6.4.3**; these references clearly indicate that this is the only place and product that pre-processed materials may be co-mingled between the C&D and LCID waste streams.

Item B – An interim stage operations drawing has been prepared for processing and disposal activities in Cells A and B (see **Drawing E1B**). This drawing shows the relative location of the C&D and LCID tipping areas and sorting areas – these are unchanged from the authorized operations in Cell A – along with the C&D disposal area (tentative working face at the time of the survey) and the concrete processing area, located north of an unnamed tributary (between the scale house and the CDLF footprint). This drawing is intended to accompany the original PTC drawing set, along with the "As-built" drawing for Cell B (**Drawing E1A**).

Item C – See Item A regarding the weekly checklist.

Item D – See Item A regarding the co-mingling of concrete wastes.

Item E – The intent of the 50-foot separation was to promote safety for the public while unloading wastes or moving about the active areas; customers unloading wastes in the tipping areas should be isolated from the processing and disposal areas by the use of barricades and/or a 50-foot separation. **Section 6.4.3** and other references (see Item A) have been modified to clarify this point; it is recommended that future permit documents reflect this language.

Item F – The comment correctly states that construction approval for the entire Phase 1 was issued per the February 7, 2004 PTC; Attachment 2, Condition 11 of the June 1, 2006 reissue of the PTC also authorized construction of the entire Phase 1, consisting of 8.18 acres. In the interest of demonstrating the viability of the combined recycling and disposal operations, A-1 voluntarily limited the initial operational area to Cell A, consisting of 2.54 acres, conditioned on the approval of the Six-Month Demonstration Report. Per the approval of the Six-Month Report, documented in the March 17, 2010 and July 14, 2010 compliance audits reports, A-1 Sandrock believed they had authorization to continue disposal operations and extended the working face slightly into Cell B. A-1 Sandrock now understands that all future disposal areas must have PTO approval, and now that the coordinated mining, recycling, and disposal operations have passed the trial startup stage and moved into a larger working area, the permitting sequences will proceed in an orderly and compliant manner – a PTO application will be submitted upon completion of Cell C base grading, and both PTC and PTO applications will be submitted beyond Phase 1. It is recommended that future permit documents reflect this language.

Item G – This comment in the compliance audit report is self-explanatory and while supportive of the concepts behind this unique operation, the comment requires no further modification of the Operation Plan, per se.

Thus concludes the response to the regulatory comments made in the Compliance Audit Reports. Changes to the Operations Plan to accommodate these comments are so noted above. The only other changes in the Operations Plan – including the Facility Plan, Engineering Plan, Closure and Post-Closure Plans – are references to "Cell B" or "Cells A and B" instead of "Cell A" where appropriate (also "Phase 1B" or "Phases 1A and 1B" instead of "Phase 1A").

It should be noted that the Closure and Post-Closure cost estimates for Financial Assurance included the entire 8.18 acres. Thus, no further modification of the Financial Assurance instrument is warranted. This application is considered a modification of an existing permit, not an amendment or a renewal. The current permit to Operate, issued in April 2009, is on a 5-year cycle and should not warrant posting of any additional Financial Assurance until renewal in April 2014.

Attachment 1
Updated Operations Plan

TABLE OF CONTENTS

This Facility Plan Update was prepared in accordance with North Carolina Solid Waste Rules **15A NCAC 13B .0531, *et seq.***, in conjunction with the **Permit to Operate** application for Phase 1 (Cells A and B) of the C&D landfill (CDLF), **Permit #41-17**. The original **Facility Plan** was submitted ca. 2002 within the permit application for Phase 1, i.e., **Part 1 – Site Suitability Report** and **Part 2 – Permit to Construct Application**, approved in February 2004 by the NC DENR Division of Waste Management. The 2002 Permit to Construct Application included a Facility Report, which described the service area and waste stream characteristics, along with a description of required equipment and analysis of required soil volumes; an Operations Plan; Sediment and Erosion Control Plan; a Design Hydrogeologic Report; and a Water Quality Monitoring Plan. This document updates the facility plan in accordance with **15A NCAC 13B .0535**, pursuant to a **Permit to Operate** for Phase 1B.

The C&D Landfill is the reclamation stage of a permitted (and active) mining operation (**North Carolina Mining Permit #41-22**). Mining activities have been planned around the permitted base grades of the C&D Landfill, which were established to meet the regulatory minimum vertical buffer requirements. The mine will be developed in three stages that correspond to the three ground disturbing phases of CDLF footprint – a fourth phase of the CDLF is a vertical expansion over the first three phases. Each subsequent phase of the facility will be subject to Division approval of a **Permit to Operate**, including **CQA documentation**, prior to commencing solid waste disposal activities. The C&D landfill shall undergo incremental closure as permitted grades are met.

The facility is permitted to accept up to 300 tons per day of C&D and LCID debris as defined in the solid waste rules. The service area is defined as all counties within and touching a 50-mile radius. The **Franchise Agreement** with Guilford County requires recycling a minimum 10 percent of the waste stream. Recycling will be conducted within in a designated tipping/processing area, separated from the disposal operation by a sufficient distance to protect the public and staff workers. The recycling effort will be conducted in a manner to protect water quality, i.e., waste processing will not occur in the rain, all materials will be cleared from the tipping/sorting area daily, the sorted materials will be stored in covered containers, and (perhaps most important) no piles of uncovered debris will be allowed to accumulate on the premises for more than one year.

At present, Phase 1 (Cell B) – "Phase 1B" – construction has been completed, with CQA documentation submitted in November 2010. A **Treatment and Processing (T&P)** facility application, now called a "Processing Facility," was submitted ca. February 2007. Revisions to the Facility Plan, including the combined operations plan, are under review by the Division. The facility has met all regulatory requirements for a Permit to Operate.

A **Closure and Post-Closure Plan** with Financial Assurance calculations was submitted in June 2008 in accordance with **Rule .0543** – the C&D landfill (though non-operational) is considered an existing facility under Rule .0547. That document will be superseded and updated per the revisions made herein.

A **Financial Assurance bond** for anticipated closure and post-closure costs for Phase 1 was recalculated and submitted to the SWS in January 2009.

This document includes the following updates, in accordance with the current application requirements for C&D landfills, described by **Rule 15A NCAC 13B .0535**:

- A **Facility Plan Update**, prepared in accordance with **Rule .0537**
- An **Engineering Plan** prepared in accordance with **Rule .0539**
- An **Operation Plan Update** prepared in accordance with **Rule .0541**
- A **Closure and Post-Closure Plan Update** prepared in accordance with **Rule .0543**, which incorporates a **Construction Quality Assurance Plan** as required by **Rules .0543** and **.0541**
- A **Monitoring Plan Update** prepared in accordance with **Rule .0544**.

OWNER/OPERATOR INFORMATION

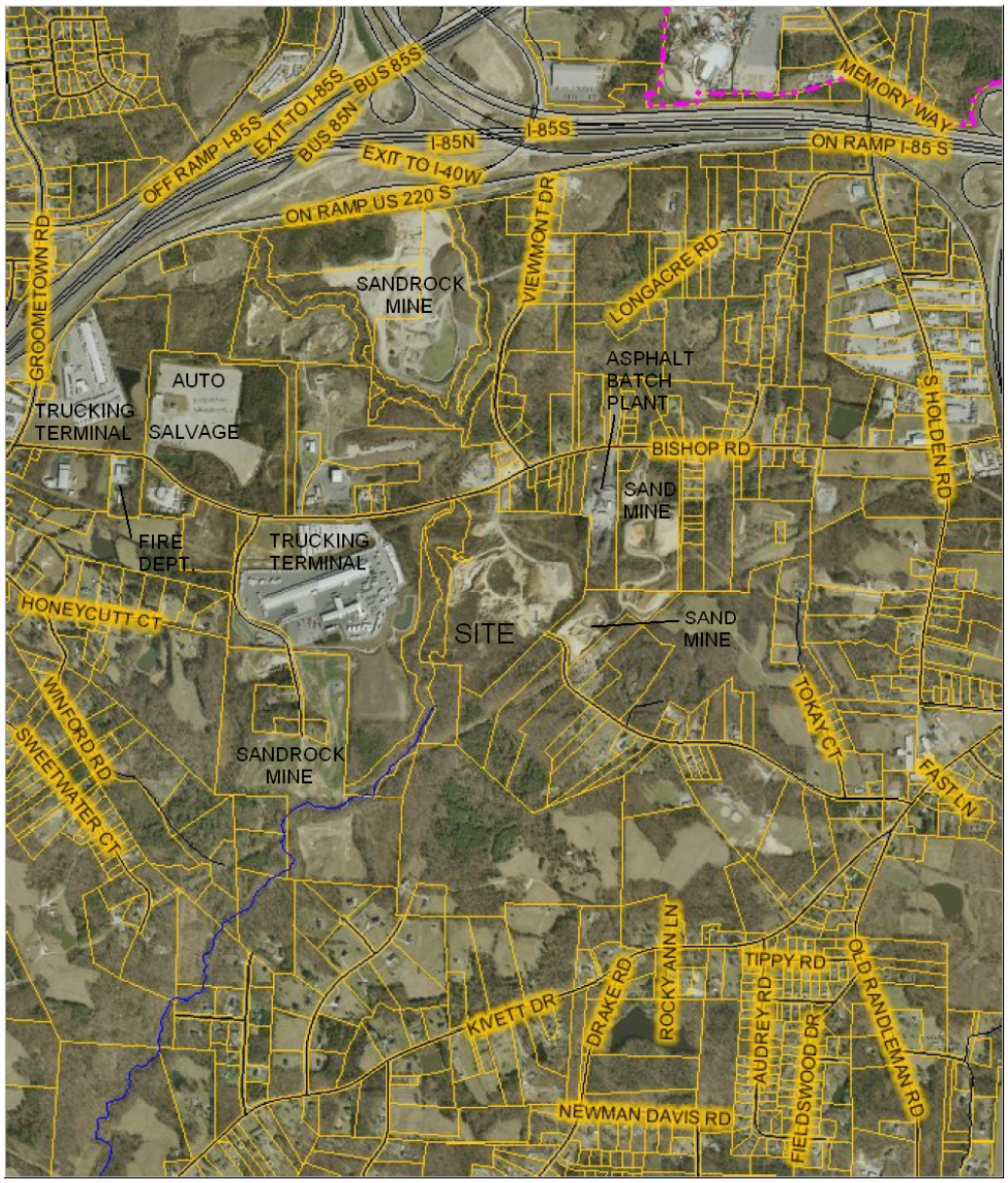
Mr. R.E. 'Gene' Petty, Sr. – Owner
Mr. Ronnie E. Petty, III – Operator
A-1 Sandrock, Inc.
2091 Bishop Road
Greensboro, NC 27406 Tel. 336-855-8195

SITE LOCATION DATA

LATTITUDE	35.98745 N
LONGITUDE	-79.84639 E

PARCEL NUMBER		12-03-0185-0-0739-W -007	
Deed Date	1/17/1996	Guilford County, NC	
Deed Book	4378	Deed Page	0198
Plat Book	149	Plat Page	93

Refer to **Appendix 1** for more specific information on the property.



Map Scale
1 inch = 1602 feet

Figure 1 – Surrounding Properties (Guilford County GIS)

1.1 Regulatory Summary

The "2006 C&D Rules" require a comprehensive facility plan that identifies future development in phases that correspond approximately to 5-year operational capacities. The facility plan must identify and show all relevant permitted Solid Waste units and activities conducted (or proposed) at the site. The grading plan requirements emphasize vertical separation and minimum subgrade soil type requirements. The proposed C&D expansion meets or exceeds the 4-foot minimum vertical separation requirement to groundwater and bedrock, thus no liner or leachate collection system is required under these rules. Subgrade soil types that will be exposed via excavation and used in the compacted fill sections are anticipated to exhibit a mix of finer soil types, e.g., ML, MH, CL, CH, SM and mixed SM-ML classifications, thus subgrade permeability is expected to be relatively low, providing the soils are reworked and compacted (see **Section 3.3.2**).

1.2 Facility Drawings

1.2.1 Facility Layout

A drawing set titled "A-1 Sandrock South Mine Operations and Closure Plan" shows the entire facility layout, along with interim grades for various phases, and relevant final cover and S&EC details. The mine and CDLF will be developed in three ground disturbing phases, with a fourth phase vertical expansion over the first three phases. Each phase is expected to provide approximately 5 years of operational capacity, based on current waste stream projections. Phase 1 is divided into three cells or sub-phases, the first of which (Phase 1A) has been completed and certified ready for waste placement.

Drawings E1 and **E2** depict the base grades and final grades for Phase 1. The aerial limits are set to provide a minimum 200-foot buffer to the facility boundary, a 50-foot buffer to jurisdictional water bodies, per the rules that were in effect when the project was initiated. **Drawings E3 – E5** show the footprints and estimated interim fill grades for Phases 2, 3 and 4, respectively, the latter of which is the final closure grades.

The January 2006 **Approved Construction Drawings** (**Drawings S6R and S6A**) show the locations of current and future soil borrow areas and potential future access routes associated with the C&D Landfill and Processing Facility. C&D recycling activities will take place within the approved CDLF footprint. No part of the CDLF footprint contains identified floodplains or jurisdictional wetlands (adjacent areas with these features will be avoided), unstable areas or cultural resources that affect project development.

1.2.2 Operational Sequence

Phase 1 and associated S&EC measures (shown on **Drawings E1 and E2**) are being developed in the northern third (approximately) of the CDLF footprint. Grading for this phase involves grade cuts up to 25 feet in depth for reaching the approved base grading plan. The operational sequence for Phase 1 is divided into 3 contiguous cells, or sub-phases, each lasting an estimated one to two years of duration, which extend to an interim elevation that approximates 5 years of capacity. Phase 2 – located southwest of the Phase 1 footprint – will be simultaneously mined and used for staging and stockpiling cover soil and "beneficial fill" materials that will be utilized for future structural fill construction. Likewise, mining will be conducted in Phase 3 during the waste placement in Phase 2. Future Permit to Construct applications will be required for Phases 2 and 3.

Interim slopes will be maintained at 3H:1V, in accordance with Division of Waste Management requirements, while upper surfaces shall be graded to promote positive drainage, ideally at a 5% slope. Operational procedures are described more fully in the Operations Plan (**Sections 5.0 – 7.0**). Exterior slopes will be closed – with simultaneous construction of erosion control benches – in Phase 1 (and future phases) as the slopes come to grade. Interim cover will be placed on exterior slopes until a maximum of 10 acres of slope is ready for final closure (refer to the Final Closure Plan, **Section 8.0**). A future Permit to Construct application for Phase 2 will be submitted to the Division approximately two years prior to the completion of Phase 1 waste placement.

1.3 Facility Report

1.3.1 Waste Stream

The following data is updated from the original (2002) Facility Report with data furnished to Guilford County in recent (2008) renegotiation of the Franchise Agreement. Supporting data, e.g., population and growth projection, are presented in **Appendix 1**.

> The geographic area to be served by the franchisee may include the following counties within (and touching) a fifty mile radius from the site: Guilford, Randolph, Rockingham, Alamance, Forsyth, Davidson, Stokes, Surry, Yadkin, Caswell, Person, Orange, Durham, Chatham, Moore, Montgomery, Stanley, Rowan, Cabarrus, Lee and Davie. The bulk of the wastes are expected to be derived from an 8-county region bordering Guilford County. The annual waste intake is anticipated to vary from 60,000 to 80,000 tons per year – a daily intake up to 300 tons per day – 10% of the waste stream will be recycled. ***The facility will accept C&D and LCID waste (see Section 7.1).***

1.3.2 Landfill Capacity

A volumetric analysis for the CDLF performed using an AutoCAD Digital Terrain Model (DTM), as presented in the original permitting documents, is discussed below.

> Based on the grading plan and final waste contours (**Drawing E5**), the landfill will have a total volumetric capacity of 2,240,000 cubic yards. Subtracting the final cover (106,000 cy), 10% of the remaining airspace will be lost due to periodic cover (consuming approximately 213,400 c.y.), the net disposal capacity is 1,920,600 c.y., or approximately 1,152,360 tons in place (at 0.5 ton/cy, including an estimated 20% compaction factor). The landfill is being planned to receive an average of 225 tpd, or 450 c.y./day. It is assumed that the landfill will operate 5.5 days per week, with 280 working days per year. These assumptions yield an estimated annual airspace consumption of 100,800 cubic yards, plus 10% for periodic cover, resulting in a total annual airspace consumption equaling 110,880 c.y. ***The planned operational life is approximately 20 years.***

A tabulation of the disposal capacity and life expectancy by phase follows this section.

1.3.3 Special Engineering Features

No seeps, springs, soft ground or other deleterious conditions were identified in the site characterization studies. As such, no special engineering features are required.

1.3.4 Soil Volume Analysis

The following soil data was developed using the airspace calculations (discussed above) and the permitted grading plan (relative to regulatory vertical buffer requirements). The excavated volume may understate the allowable excavation if "beneficial fill" as defined by the Solid Waste Rules is used to restore site grades to design values. These data were presented in the original (2002) Facility Report, adjusted per the recent recalculation of volumes for the current operational sequence and current cover requirements.

Total Proposed Airspace	2,240,000 cy
Final Cover Required	
(3' x 21.89 ac x 1613 cy/ac/ft)	106,000 cy
Intermediate Cover (10% Volume)	213,400 cy
Structural Fill for Construction	16,000 cy
Total Required Soil	335,400 cy
Excavated Volume	*760,000 cy*
Net Soil Balance	**424,600 cy surplus**

PHASE 1 CONDITIONS	**A-1 Sandrock, Inc., CDLF Phase 1 (Permit #41-17)**		
Solid Waste Units Present	C&D Recycling Facility, CDLF		
Other Activities/Infrastructure	Scales/Office, Permitted Mining, LCID Processing		
CDLF Unit Footprint Acreage	21.89 acres		
CDLF Phases/Sub-Phases [1]	1**A**	**1B**	**1C**
New Ground Footprint Acreage [1]	2.54 ac	3.18 ac	2.46 ac
Interim Capacities (Sub-Phases) [2]	62,370 cy	192,470 cy	223,644 cy
Interim Elevations (Sub-Phases)	EL. 810	EL. 830	EL. 840
Volumetric Capacity (Phase 1) [2]	478,484 cy		
Final Elevations (Phase 1) [2]	EL. 840		
Maximum Waste Thickness [2]	60 feet [5]		
Permitted Side Slope Ratios	3H:1V		
Permitted Footprint Acreage [3]	8.18 ac		
Facility Boundary Acreage	75 acres		
Total Permitted Capacity [2, 3]	478,484 cy		
Operational Life Expectancy	4.74 years		

FUTURE CONDITIONS	**Phases 2 through 4 are contiguous with Phase 1**		
Solid Waste Units Present [4]	Unchanged		
Other Activities/Infrastructure [4]	Unchanged		
New CDLF Unit Footprint Acreage [4]	21.9 acres		
New CDLF Phases/Sub-Phases [1]	**2**	**3**	**4**
New Ground Footprint Acreage [1]	7.82 ac	5.89 ac	11.06 ac [5]
Interim Capacities (Sub-Phases) [2, 6]	608,193 cy	647,787 cy	505,536 cy
Interim Elevations (Sub-Phases)	EL. 846	EL. 854	EL. 904
New CDLF Unit Capacity [2, 6]	1,761,516 cy		
Final Elevations (Entire Unit) [2]	EL. 904		
Maximum Waste Thickness [2]	110 feet		
Permitted Side Slope Ratios [4]	3H:1V		
Total CDLF Footprint Acreage [4]	21.89 acres		
Facility Boundary Acreage [4]	75 acres		
Total Permitted Capacity [6]	2,240,000 cy		
Operational Life Expectancy	20.20 years		

1 Corresponding to 5-year Operating Capacity
2 Includes Final Cap System and Operational Cover – Phase 1C volume was adjusted to match the permit issue
3 Covered by current Permit to Construct application
4 Subject to Division approval of future applications
5 Vertical Expansion – not actual ground disturbance (does not add to total footprint area)
6 Consistent with the February 2004 Permit to Construct – Phase 4 volume was adjusted to match permit issue

2.1 Engineering Report

This section of the report describes the physical aspects of the facility design, with emphasis on waste containment and environmental control systems, based on the hydrogeologic data discussed in **2002 Design Hydro report**. The design was prepared by a qualified Professional Engineer, who is licensed to practice in North Carolina and is familiar with the requirements of the North Carolina Division of Waste Management (Division) rules. Phase 1 is set to provide approximately 5 years of capacity, in keeping with rules. Also, in keeping with the intent of the **2006 C&D Rules**, there is no liner or leachate collection system proposed for this facility since the site meets the rule requirements for soil types present within two feet below planned base grades, and there is at least 4 feet of vertical separation between the waste and seasonal high ground water and/or bedrock, (see **Rule .0540 (2)**). The planned base grades and outer slopes will have maximum slope ratios of 3H:1V, which have been demonstrated to be stable.

2.1.1 Analytical Methods

The facility design incorporates elements that are consistent with Division rules and guidelines, as well as sound engineering practice. Various analyses used in the design of the facility include evaluations of soil conditions, i.e., the consistency of subgrade soils and the availability of suitable soils for constructing stable embankments and other earthen structures (discussed below), and ground water characteristics, i.e., flow directions and seasonal water depth fluctuations. Soil properties testing used to facilitate these evaluations included grain size analysis, shear strength, consolidation, and compaction characteristics (see **2002 Site Suitability study**). Stability and settlement of foundation soils were considered in setting base grades, as was outer slope stability for the final cover system (see **Appendix 2**). Other analyses included a detailed evaluation of S&EC and storm water management systems, previously permitted by NC DENR Division of Land Resources, Land Quality Section, which were presented in the **2002 Permit to Construct** application – relevant calculations are presented in **Appendix 3**.

2.1.2 Identified Critical Conditions

Based on the nature of the soils within Phase 1 (and the entire CDLF footprint), along with an understanding of geologic conditions within the region, no inherent foundation stability or long-term settlement problems are anticipated. Some considerations that are both generic to landfills and specific to the on-site soils, learned through practical experience with the construction of other landfills in the region, are discussed below.

- Subsurface conditions consist of weathered granite saprolite, i.e., "sandrock," which can vary in density within short lateral and horizontal distances. Conditions that produce "auger refusal" can be localized and not apparent during open excavations. The grading plan is based on auger refusal and may not reflect the actual excavation characteristics.

- Ground water is typically deeper than bedrock within the eastern portions of the site, shallower than bedrock within the western portion of the site – that is, groundwater depths govern the vertical separation requirements for the base grading plan within the western half of the site (approximately), bedrock elevations govern within the eastern portion of the site.

- A diabase dike was identified that produced "auger refusal" conditions at anomalously shallow elevations, relative to the surrounding sandrock. In the course of excavating the sandrock and the diabase dike, it is likely that the upper diabase dike will prove to be boulders, which can be excavated once the surrounding overburden is removed.

- Should such conditions occur, the Engineer will document these conditions and petition the Division for a minor grade adjustment – ground water was not found to be the controlling factor for base grade determination in this portion of the site.

- Other minor veins of rock-like materials may be encountered above the permitted grades, which may require ripping for removal.

- Required soil types for the upper two (2) feet of base grades include SM, SC, ML, MH, CL, and CH classifications. These soils are abundant on the site.

- Required lower permeability soils for final cover construction, which require a permeability no greater than 1×10^{-5} cm/sec are also available in sufficient quantities, but the operator will need to segregate and reserve these soils.

- Borrow site selection and a field evaluation of the soils during construction (i.e., the CQA program, see **Section 7**) will be critical to assure the subgrade construction complies with the rule requirements.

- Soil compaction is dependent on both compaction effort (i.e., the right equipment) and working within the correct range of near-optimum moisture (**Section 5.2**).

- Properly compacted embankments are expected to be stable due to high soil strength and stable foundation conditions. Outer slope stability (relative to final cover) will also rely on adequate compaction and observation of proper slope ratios, due to the strength considerations.

- Another consideration is significant soil erosivity, which is counteracted with good cover construction practices and vegetative cover. The on-site soils have moderate field capacity and poor nutrient value, which may require additional effort to establish vegetation. These conditions pose operational considerations but require no special design accommodations.

2.1.3 Technical References

Calculations found in **Appendix 2** are referenced within the various analyses. All calculations and analyses were performed in accordance with accepted engineering standards of practice.

2.1.4 Location Restriction Demonstrations

The site was granted a Site Suitability determination in accordance with **15A NCAC 13B .0531** *et seq.* based on work completed in 2002-04, i.e., the site characteristics were determined suitable for a C&D landfill. Relative to **Rule .0536** pertaining to C&D landfills, the site has no disqualifying conditions with respect to zoning, setbacks from residences or potable wells, historic or cultural sites, state or nature preserves, 100-year floodplains, wetlands, water supply critical areas, or endangered species. Documentation pertaining to these site selection criteria is found in the **2002 Site Suitability Report**.

2.2 Construction Materials and Practices

Based on the **2002 Design Hydrogeologic** (found in the original **Permit to Construct** application) investigation, on-site soils available for embankment and subgrade construction consist chiefly of variably silty sand exhibiting Unified Soil Classification System classifications of SM and SM-ML, with silty clay (CL) and clayey silt (ML). These soils meet the requirements for the upper two feet beneath the landfill subgrade referenced in **15A NCAC 13B .0540 (2)**. The soils exhibit adequate compaction characteristics and shear strength (when properly compacted) to build stable embankments and subgrade that will not undergo excessive. Some selective use of soils and/or field evaluation will be required to place the correct soil types within the upper two (2) feet beneath the subgrade elevations.

Good construction practices for embankments and subgrade include compaction using steel-wheel rollers, sheep foot rollers, and/or smooth-drum rollers of sufficient weight – not dozers – making a minimum numbers of passes (typically three to five passes) in two perpendicular directions in order to achieve the desired strength properties for stability. Past experience at the site indicates that material selection (i.e., avoiding soils that are excessively wet or exhibit excess organic debris content) and/or blending soils to negate the effects of wet or slick soils will produce satisfactory results. The targeted compaction criterion is 95% of standard Proctor maximum dry density (**ASTM D-698**). Critical embankment and subgrade areas should be tested to ensure proper compaction in accordance with the criteria outlined in the CQA Plan (**Section 4.0**).

2.3 Design Hydrogeologic Report

The 2002 Design Hydrogeologic Report was approved by the Division in 2004.

2.4 Engineering Drawings

Refer to the rolled plan set that accompanies this report. All relevant criteria required by the rules (except as noted) are depicted on the plans.

2.4.1 Existing Conditions

See **Drawings S6A** and **S6R** in the **2006 Approved Construction Drawings**.

2.4.2 Grading Plan

See **Drawings E1 – E4**.

2.4.3 Stormwater Segregation

See **Drawings E1 – E4. W**hile this rule requirement pertains to separation of stormwater runoff from leachate (i.e., a lined landfill), good practices for water management include maintaining slopes with positive drainage (always directed toward approved S&EC measures), facilitated by orderly waste placement.

2.4.4 Final Cap System

See **Drawing E5** for final contours and placement of drainage measures, and **Drawings EC1 – EC3** for final cover details.

2.4.5 Temporary and Permanent S&EC

See **Drawings E1 and E2** for temporary sedimentation and erosion control (S&EC) measures and **Drawing EC1** for permanent measures pertaining to the final cover. An S&EC plan was submitted to the NC DENR Division or Land Resources, Land Quality Section, pursuant to the mining permit. Relevant calculations for cell construction and final closure are presented in **Appendix 3**.

2.4.6 Vertical Separation

Vertical separation was established for base grades in the 2002 Design Hydrogeologic report. Separation to groundwater and bedrock are depicted on **Figures 1 – 4** following this text (***see tabbed section***), which present maps and cross sections from the original permitting work.

2.4.7 Other Features

This rule pertains to liners and leachate collection systems, if proposed (none are).

2.5 Specific Engineering Calculations and Results

Calculations for settlement and slope stability were performed using site specific data. The calculations can be found in **Appendix 2**, along with key supporting geotechnical lab data. More complete lab data are found in the **2002 Site Suitability Report** and/or the **Design Hydrogeologic Report**. The following is brief description of the analyses.

2.5.1 Settlement

Settlement is a concern at landfills for maintaining vertical separation between the bottom of the waste (or base liner) and the maximum long-term seasonal high water table. Settlements of the foundation soils result from time-dependent strain, i.e., a change in thickness within the various soil layers due to the vertical stress (weight of the landfill) applied at the surface, accompanied by drainage of the various soil layers. Vertical stresses beneath landfills gradually increase as the waste becomes thicker over long periods of time; strain-induced settlements within sands and/or well drained silts and clays are relatively short-term, thus long-term settlements are not typically a concern unless thick uniform clay deposits are present (which tend to drain slowly) – such is not the case at the subject landfill. ***This landfill site is excavated into residual saprolite, derived from the underlying bedrock, thus settlement is not expected to be a concern.***

Settlements were calculated using elastic methods adapted from the US Federal Highway Administration (FHWA) for highway embankments. Ostensibly, a landfill is a large flexible embankment with the highest stresses impinging on the foundation soils near the center. The FHWA settlement calculation is based on the work of Hough (1959) and others, which considers both the material type and overburden depth for determining a "correction factor" for standard penetration test (SPT) values, from which the compressibility and load-induced strain of each soil layer can be evaluated. For sandy soils conventional sampling via Shelby tubes and laboratory consolidation testing is infeasible. No Shelby tube samples were acquired for laboratory consolidation tests, because the soils were too sandy and dense.

A spreadsheet facilitates the settlement calculation (see **Appendix 2**). The maximum vertical stress increase calculated using the maximum embankment height of 110 feet and an average unit weight of 1000 pounds per cubic yard (37 pcf), then applying a depth-related "influence factor" based on elastic stress distribution theory. Next a subsurface stress distribution was developed for original and post-construction (final height) conditions, based on the depth and average unit weight of the soil layers, plus the added vertical stresses. The SPT correction factor was applied to determine the compressibility factor and strain within each layer, differentiating between sand and clay layers based on empirical data. Strain in the individual layers was summed up to estimate the total settlement. Time-dependent settlement was not considered due to the well drained conditions indicated by the subsurface data.

Assuming fairly uniform subsurface conditions within the footprint – as confirmed by the test borings – a representative subsurface profile was used to estimate the maximum settlements beneath the center of the landfill. Settlements along the edges of the landfill are negligible, and settlements beneath the slopes would fall in between the maximum and minimum values. The calculations confirm that the base grade design, which typically provides more than the minimum required 4 feet of separation, is sufficient to accommodate the anticipated settlement. Differential settlement within the footprint is not a concern. ***The maximum estimated foundation settlement is 0.36 feet.***

2.5.2 Slope Stability

Two primary concerns exist for landfills with respect to slope stability: deep-seated or global stability involving a deep layer in the foundation or along the base of the landfill, which could potentially result in catastrophic slope failure, and veneer stability (sliding of the cover), which can expose the waste but is typically more of a maintenance issue relative to repairs in the event of a failure (veneer stability can also be catastrophic).

Subsurface conditions identified at this site are relatively sandy (high strength soils) with interspersed this clay layers with sand seams that are expected to drain readily under the applied embankment loads – only "effective" stresses (i.e., drained conditions) were considered. The site is not earthquake prone, so liquefaction is not a concern. No extremely soft layers that would pose stability concerns were identified by the SPT testing, but the foundation is expected to undergo a strain-hardening strength increase as settlement occurs, i.e., the foundation soils will become even more stable with time.

2.5.2.1 Deep-seated stability – Limit-equilibrium methods, i.e., the STABL-5M model used for this project, evaluate the balance of forces driving a slide (weight of the porous material and contained water) against the forces resisting a slide (shear strength, expressed as cohesion and friction) along a theoretical failure surface, which can be either a circular surface or a series of intersecting planar surfaces. A "static" analysis considers just the weight of the materials and the shear strength (tie-back loads may be considered for reinforced embankments); a "dynamic" analysis might consider external loads, such as linear loads at the top of the embankment (i.e., traffic forces) or additional horizontal loads to represent earthquakes (expressed as a fraction of the normal gravity field, specific to the region of interest).

In more advanced routines, the mass above the failure surface is divided into many slices, and the driving and resisting forces for each of which are calculated and summed up. Variations on the "method of slices" involve planar block failure surfaces – typically the more conservative analysis – and classic circular failure surfaces, both of which represent the loci of movement at the base of a sliding mass above the failure surface. The balance of forces – the sum of the resisting forces divided by the sum of the driving forces – is expressed as a ratio, e.g., 1.5:1, or simply 1.5, which is called the "safety factor." Ratios less than unity (safety factor <1) indicate unstable conditions. Typical minimum safety factors for maintaining stable embankment conditions throughout the life of a project are 1.5 for static conditions, 1.2 for seismic conditions.

Shear strength inputs to the STABL-5M model were developed from the drilling and laboratory data (see the **2002 Design Hydrogeologic Report**). A circular failure surface and a block analysis were analyzed with the Janbu method of slices. A representative soil profile was developed from the drilling data. A side slope ratio of 3H:1V was modeled. Shear strength parameters were derived empirically from the standard penetration resistance values, based on familiarity with local soils and decades of engineering experience. Typically, the in-situ sandrock exhibits a high shear strength value, expressed in engineering terms as the cohesion (in units of force/area) and the internal friction angle (expressed in degrees).

The following table shows a summary of the soil strength input values, representative of pre-excavation conditions at the project site, i.e., along the edges of the mine and landfill.

Soil Layer	Layer Thickness (feet)	Soil Layer Description	Saturated Unit Weight (pcf)	Drained Cohesion (psf)*	Drained Friction Angle (deg)
1	110	Waste	64	100	25
2	10	Silty sand N = 17	110	100	35
3	25	Silt-Clay N = 20-50	135	300	34
4	40	Silty sand N = 100	130	40	35
5	40	Bedrock	145	5000	45

*Apparent cohesion for silty sands and waste is based on retrogression analysis from other projects (past experience). The water table was modeled at a depth of 5 feet below ground surface, i.e., the base of the waste, which reflects seasonal high conditions.

Based on the analysis presented in **Appendix 2**, the minimum safety factors calculated for this project are summarized below:

Failure Analysis	Seismic*	Non-Seismic
Block	1.56	1.85
Circular	2.15	2.15

*A horizontal static load of 0.04g was applied to represent regional seismicity, consistent with the protocols of the STABL5M computer program – the region is not within a seismic impact zone as defined by NC DENR Solid Waste Rules

2.5.2.2 Veneer Stability – Sliding of the final cover (or veneer failure) is dependent on slope angle, material strength, i.e., the interface friction angle and cohesion within the soils and between the soils and synthetic components (if any), and the degree of saturation. Veneer failure occurs when the pore pressures build up along a critical interface in excess of available shear strength. The severity of failure can range from minor sloughing of small areas (maintenance nuisances) to large-scale slides requiring complete replacement of large sections – this type of failure is expensive to repair, especially when synthetic components are involved. The analysis is typically performed for preliminary design conditions to anticipate (and try to avoid) the large-scale failures.

A worse-case scenario involves little (or no) cohesion, as in a geotextile-geomembrane interface, and complete saturation of the soils overlying that interface. Good engineering practice requires a drainage layer (typically a synthetic geonet) whenever a flexible membrane barrier is used, e.g., an alternative final cover that might be considered. The regulatory minimum cover includes 18 inches of vegetative support soil overlying a compacted soil barrier. Given the regional soil types, the upper 18 inches could include a high permeability sand layer near the base, and ample soil resources are available for the compacted soil barrier (maximum 1 x 10^{-5} cm/sec permeability). North Carolina Solid Waste regulations allow alternative final covers, subject to approval by the Solid Waste Section, but specific interface testing will be required to verify future designs.

Even when native soil covers are used, drainage is still important relative to veneer stability, so a final cover section should include higher permeability sand layer next to the barrier to prevent the soils above the barrier from becoming saturated. Assuming a regulatory minimum cover soil profile is used, the critical interface for veneer stability exists within a low-cohesion sand layer overlying the compacted soil barrier at full saturation on a 3H:1V slope (i.e., the angle measured from the horizontal is 18 degrees). While a minimum cohesion could be assumed along the sand layer and the compacted soil barrier, the stresses near the base of the sand layer would control stability.

A veneer stability analysis (**Appendix 2**) adapted from Matasovic (1991)[1] was performed to evaluate four conditions: static unsaturated and saturated conditions (with a required safety factor of 1.5) and seismic unsaturated and saturated conditions (with a safety factor of 1.1). For this site, the static (non-seismic) saturated case is the critical condition for design because of the higher required safety factor. The calculations start with the given slope geometry and saturation state, then for a given safety factor the required friction (with or without cohesion) is back-calculated to provide the desired safety factor. The analysis assumed full saturation of the vegetation support layer (upper cover soil is at field capacity) with a 1-year, 60-minute design storm impinging, resulting in a head of just over 12 inches acting on the base of the upper soil layer. Assuming the deeper compacted soil layer is stronger (due to cohesion) ***a minimum friction angle of 31 degrees is required within the upper soil layer***. Select soils available in the region (including the borrow sites on the premises) are capable of providing this minimum friction angle, combined with the required high permeability for drainage. The CQA program for the final closure should verify the available friction angles for the actual cover components (including alternative cover designs, if these are to be used).

[1] Geotechnical and Stability Analyses for Ohio Waste Containment Facilities, Geotechnical Resource Group, Ohio Environmental Protection Agency, Columbus, Ohio, September 2004, pg. 9-12.

2.5.3 Final Slope Ratios

Both the deep-seated stability analysis (**Section 2.5.2.1**) and the veneer stability analysis (**Section 2.5.2.2**) assumed a 3H:1V slope ratio. These analyses demonstrate that stability safety factors meet the minimum acceptable requirement of 1.5 for static (non-seismic) conditions. The use of 3H:1V slope ratios will result in stable slopes, providing that the drainage requirements are accommodated, and assuming proper vegetation maintenance.

This section demonstrates compliance of the facility design for CDLF Phase 1A with the requirements of the **2006 C&D Rules, 15A NCAC 13B .0531 *et seq.*** Reference is made to the construction plan set and various appendices.

3.1 Horizontal Separation

The following regulatory criteria are addressed in project drawings specified below. Refer to the rolled plan set that accompanies this report.

3.1.1 Property Lines

The minimum setback to property lines is 200 feet (**Drawings E1 – E5**).

3.1.2 Residences and Wells

The minimum setback to residences and wells is 500 feet (**Drawings E1 – E5**).

3.1.3 Surface Waters

The minimum setback to surface waters is 50 feet (**Drawings E1 – E5**).

3.1.4 Existing Landfill Units

There are no other landfill units present on the site.

3.2 Vertical Separation

3.2.1 Settlement

Maximum waste thicknesses are approximately 110 feet; the waste density is approximately 0.5 tons/cubic yard. Foundation soils are very dense residual silty sand and gravelly sand and silt (all saprolite). Settlement calculations (see **Appendix 2**) indicate maximum post-construction settlements on the order of 0.36 feet (4 inches), or less. **Figures 1 – 4** following this text indicate settlements of this magnitude will not decrease the vertical separation to less than 4 feet, nor will strains adversely affect the engineered subgrade. Discussion of the assumptions and procedures behind the calculations is presented in **Section 2.5**.

3.2.2 Soil Consistency

Based on the laboratory data summary table (see **Appendix 2**), a majority of the on-site soils generally classify as silty sands (SM), silt (ML) or dual classify as sand-silt (SM-ML). A relatively small fraction of the near surface soils consist of low plasticity silty clay (CL), and there are minor high plasticity silty clay (MH-CH) soil types present. ***Based on the data, these soil types are prevalent and will be present – either in-situ or within compacted subgrade – to meet the requirements of*** **Rule .0540 (2) (b)** ***for the upper two feet beneath the subgrade.*** No modification of the soils, i.e., admixtures, will be required to meet this rule requirement, but reworking to blend the soils to a more uniform consistency and proper compaction may be required to mitigate isolated pockets of highly granular soils. For new base grade fill sections, proper soil selection will be required. The soil types shall be documented in the CQA program.

3.3 Survey Control Benchmarks

A permanent benchmark is located long Bishop Road (see facility drawings), with the following information:

NAD 83 Coordinates	**N 817,233.63456**
	E 1,749,238.54876
NGVD 29	**El. 783.30**

3.4 Site Location Coordinates

The latitude and longitude coordinates of the center of the site (determined from Google Earth) are approximately:

LATTITUDE	**35.98745 N**
LONGITUDE	**-79.84639 E**

3.5 Landfill Subgrade

3.5.1 Subgrade Inspection Requirement

The Owner/Operator shall have the subgrade inspected by a qualified engineer or geologist upon completion of the excavation, in accordance with **Rule .0534 (b)** and **Rule .0539**. Said inspection is required by the Division to verify that subgrade conditions are consistent with expected conditions based on the **Design Hydrogeologic Report**.

3.5.2 Division Notification

The Owner/Operator shall notify the Division at least 24 hours in advance of the subgrade inspection.

3.5.3 Vertical Separation Compliance

The subgrade inspection shall verify to the Division that the minimum vertical separation requirements are met and that required subgrade soil types are present.

3.6 Special Engineering Features

This section of the rules generally pertains to liners and leachate collection systems, if any are present (none will be).

3.7 Sedimentation and Erosion Control

The sedimentation and erosion control structures were permitted by the NC DENR Division of Land Resources, Land Quality Section and have been designed to accommodate the 25-year, 24-hour storm event, per the North Carolina Sedimentation Pollution Control Law (**15A NCAC 04**). Required measures are depicted in the construction plan set (see **Drawings E1 – E5** and **EC1 – EC3**). Existing sediment traps for Phase 1 shall be cleaned out and upgraded as needed; other measures shall be maintained throughout the life of the facility. A planned expansion or a new sediment basin shall be constructed to serve Phase 2 and beyond.

4.1 General Provisions

This Construction Quality Assurance (CQA) Plan has been prepared to provide the Owner, Engineer, and CQA Testing Firm – operating as a coordinated team – the means to govern the construction quality and to satisfy landfill certification requirements. The CQA program includes both a quantitative testing program (by a third-party) and qualitative evaluations (by all parties) to assure that the construction meets the desired criteria for long-term performance. Variations in material properties and working conditions may require minor modification of handling and placement techniques throughout the project. Close communication between the various parties is paramount. It is anticipated that the early stages of the construction activities will require more attention by the CQA team, i.e., the Contractor, Engineer, Owner and CQA Testing Firm.

The requirements of the CQA program (construction oversight and testing) apply to the preparation of the base grades, embankments, and engineered subgrade, as well as the final cover installation. All lines, grades, and layer thicknesses shall be confirmed by topographic surveys performed under the supervision of the Engineer of Record or the CQA Testing Firm, and as built drawings of the base grades and final cover shall be made part of the construction records. Once the base grade and final cover construction is completed, the Engineer shall verify that all surfaces are vegetated within 20 days following completion of final grades. The Engineer shall also verify that interior slopes and base grades of new cells are protected until waste is placed.

4.1.1 Definitions

4.1.1.1 Construction Quality Assurance (CQA) – In the context of this CQA Plan, Construction Quality Assurance is defined as a planned and systematic program employed by the Owner to assure conformity of base grade and embankment construction and the final cover system installation with the project drawings and specifications. CQA is provided by the CQA Testing Firm as a representative of the Owner and is independent from the Contractor and all manufacturers. The CQA program is designed to provide confidence that the items or services brought to the job meet contractual and regulatory requirements and that the final cover will perform satisfactorily in service.

4.1.1.2 Construction Quality Control (CQC) – Construction Quality Control refers to actions taken by manufacturers, fabricators, installers, and/or the Contractor to ensure that the materials and the workmanship meet the requirements of the project drawings and the project specifications. The manufacturer's specifications and quality control (QC)

requirements are included in this CQA Manual by reference only. A complete updated version of each manufacturer's QC Plan for any Contractor-supplied components shall be incorporated as part of the Contractor's CQC submittal. The Owner and/or the Engineer shall approve the Contractor's QC submittal prior to initial construction. Contractor submittals may be (but are not required to be) incorporated into the final CQA certification document at the Owner's discretion.

4.1.1.3 CQA Certification Document – The Owner and/or the Engineer will prepare a certification document upon completion of construction, or phases of construction. The Owner will submit these documents to the NC DENR Division of Waste Management Solid Waste Section. The CQA certification report will include relevant testing performed by the CQA Testing Firm, including field testing used to verify preliminary test results and/or design assumptions, records of field observations, and documentation of any modifications to the design and/or testing program. An "as-built" drawing (prepared by/for the Owner), showing competed contours, shall be included. The Certification Document may be completed in increments, i.e., as several documents, as respective portions of the final cover are completed. **Section 2** discusses the documentation requirements.

4.1.1.4 Discrepancies Between Documents – The Contractor shall be instructed to bring discrepancies to the attention of the CQA Testing Firm who shall then notify the Owner for resolution. The Owner has the sole authority to determine resolution of discrepancies existing within the Contract Documents (this may also require the approval of State Solid Waste Regulators). Unless otherwise determined by the Owner, the more stringent requirement shall be the controlling resolution.

4.1.2 Responsibilities and Authorities

The parties to Construction Quality Assurance and Quality Control include the Owner, Engineer, Contractor, CQA Testing Firm (i.e., a qualified Soils Laboratory).

4.1.2.1 Owner – The Owner is **A-1 Sandrock, Inc.**, who operates and is responsible for the facility. The Owner or his designee is responsible for the project and will serve as liaison between the various parties.

4.1.2.2 Engineer – The Engineer (a.k.a. the "Engineer of Record") is responsible for the engineering design, drawings, and project specifications, regulatory affairs, and communications coordinator for the construction of the base grades, embankments, engineered subgrade, drainage and final cover systems. The Engineer represents the Owner and coordinates communications and meetings as outlined in **Section 4.3**.

The Engineer shall also be responsible for proper resolution of all quality issues that arise during construction. The Engineer shall prepare the CQA certification documents, with input from the Owner, the CQA Testing Firm and the Owner's Surveyor. The Engineer shall be registered in the State of North Carolina.

4.1.2.3 Contractor – The Contractor is responsible for the construction of the subgrade, earthwork, and final cover system. The Contractor is responsible for the overall CQC on the project and coordination of submittals to the Engineer. Additional responsibilities of the Contractor include compliance with **15A NCAC 4**, i.e., the North Carolina Sedimentation and Erosion Control rules.

> **Qualifications** – The Contractor qualifications are specific to the construction contract documents and are independent of this CQA Manual.

4.1.2.4 CQA Testing Firm – The CQA Testing Firm (a.k.a. Soils Laboratory) is a representative of the Owner, independent from the Contractor, and is responsible for conducting geotechnical tests on conformance samples of soils and aggregates used in structural fills and the final cover system. Periodic site visits shall be coordinated with the Engineer of Record and the Contractor.

> **Qualifications** – The CQA Testing Firm shall have experience in the CQA aspects of landfill construction and be familiar with ASTM and other related industry standards. The Soils CQA Laboratory will be capable of providing test results within 24 hours or a reasonable time after receipt of samples, depending on the test(s) to be conducted, as agreed to at the outset of the project by affected parties, and will maintain that standard throughout the construction.

4.1.3 Control vs. Records Testing

4.1.3.1 Control Testing – In the context of this CQA plan, Control Tests are those tests performed on a material prior to its actual use in construction to demonstrate that it can meet the requirements of the project plans and specifications. Control Test data may be used by the Engineer as the basis for approving alternative material sources.

4.1.3.2 Record Testing – Record Tests are those tests performed during or after the actual placement of a material to demonstrate that its in-place properties meet or exceed the requirements of the project drawings and specifications.

4.1.4 Modifications and Amendment

This document was prepared by the Engineer to communicate the basic intentions and expectations regarding the quality of materials and workmanship. Certain articles in this document may be revised with input from all parties, if so warranted based on project specific conditions. No modifications will be made without the Division's approval.

4.1.5 Miscellaneous

4.1.5.1 Units – In this CQA Plan, and through the plans and specifications for this project, all properties and dimensions are expressed in U.S. units.

4.1.5.2 References – This CQA Plan includes references to the most recent version of the test procedures of the American Society of Testing and Materials (ASTM). **Table 7D** at the end of this text contains a list of these procedures.

4.2 Inspection, Sampling and Testing

The requirements of the General Earthwork (perimeter embankments and subgrade) and Final Cover Systems (soil barrier, vegetative cover, and storm water management devices) differ with respect to continuous or intermittent testing and oversight. The following two sections are devoted to the specific requirements of each work task.

4.2.1 General Earthwork

This section outlines the CQA program for structural fill associated with perimeter embankments, including sedimentation basins, and general grading of the subgrade. Issues to be addressed include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.1.1 Compaction Criteria – All material to be used as compacted embankment shall be compacted to a minimum of **95% of the Standard Proctor Maximum Dry Density (ASTM D-698)**, or as approved by the Engineer or designated QC/QA personnel. Specifically, field observation of the response of soils beneath equipment and the use of a probe rod and/or a penetrometer are other means of determining the adequacy of compaction. Skilled soil technicians working under the supervision of an engineer may make this determination, subject to concurrence by the engineer. Approval is based on visual evaluation for consistency with project specification and objectives. Such material evaluations may be performed either during material handling, i.e., delivery to or upon

receipt at the landfill, or from existing stockpiles and/or the soil borrow site. Borrow soils shall be evaluated by the Engineer and QC/QA personnel prior to placement on the work site. All visual inspection and testing shall be documented for the CQA Report.

Where permeability is the key parameter of interest, field and/or lab tests will be used.

4.2.1.2 Testing Criteria – Periodic compaction (moisture-density) testing requirements are imposed on the structural fill, although compaction and testing requirements may not be as stringent as that required for the final cover construction. Initial compaction testing shall be in accordance with the project specifications. The Engineer may recommend alternative compaction testing requirements based on field performance. Additional qualitative evaluations shall be made by the Contractor Superintendent and the Engineer to satisfy the performance criteria for placement of these materials.

CQA monitoring and testing will not be "full-time" on this project. Rather, the CQA Testing Firm will test completed portions of the work at the Contractor's or Owner's request. The CQA Testing Firm may be called upon to test final cover and/or compacted structural fill at any time, ideally scheduling site visits to optimize his efforts. The Engineer will make an inspection at least monthly, more often as needed (anticipated more often in the initial stages of new construction).

4.2.1.3 Material Evaluation – Each load of soil will be examined either at the source, at the stockpile area, or on the working face prior to placement and compaction. Any unsuitable material, i.e., that which contains excess moisture, insufficient moisture, debris or other deleterious material, will be rejected from the working face and routed to another disposal area consistent with its end use. Materials of a marginal natural, i.e., too dry or too wet, may be stockpiled temporarily near the working face for further evaluation by designated QC/QA personnel. The Contractor may blend such materials with other materials (in the event of dryness) or dry the materials (in the event of excess moisture).
Soils designated for the upper 2 feet of subgrade within the cell shall consist of ML, MH, CL, CH, SM and mixed SM-ML classifications – this shall be confirmed with lab testing.

4.2.1.4 Subgrade Approval – Designated QC/QA personnel shall verify that the compacted embankment and/or subgrade are constructed in accordance with the project specifications prior to placing subsequent or overlying materials. These activities include an inspection of the subgrade by a qualified engineer, geologist, or soil technician working under the supervision of an engineer, which will examine and classify the soils within the upper two feet beneath the finished subgrade. This may consist of continual observation during placement with confirmatory sampling and laboratory gradation testing at specified

intervals, or there may be an exploratory sampling program at some time near the completion of the subgrade with confirmatory testing at specified intervals. The frequency of visual inspection and testing shall conform to **Table 4A**.

4.2.2 General Earthwork Construction

4.2.2.1 Construction Monitoring – The following criteria apply:

A. Earthwork shall be performed as described in the project specifications. The Construction Superintendent has the responsibility of assuring that only select materials are used in the construction, discussed above.

B. Only materials previously approved by the Engineer or his designee shall be used in construction of the compacted embankment. Unsuitable material will be removed and replaced followed by re-evaluation to the satisfaction of the Engineer and retesting, as may be required.

C. All required field density and moisture content tests shall be completed before the overlying lift of soil is placed – as applicable. The surface preparation (e.g. wetting, drying, scarification, compaction etc.) shall be completed before the Engineer (or his designate) will allow placement of subsequent lifts.

D. The CQA Testing Firm and/or the Engineer shall monitor protection of the earthwork, i.e., from erosion or desiccation during and after construction.

4.2.2.2 Control Tests – The control tests, as shown on **Table 7A**, will be performed by the CQA Testing Firm prior to placement of additional compacted embankment.

4.2.2.3 Record Tests – The record tests, as shown on **Table 7A**, will be performed by the CQA Testing Firm during placement of compacted embankment. The CQA Testing Firm may propose and the Engineer may approve an alternative testing frequency. Alternatively, the Engineer may amend the testing frequency, without further approval from the regulatory agency, based on consistent and satisfactory field performance of the materials and the construction techniques.

4.2.2.4 Record Test Failure – Failed tests shall be noted in the construction report, followed by documentation of mitigation. Soils with failing tests shall be evaluated by the Engineer (or his designee), and the soils shall either be recompacted or replaced, based on the Engineer's judgment. Recompaction of the failed area shall be performed and retested until the area meets or exceeds requirements outlined in the specifications.

4.2.2.5 Judgment Testing – During construction, the frequency of control and/or record testing may be increased at the discretion of the CQA Testing Firm when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas will be considered when:

- Rollers slip during rolling operation;
- Lift thickness is greater than specified;
- Fill material is at an improper moisture content;
- Fewer than the specified number of roller passes is made;
- Dirt-clogged rollers are used to compact the material;
- Rollers may not have used optimum ballast;
- Fill materials differ substantially from those specified; or
- Degree of compaction is doubtful.

4.2.2.6 Deficiencies – The CQA Testing Firm will immediately determine the extent and nature of all defects and deficiencies and report them to the Owner and Engineer. The CQA Testing Firm shall properly document all defects and deficiencies – this shall be more critical on the final cover construction, although this applies to structural fill, as well. The Contractor will correct defects and deficiencies to the satisfaction of the Owner and Engineer. The CQA Testing Firm shall perform retests on repaired defects.

4.2.3 Final Cover Systems

This section outlines the CQA program for piping, drainage aggregate, geotextiles, compacted soil barrier layer, and the vegetative soil layer of the final cover system, as well as the related erosion and sedimentation control activities. Issues to be addressed include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.3.1 Material Approval – The Engineer and/or the CQA Testing Firm shall verify that the following materials (as applicable) are provided and installed in accordance with the project drawings, specifications, and this CQA Manual. In general, the Contractor shall furnished material specification sheets to the Engineer for review and approval. In certain cases, materials furnished by the Contractor may need to meet the Owner's requirements, in which case the Owner shall approve of the materials with the Engineer's concurrence. The materials approval process may involve the submittals furnished by the Owner, (for documentation purposes) in the event that the Owner decides to furnish certain materials.

A. High Density Polyethylene (HDPE) Pipe

(1) Receipt of Contractor's submittals on HDPE pipe.

(2) Review manufacturer's submittals for conformity with project specs.

B. Corrugated Polyethylene (CPE) Pipe

(1) Receipt of Contractor's submittals on CPE pipe.

(2) Review manufacturer's submittals for conformity with project specs.

C. Aggregates (Verify for each type of aggregate)

(1) Receipt of Contractor's submittals on aggregates.

(2) Review manufacturer's submittals for conformity with project specs.

(3) Verify aggregates in stockpiles or borrow sources conform to project specifications. Certifications from a quarry will be sufficient.

(4) Perform material evaluations in accordance with **Table 7B**.

D. Vegetative Soil Layer and Drainage Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Review contractor's submittals on seed specifications.

(3) Perform material evaluations in accordance with **Table 7C**.

E. Compacted Barrier Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Conduct material control tests in accordance with **Table 7C**.

F. Erosion and Sedimentation Control

(1) Review Contractor's submittals on erosion and sedimentation control items (including rolled erosion control products and silt fence).

(2) Review of submittals for erosion and sedimentation control items for conformity to the project specifications.

(3) Perform visual examination of materials for signs of age or deterioration.

4.2.3.2 Final Cover Systems Installation – The CQA Testing Firm, in conjunction with the Engineer, will monitor and document the construction of all final cover system components for compliance with the project specifications. Monitoring for the components of the final cover system includes the following:

- Verify location of all piping;
- Assuring sufficient vertical buffer between field equipment and piping;
- Monitoring thickness and moisture-density of the final cover layers and verification that equipment does not damage the compacted barrier layer or other components; and
- Assuring proper installation of sedimentation and erosion control measures.

4.2.3.3 Deficiencies – The CQA Testing Firm and/or the Engineer will immediately determine the extent and nature of all defects and deficiencies and report them to the Owner. The CQA Testing Firm and/or the Engineer shall properly document all defects and deficiencies. The Contractor will correct defects and deficiencies to the satisfaction of the Engineer. The CQA Testing Firm and/or the Engineer shall observe all retests.

4.3 CQA Meetings

Effective communication is critical toward all parties' understanding of the objectives of the CQA program and in resolving problems that may arise that could compromise the ability to meet those objectives. To that end, meetings are essential to establish clear, open channels of communication. The frequency of meetings will be dictated by site conditions and the effectiveness of communication between the parties.

4.3.1 Project Initiation CQA Meeting

A CQA Meeting will be held at the site prior to placement of the compacted barrier layer. At a minimum, the Engineer, the Contractor, and representatives of the CQA Testing Firm and of the Owner will attend the meeting. The purpose of this meeting is to begin planning for coordination of tasks, anticipate any problems that might cause difficulties and delays in construction, and, above all, review the CQA Manual to all of the parties involved.

During this meeting, the results of a prior compaction test pad will be reviewed, and the project specific moisture-density relationships and it is very important that the rules regarding testing, repair, etc., be known and accepted by all. This meeting should include all of the activities referenced in the project specifications. The Engineer shall document the meeting and minutes will be transmitted to all parties.

4.3.2 CQA Progress Meetings

Progress meetings will be held between the Engineer, the Contractor, a representative of the CQA Testing Firm, and representatives from any other involved parties. Meeting frequency will be, at a minimum, once per month during active construction or more often if necessary during critical stages of construction (i.e., initial stages of final cover). These meetings will discuss current progress, planned activities for the next week, and any new business or revisions to the work.

The Engineer will log any problems, decisions, or questions arising at this meeting in his periodic reports. Any matter requiring action, which is raised in this meeting, will be reported to the appropriate parties. The Engineer will document these meetings and minutes will be transmitted to interested parties and to a record file.

4.3.3 Problem or Work Deficiency Meetings

A special meeting will be held when and if a problem or deficiency is present or likely to occur. At a minimum, the Engineer, the Contractor, the CQA Testing Firm, and representatives will attend the meeting from any other involved parties. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:

- Define and discuss the problem or deficiency;
- Review alternative solutions; and
- Implement an action plan to resolve the problem or deficiency.

The Engineer will document these meetings and minutes will be transmitted to interested parties and to a record file.

4.4 Documentation and Reporting

An effective CQA plan depends largely on recognition of which construction activities should be monitored and on assigning responsibilities for the monitoring of each required activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Testing Firm will provide documentation to address quality assurance requirements. Monitoring will not be continuous and full-time, although the CQA Testing Firm representative (typically this is a Soil Technician) and the Engineer will make frequent and periodic visits to inspect and/or test the work. Both parties shall keep records of their visits and observations.

The Soils Technician will visit the site periodically (e.g., once per week) to document activities during placement of the structural fill and during final cover construction. Site visits by the CQA Testing Firm shall be coordinated between the Contractor and the CQA Testing Firm. The Engineer will make monthly site visits during these critical stages to review the work.

The Construction Superintendent or his representative shall be present on-site daily and shall keep a record of the general construction progress, noting specifically any problems or inconsistencies that need to be brought to the Owner's attention. The specifics of the Contractor's records will not be spelled out, but at a minimum, daily or weekly progress records shall be kept and made available to the Owner upon request.

The CQA Testing Firm will provide the Owner (or his designee) with periodic progress reports including signed descriptive remarks, data sheets, and logs to verify that required CQA activities have been carried out. These reports shall also identify potential quality assurance problems. The CQA Testing Firm will also maintain at the job site a complete file of project drawings, reports, project specifications, the CQA Plan, periodic reports, test results and other pertinent documents. The Owner shall furnish a location to keep this record file.

4.4.1 Periodic CQA Reports

The CQA Testing Firm representative's reporting procedures will include preparation of a periodic report that will include the following information, where applicable:

- A unique sheet number for cross referencing and document control;
- Date, project name, location, and other identification;
- Data on weather conditions;
- A Site Plan showing all proposed work areas and test locations;
- Descriptions and locations of ongoing construction;
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;
- Locations where tests and samples were taken;
- A summary of test results (as they become available, in the case of laboratory tests);
- Calibration or recalibration of test equipment, and actions taken as a result of recalibration;
- Off-site materials received, including quality verification documentation;

- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality;
- Summaries of pertinent discussions with the Contractor and/or Engineer;
- The Technician's signature.

The periodic report must be completed by the end of each Technician's visit, prior to leaving the site. This information will keep at the Contractor's office and reviewed periodically by the Owner and Engineer. The CQA Testing Firm on a weekly basis should forward copies of the Periodic CQA Reports electronically to the Engineer. Periodic CQA Reports shall be due to the Engineer no later than Noon on the next working day (typically Monday) following the end of a work week (typically Friday). If a periodic visit is postponed or cancelled, that fact should be documented by the CQA Testing Firm and noted in the next periodic report.

4.4.2 CQA Progress Reports

The Engineer will prepare a summary progress report each month, or at time intervals established at the pre-construction meeting. As a minimum, this report will include the following information, where applicable:

- Date, project name, location, and other information;
- A summary of work activities during the progress reporting period;
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period;
- A summary of all test results, failures and retests, and
- The signature of the Engineer.

The Engineer's progress reports must summarize the major events that occurred during that week. This report shall include input from the Contractor and the CQA Testing Firm. Critical problems that occur shall be communicated verbally to the Engineer immediately (or as appropriate, depending on the nature of the concern) as well as being included in the Periodic CQA Reports.

4.4.3 CQA Photographic Reporting

Photographs shall be taken by the CQA Testing Firm at regular intervals during the construction process and in all areas deemed critical by the CQA Testing Firm. These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. These records will be presented to the Engineer upon completion of the project.

Electronic photographs are preferred, in which case the electronic photos should be forwarded to the Engineer (the CQA Testing Firm shall keep copies, as well). In lieu of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities. The Engineer may require that a portion of the documentation be recorded by photographic means in conjunction with videotaping.

4.4.4 Documentation of Deficiencies

The Owner and Engineer will be made aware of any significant recurring nonconformance with the project specifications. The Engineer will then determine the cause of the non-conformance and recommend appropriate changes in procedures or specification. When this type of evaluation is made, the results will be documented, and the Owner and Engineer will approve any revision to procedures or specifications.

4.4.5 Design or Specification Changes

Design and/or project specification changes may be required during construction. In such cases, the Contractor will notify the Engineer and/or the Owner. The Owner will then notify the appropriate agency, if necessary. Design and/or project specification changes will be made only with the written agreement of the Engineer and the Owner, and will take the form of an addendum to the project specifications. All design changes shall include a detail (if necessary) and state which detail it replaces in the plans.

4.5 Final CQA Report

At the completion of each major construction activity at the landfill unit, or at periodic intervals, the CQA Testing Firm will provide final copies of all required forms, observation logs, field and laboratory testing data sheets, sample location plans, etc., in a certified report. Said report shall include summaries of all the data listed above.

The Engineer will provide one or more final reports, pertinent to each portion of completed work, which will certify that the work has been performed in compliance with the plans and project technical specifications, and that the supporting documents provide the necessary information.

The Engineer will provide Record Drawings, prepared with input from the Owner's Surveyor, which will include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.).

All final surveying required for the Record Drawings will be performed by the Owner's Surveyor. The items shown below shall be included in the Final CQA Report(s). Note that some items may not be applicable to all stages of the project.

FINAL CQA REPORT GENERAL OUTLINE (FINAL COVER SYSTEM)

1.0 Introduction
2.0 Project Description
3.0 CQA Program
3.1 Scope of Services
3.2 Personnel
4.0 Earthwork CQA
5.0 Final Cover System CQA
6.0 Summary and Conclusions
7.0 Project Certification

Appendices
A Design Clarifications/Modifications
B Photographic Documentation
C CQA Reporting
C1. CQA Reports
C2. CQA Meeting Minutes
D Earthwork CQA Data
D1. CQA Test Results - Control Tests
D2. CQA Test Results - Record Tests
E Final Cover System CQA Data
E1. Manufacturer's Product Data and QC Certificates
E2. Test Results - Drainage Aggregate
E3. Test Results - Vegetative Soil Layer
E4. Test Results - Pressure Testing of HDPE Piping (Manufacturer data)
E5. Test results on final cover compacted soil barrier/low permeability layer
F Record Drawings
F1. Subgrade As Built
F2. Compacted soil barrier/low permeability layer as-built drawing
F3. Vegetative Soil Layer As Built

Each CQA report shall bear the signature and seal of the Engineer (or multiple Engineers as applicable), attesting that the construction was completed in accordance with the CQA plan, the conditions of the permit to construct, the requirements of the North Carolina Solid Waste Rules, and acceptable engineering practice.

4.6 Storage of Records

All handwritten data sheet originals, especially those containing signatures, will be stored in a secure location on site. Other reports may be stored by any standard method, which will allow for easy access. All written documents will become property of the Owner.

4.7 Protection of Finished Surfaces

The only relevant systems exposed after construction will be the finished slopes, including both interior and exterior slopes, various drainage systems, and the subgrade. Ground cover shall be established on all finished surfaces shall to prevent erosion, i.e., seeding of the finished surfaces within 20 days, per NC DENR Division of Land Quality rules, or other measures for preventing erosion (e.g., mulch, rain sheets). Maintenance of finished slopes and subgrade until waste is placed is required. Exterior slopes shall be vegetated in accordance with application sediment and erosion control regulations. The Engineer shall document that the finished surfaces are adequately protected upon completion, and said documentation shall be recorded in the CQA report.

The Owner/Operator shall be responsible for maintaining the finished surfaces, including exterior slope vegetation and drainage conveyances, along with the interior slopes and subgrade. If finished surfaces within the waste disposal area will be required to sit completed for more than 30 days following completion, the Engineer shall examine the finished surfaces prior to waste disposal and the Owner shall be responsible for any necessary repairs, e.g., erosion that might affect embankment integrity or vertical separation with a subgrade. The Engineer shall document any required maintenance or repairs prior to commencing disposal activities, placing said documentation into the Operating Record.

TABLE 4A
CQA TESTING SCHEDULE FOR GENERAL EARTHWORK

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
CONTROL TESTS:		
Consistency Evaluation	ASTM D 2488 (visual)[1]	Each Material
RECORD TESTS:		
Lift Thickness	Direct Measure	Each compacted lift
In-Place Density	ASTM D 2922[2]	20,000 ft^2 per lift
Moisture Content	ASTM D 3017[3]	20,000 ft^2 per lift
Subgrade Consistency within the upper 24 inches[4]	Visual	4 tests per acre
Subgrade Consistency within the upper 24 inches[4]	ASTM D 422 ASTM D 4138	1 test per acre

Notes:

1. To be performed by Contractor Superintendent, Engineer, or CQA Testing Firm. Direct measure shall be facilitated with hand auger borings.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device. ***Minimum required soil density is 95 percent of the standard proctor maximum dry density, which is dependent on the moisture-density characteristic developed for the specific soil during initial construction; lower density or incorrect moisture results in a failed test and the lift must reworked and retested.***

2a. If "beneficial fill" materials are used to construct embankments or structural fill, the Contractor shall spread large particles evenly and fill all voids with finer soil – this is referred to as "choking off" the voids; density testing shall be suspended at the discretion of the Engineer, but judgment testing shall be applied and the use of these materials and evaluation thereof shall be documented as would any other soil placement activity

3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every 10 nuclear density-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Subgrade evaluation shall be conducted via continuous inspection with the indicated testing frequency, in order to evaluate the full 24 inch depth, of an intrusive investigation (e.g., hand auger borings) may be performed after portions of the subgrade are completed with the indicated testing frequency – all testing locations, testing types and test results shall be recorded on a site map and made part of the construction record

TABLE 4B
CQA TESTING SCHEDULE FOR DRAINAGE AND FINAL COVER MATERIALS

COMPONENT	PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
RECORD TESTS:			
Gas Vent Pipes and Stone	Correct type, grade and placement for pipes; correct gradation and trench dimensions for collection stone*	Visual	Each Vent
Coarse Aggregate:	Confirm Gradation	Visual	5,000 CY[1]
Vegetative Soil Layer: (In-Situ Verification)	Visual Classification	ASTM D 2488	1 per acre
	Layer Thickness	Direct measure	Survey[4]

Notes:

1. A quarry certification is acceptable for aggregate from a commercial quarry. If a byproduct is used, i.e., crushed concrete aggregate, the gradation test frequency may be adjusted based on project specific conditions. The Engineer shall approve all materials and alternative test frequencies. ***Materials that do not meet relevant ASTM or ASHTO standard gradation specifications (either may be used at the discretion of the Engineer) shall be rejected.***

* Relative to **Detail G** on **Drawing EC2**.

TABLE 4C
CQA TESTING SCHEDULE FOR FINAL COVER COMPACTED SOIL BARRIER

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
RECORD TESTS:		
Lift Thickness	Direct measure	Survey[4]
Permeability	ASTM D5084[1]	1 per acre per lift
In-Place Density	ASTM D 2922[2]	4 per acre per lift
Moisture Content	ASTM D 3017[3]	4 per acre per lift
Direct Shear Friction Test	ASTM D 5321[5]	1 per acre

Notes:

1. Optionally use ASTM D6391. Maximum allowable confining pressure for laboratory testing under ASTM D5084 is 20 psi; maximum gradient is 10; actual confining pressure and gradient values shall be at the discretion of the engineer in charge of the CQA program.

   Maximum allowable soil permeability is 1 x 10^{-5} cm/sec; higher permeability results in a failed test and the lift must be reworked and retested.

2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear device. ***Minimum required density is dependent on the moisture-density-permeability characteristic developed for the specific soil during initial construction; lower density or incorrect moisture may result in higher permeability. Permeability criteria shall govern the determination of a passing test.***
3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every ten nuclear-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Topographic graphic survey by licensed surveyor
5. These tests may be suspended at the Engineer's discretion after Phase 1 cover is completed

TABLE 4D
REFERENCE LIST OF ASTM TEST METHODS

ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Standard Test Method for Particle Size Analysis of Soils.
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
ASTM D 2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
ASTM D 2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 2937	Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.
ASTM D 3017	Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
ASTM D 4318	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method.
ASTM D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5993	Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners.
ASTM D6391	Standard Test Method for Field Measurement of Hydraulic Conductivity Limits of Porous Materials Using Two Stages of Infiltration from a Borehole
ASTM D 6768	Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.
ASTM D 5321	Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method

5.1 General Conditions

This Operation Plan was prepared for the A-1 Sandrock Recycling (Processing) facility and C&D landfill (CDLF) to provide the facility staff with an understanding of relevant rules and how the Engineer assumed that the facility would be operated. While deviations from the operation plan may be acceptable, significant changes should be reviewed and approved by the Engineer and/or regulatory personnel.

5.1.1 Facility Description

The facility consists of a permitted mine and landfill located on a 75-acre tract, which is relatively isolated by natural barriers such as creeks and wooded tracts. Permitted mining operations include the excavation of "sandrock" (weathered granite) and other soil, which is sold off-site for construction use. Other on-site soil resources are available to meet the operational needs of the CDLF. The landfill is a permitted reclamation activity that will restore the property to a usable condition for future development. Recycling activities are required as a condition of the Franchise Agreement with local government.

5.1.2 Location and Surroundings

The facility entrance is located at 2091 Bishop Road, accessible from I-85 Business via Holden Road or Groomtown Road. Bishop Road is paved and has a 45-mph posted speed limit. The entrance to the facility was enhanced to improve visibility for traffic with turn lanes and a widening of Bishop Road. Nearby facilities include an asphalt plant, other mines and landfills, a trucking terminal, a MSW transfer station, and other businesses which put heavy truck traffic on the road. The scales and office are located near the front gate, which is the only means of accessing the site by the public. There is an area for "stacking" truck traffic within the facility entrance. A few residences exist within a mile of the facility on Bishop Road, which rely on ground water for human consumption (as does the facility itself). The site is located in the Deep River Reservoir watershed – water quality is an important issue in the permitting and operation of the facility. A regional fire department is located one-mile to the west on Bishop Road.

5.1.3 Geographic Service Area

The service area authorized by the Guilford County Commissioners includes the entire political boundaries of all counties within or touching a 50-mile radius from the facility. The operator is responsible for knowing his customer base and waste stream characteristics, such that the approved service area is observed.

5.1.4 Waste Stream and Intake

The facility receives C&D and LCID debris from commercial haulers, contractors, and private individuals. All materials are inert and meet the NC DENR Division of Waste Management definitions. The facility expects to receive approximately 150 tons per day (4000 tpm) of combined C&D wastes and LCID. The franchise allows up to 300 tons per day. Much of the daily C&D intake will come from an affiliated waste hauling service. The intake will be source-sorted with putrescible MSW excluded to the extent possible.

5.1.5 Hours of Operation

The facility is open to the public from 7 AM to 5 PM on Monday – Friday and 7 AM to 12 PM on Saturday. All current operations for the facility are within those hours.

5.2 Contact Information

5.2.1 Emergencies

For fire, police, or medical/accident emergencies dial 911.

Hazardous Waste responders and disposal contacts are listed in **Appendix B.**

5.2.2 A-1 Sandrock, Inc., Administrative Offices

Mr. R.E. 'Gene' Petty, Sr. – Owner
Mr. Ronnie E. Petty, III – Operator
A-1 Sandrock, Inc.
2091 Bishop Road
Greensboro, NC 27406 Tel. 336-855-8195

5.2.3 North Carolina Department of Environment and Natural Resources

Winston-Salem Regional Office
585 Waughtown Street
Winston-Salem, NC 27107 Tel. 336-771-5000
Fax: 336-771-4631

Division of Waste Management - Solid Waste Section

Regional Supervisor:	Jason Watkins	Tel. 336-771-5000
Waste Management Specialist:	Hugh Jurnigan	Tel. 336-771-5000
Permitting Engineer:	Donna Wilson	Tel. 919-508-8400

Division of Land Resources - Land Quality Section

Regional Engineer:	Matthew Gantt, P.E	Tel. 336-771-5000.

5.3 Permitted Activities

The following is a comprehensive summary of the various permitted solid waste activities at the site. This document was prepared in response to comments from the NC DENR Division of Waste Management, Solid Waste Section, in keeping with current SWS policy and pursuant to a Permit to Operate application for the CDLF Phase 1 Cell B. Active permits are renewable on a 5-year operating cycle. Permitted activities conducted within the 75-acre facility boundary, shown on **Drawings E1 – E5**, include the following:

Activities conducted under **Permit #41-17 (Processing Facility)**:

- Receipt of wood wastes and inert debris (C&D and LCID)
- Sorting recyclables, shredding or grinding the wastes*
- Removal of incidental non-compliant wastes*
- Production of mulch, boiler fuel, aggregates***
- Temporary storage of products in roll off boxes

Activities conducted under **Permit #41-17 (CDLF disposal unit)**:

- Disposal of construction and demolition debris
- Disposal of asbestos wastes in a designated area

*Primary recyclables include aggregates, wood wastes, and metals; aggregates derived from the two sources may be combined, wood wastes derived from the two sources may be blended for fuel; typically the C&D wastes are better suited for boiler fuel, LCID wastes are better suited for mulching, thus the two waste streams are typically not blended; no other blending shall occur

**Includes MSW and other non-C&D wastes that inadvertently enter the C&D waste stream at construction sites – these materials will be placed in roll-off boxes and taken to the nearby MSW transfer station on a weekly basis; no MSW disposal shall occur at this facility

***Materials typically will be distributed off-site, but some on-site use of mulch outside of the active C&D unit will occur (with limitations on application rates), and aggregates may be used on-site; all non-fuel wood wastes processed at the facility will be considered as mulch – not compost – with no nutrient value

All processing activities will take place within the approved CDLF footprint ***except for concrete debris***. Finished goods may be stored outside the CDLF footprint within designated areas (approved for mining disturbance). No mining, processing or disposal activities shall occur within designated stream buffers, wetlands, or the 100-year floodplain. All activities and areas are accessible only via a single gate and are secure after hours. Each permitted activity is described in brief detail in **Section 5.4**.

5.4 Description of Facilities

5.4.1 Processing Facility

The Owners of the facility intend to accept appropriate C&D and LCID wastes for recycling into boiler fuel, mulch, and aggregates, with ancillary recycling of metals. All C&D materials shall be weighed and recorded, with accurate accounting to account for material flow. ***Intake materials shall be processed within the approved CDLF footprint; tipping areas accessible by the public shall be separated from processing and disposal areas with barricades and/or a minimum of 50 feet; the LCID processing area will be separate from the C&D processing facility within the CDLF footprint, except that concrete only from both C&D and LCID waste streams will be processed in a separate area near the scale house (see facility drawings)***. The tipping and processing areas have runoff control measures that integrate into the main storm water system but can be isolated in the event of a spill of fuel, oil, or hazardous materials. Operations shall be scheduled around the weather to minimize contact between the waste and water – no grinding of C&D wastes shall take place in the rain.

Materials shall be sorted and placed in covered containers (e.g. 100-cubic yard trailers or 40-cubic yard roll-off boxes) or stockpiles than can be covered – the goal of the Owner will be to remove all materials from the tipping area on a daily basis and ship the processed materials (both the recyclable goods and the rejects) to appropriate receiving facilities on a weekly basis. Recyclable C&D materials shall be shipped to established markets, e.g., boiler fuel and metals; aggregates will be ground and sold or used on the premises in a beneficial manner. Reject C&D wastes shall be disposed within the on-site C&D disposal facility. A separate covered roll-off box will be kept on-hand for inadvertent non-C&D wastes (MSW) that may come into the facility, which will be taken to the nearby MSW transfer station or other approved disposal facility on a weekly basis. Finished materials shall be removed (or turned) at least quarterly (see **O&M Checklist**).

5.4.2 CDLF (Phases 1)

The CDLF is an unlined landfill encompassing 21.9 acres, approved ca. February 2004. Phase 1 occupies 8.18 acres, sized to last approximately 5+ years depending on the waste stream and compaction, coinciding with the 5-year Permit to Operate cycle. Phases 1A and 1B cover approximately 6.16 acres that drains north toward a large perimeter channel, which in turn leads to the main sedimentation basin – all measures were designed in accordance with 15A NCAC 4 and were approved by the NC DENR Division of Land Resources. The limits of Phases 1A and 1B are clearly staked with permanent markers.

Construction of Phases 2 and 3 will be subject to future Permit to Construct applications, along with CQA documentation that will be incorporated into future Permit to Operate applications. Closure of various phases will be incremental, conducted in accordance with the approved Closure/Post-Closure Plan. Financial Assurance requirements will be adjusted on a yearly basis to account for new areas opening and those being closed. Operation of the C&D Landfill will be in accordance with Solid Waste rules. A Ground Water Monitoring Plan has been approved by the SWS. All mining permit requirements, i.e., sedimentation and erosion control apply, as so NC DENR storm water rules.

5.5 Facility Drawings

A copy of the approved Facility Plan and construction drawings must be kept on-site at all times. Several sets of drawings submitted to various agencies exist, e.g., local government site plan approval, the mining permit application and solid waste applications; revisions have occurred over time. The Engineer should be consulted to resolve conflicts between drawings. The enclosed drawing set is current for the T&P facility and the Phase 1 CDLF waste placement sequence with respect to the Solid Waste permit. The Owner/Operator shall note the location of the active working face on the facility plan, noting areas that have come to final grade and areas that are closed – the map shall be updated continuously and filed with the **Operating Record** (**Section 5.12**). The drawings show the locations of special waste disposal areas (i.e., asbestos), soil borrow and stockpile areas.

5.6 Staff Responsibilities

Every staff member shall receive instruction on "preventative maintenance" pertaining to ground water and surface water quality, and how to protect these features, in addition to waste acceptance criteria and operational requirements that pertain to each individual's specific duties. The critical importance of preserving environmental quality and maintaining operational compliance should be a topic for discussion at regular staff meetings, along with issues concerning safety and efficient operation of the facility.

Each worker should understand that the overall compliance of the facility affects not only their position at the facility but the future ability to continue operations beyond the next 5-year permit review. All staff should be vigilant about enforcing the waste acceptance policy and to make sure that all aspects of the operation, from mowing the grass to the daily transfer or disposal of waste, are conducted in an environmentally sound manner. In accordance with **Rule .0542 (j) (2)** a trained operator must be on duty at all times when the facility is open to the public and/or when operations are being conducted. All training should be documented and Operator's certifications shall be kept current.

5.7 Inspections and Maintenance

The **O&M Checklist** (see **Appendix 4D**) is a voluntary means of assuring minimum regulatory requirements are being met and includes a schedule for routine facility inspection and maintenance; the checklist provides a convenient means of documenting the completion of required inspection and maintenance. Staff supervisors are to carry the O&M Checklist with them during their routine activities and complete one form per week covering both the recycling facility and CDLF and associated activities. These forms are to be signed by the responsible staffer and incorporated into the operating record. Some items on the O&M Checklist require daily attention (e.g., housekeeping tasks), which are to be recorded weekly, in addition to routine operational requirements, i.e., periodic waste coverage in the CDLF and waste inspections in both the recycling facility and CDLF (see **Sections 6.0** and **7.0**). The following items are included O&M Checklist:

Daily inspection and potential action items include (to be recorded weekly):

- Collection of trash and windblown debris around the scales and buildings,
- Detection of spills or fluid leakage in heavy equipment traffic areas, i.e., access roads, working face, grinding area, active mine, fueling areas,*
- Make sure access roads are passable and free of obstructions,
- Look for smoke, dust, runoff around the CDLF, stockpiles and buildings,
- Check stockpiles for inappropriate materials (remove as needed).

Weekly inspection and potential action items include:

- Check the security of gates, doors, locks and fences,
- Check operation of electronic surveillance and communication equipment,
- Check fire alarms, extinguishers, smoke detectors, and gas detection devices,
- Inspect soil coverage on inactive disposal areas
- Inspect drainage conveyances for excess erosion or sediment build up

Monthly inspection and potential action items include:

- Check closed slopes for cracking, sloughing, bulging, distressed vegetation,
- Check slopes for obvious signs of erosion, basins for excess sedimentation,**
- Inspect the quality of vegetation on closed slopes

Semi-Annual action items include:

- Mow slopes, shoulders, ditches (all disposal units and grounds),
- Clear paths to monitoring locations (wells and surface sampling stations),
- Inspect/clean sediment basins,

Annual action items include:

- Topographic survey of active phase of CDLF,
- Remove and distribute any remaining mulch,
- Remove and distribute any stockpiled finished products,
- Staff training.

*All spills or leaks shall be cleaned up promptly, and if a reportable quantity of material is spilt or leaked, regulatory authorities may need to be notified, e.g., NC DENR Division of Water Quality.

**Slopes, channels, and erosion/sedimentation control measures also shall be checked within a 24-hour period following any rainfall event exceeding one-half inch; damage to slopes or measures shall be promptly repaired.

5.8 Access Control

5.8.1 Physical Restraints – The site is accessible by the single entrance gate. All customers and visitors shall check upon arrival; all incoming waste-hauling vehicles shall cross the scales. The entrance gates will be securely locked during non-operating hours.

5.8.2 Security – Frequent inspections of gates and fences will be performed by landfill personnel. Evidence of trespassing, vandalism, or illegal operation will be reported to the Owner.

5.8.3 All-Weather Access – The on-site roads will be paved or otherwise hardened and maintained for all-weather access.

5.8.4 Traffic – The Operator shall direct traffic to a waiting area, if needed, and onto the working face with safe access to an unloading site is available. Once a load is emptied, the delivery vehicle will leave the working face immediately.

5.8.5 Anti-Scavenging Policy – The removal of previously deposited waste by members of the public (or the landfill staff) is strictly prohibited by the Division for safety reasons. The Operator shall enforce this mandate and discourage loitering after a vehicle is unloaded. No persons that are not affiliated with the landfill or having business at the facility (i.e., customers) shall be allowed onto or near the working face.

5.8.6 Signage - A prominent sign containing the information required by the Division shall 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 access routes. Restricted access areas will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be used.

5.8.7 Communications – Visual and radio communications will be maintained between the C&D landfill and the landfill scale house and field operators. The scale house has telephones in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house.

5.9 Fire and Safety

5.9.1 Fire Prevention – Measures shall be taken to prevent fires in the raw materials and finished goods stockpiles in the processing facility. Stockpiles (and the disposal area) shall be inspected daily for signs of smoke or combustion. The piles shall be separated by a minimum distance of 25 feet for access. At a minimum, any accumulated piles of combustible materials shall be limited to 6,000 c.y. in size and turned on a quarterly basis or when dictated by temperature. The piles shall be monitored for dryness and temperature – a temperature probe shall be acquired and kept in the office – maximum allowable temperatures shall be 120 degrees Fahrenheit.

Fire Control – Fires in landfills and stockpiles (especially LCID facilities) have been a regulatory concern of recent times. 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 shall be operational on all heavy pieces of equipment at all times. Brush fires of within the waste may be smothered with soil, if combating the fire poses no danger to the staff. The use of water to combat the fire is allowable, but soil is preferable. For larger or more serious fire outbreaks, the local fire department will respond. In the event of any size fire at the facility, the Owner shall contact NC DENR Division Waste Management personnel within 24 hours and complete a **Fire Notification Form** (**Appendix 4C**) within 15 days, which will be placed in the **Operating Record.**

5.9.2 Personal Safety – Safety is a key concern with the operation of this facility. All aspects of operation were planned with the health and safety of the landfill's operating staff, customers, and neighbors in mind. Prior to commencing operations, a member of the management staff will be designated as Site Safety Officer. This individual, together with the Facility's management will modify the site safety and emergency response program as needed to comply with National Solid Waste Management Association and Occupational Safety and Health Administration (OSHA) guidance. Staff safety meetings (minimum one per month) shall be conducted. Safety equipment to be provided includes (at a minimum) equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Field operators will be encouraged to complete the American Red Cross Basic First Aid Course with CPR.

The working face of a landfill is an inherently dangerous place due to the movement of heavy equipment, steep slopes, obstacles to pedestrian movement and sometimes poor visibility (e.g., backing up equipment). These considerations are also a concern for the sorting and grinding operations, as well as the concern for flying debris that can be ejected from a tub grinder. Safety for customers will be promoted by the Operator and his staff knowing where the equipment and customer vehicles are moving at all times. Radio communications between the scale house and the field staff will help keep track of the location and movement of customers.

The processing areas (C&D and LCID) and the working face of the CDLF disposal unit shall be located no closer than 50 feet to the tipping areas. Signs, fences and/or physical barriers will be used to separate public access areas from the working face of the CDLF and the waste processing areas (sorting, grinding, etc.) – activities that could endanger the public shall not be conducted when non-employees are present. Vehicles transporting waste to the facility and/or the general public shall not have access to the working face. Children under the age of 16 shall not be allowed in the facility. If waste processing and loading is to be conducted after dark, appropriate lighting shall be provided. No unloading, grinding or disposal activities shall be conducted after dark.

5.10 Other Regulatory Requirements

5.10.1 Sedimentation and Erosion Control – All aspects of the facility operation are subject to the requirements of **15A NCAC 4**, the Sedimentation and Erosion Control rules. Runoff measures were designed in accordance with this rule and approved by the NC DENR Division of Land Resources, Land Quality Section, as a condition of the mining permit. Approved S&EC measures shall be installed and maintained throughout the operational life of the facility and into the post-closure period (see **Closure/Post Closure Plan, Section 7.0**). Measures to curtail erosion include vegetative cover and woody mulch as ground cover. Measures to control sedimentation include stone check dams in surface ditches, sediment traps and basins. All exposed soils, regardless of whether they are inside or outside the disposal area, should be covered within 20 days after any given area is brought to final grade.

5.10.2 Water Quality (Storm Water) Protection – This facility is covered by NC DENR Division of Water Quality **Storm Water General Permit, NCG020000** – ***Certification No. NCG020633***. Compliance with the provisions of the permit – and the monitoring requirements – is required. A **Storm Water Pollution Prevention Plan** was prepared for the facility, in accordance with the General Permit, which shall be observed and incorporated into the daily operation of the facility. Steps to protect water quality

include diverting surface water ("run-on") away from the disposal area, allowing no impounded water inside the disposal area, and avoiding the placement of solid waste into standing water. The facility is obligated by law not to discharge pollutants into the waters of the United States (i.e. surface streams and wetlands). Any conditions the Operator suspects might constitute a discharge should be mitigated immediately – appropriate agencies and the Engineer should be contacted.

5.11 Miscellaneous Requirements

5.11.1 Minimizing Surface Water Contact – Protection of water quality is a key interest in the operation of this facility. Although C&D wastes are typically inert, there can be chemical residues present in the C&D (e.g., solvents) that can mobilize upon contact with water – i.e., leachate generation – and which can enter the environment via storm water runoff. This tends to be more prevalent when the wastes are processed (sorted and ground) due to increased surface area available to contact the water source and increased exposure to ambient conditions.

Whereas the tipping and processing areas will be uncovered, the C&D processing facility shall not be operated during rain events in order to minimize contact between the waste and surface water, thus minimizing leachate generation. Activities pertaining to the processing facility should be scheduled to accommodate the weather forecast. During periods of light rain unloading may occur and sorting operations may occur if no runoff is visible, but no grinding shall occur. During heavy rain (with visible runoff) or periods of high wind the incoming (unprocessed) materials shall be stockpiled and covered with tarps (secured against wind) or incorporated into the working face to minimize contact with water. Processed materials (including source-sorted loads) shall be placed in appropriate (covered) containers – i.e., transport trailers or roll-off boxes.

5.11.2 Processing Facility Operation over the CDLF – The Processing Facility (tipping, sorting, loading) activities will move within the C&D footprint to be near the working face of the CDLF unit, albeit a safe distance shall be maintained – minimum of 50 feet – to promote safety of workers and the public (**Section 5.9.2**). At some time it may advantageous to locate the Processing Facility atop an inactive portion of the CDLF unit. ***When the Processing Facility is to be operated over an inactive portion of the CDLF, a soil pad with a minimum thickness of 2 feet shall be placed beneath the processing facility operational area (including the tipping and grinding areas), in addition to the interim soil cover that might already be present*** (see **Section 7.4.2**).

The purpose of the supplemental operating soil pad is to protect the underlying wastes – and water quality – against possible spills, leaks and/or the introduction of non-compliant materials (liquids) that might escape detection in the preliminary screening. The soil pad serves as a sorbent layer that can be removed in the case of an incident, minimizing the chance of the incident affecting the ground water or surface water monitoring system, and maintaining adequate coverage for the underlying wastes. The soil pad may be removed at the end of the processing operation and/or prior to placement of final cover and/or additional waste disposal.

5.11.3 Equipment Maintenance – Facility equipment consists of a variety of excavators, loaders, dozers, dump trucks, and specialized equipment, e.g., a tub grinder for LCID and a separate grinder with power screens for aggregates. Most of the equipment is used in the normal course of mining operations. The Owner represents that he has sufficient resources to provide and maintain the needed equipment to operate the facility. A maintenance schedule for the facility equipment is beyond the scope of this Operations Plan. The Operator (or his designee) should develop a routine equipment maintenance program to assure reliable operation and to lessen the likelihood of fluid spills or leaks.

Fuel and lubricants shall be stored under covers and/or with secondary containment systems that are separate from the principle storm water drainage systems at all times. Care shall be taken when servicing or fueling equipment to prevent spills. Driveways, shop areas and all operations areas where heavy equipment is working shall be inspected daily for signs of spills and leaks. Equipment should be parked overnight and serviced in designated areas with separate berms and/or runoff controls that will not discharge to the facility storm water management systems or into the environment. Care shall be taken not to allow any hazardous substance to enter the surface water or ground water, including (but not limited to) fuel, oil, hydraulic fluid, pesticides, and herbicides. The requirements of the **Storm Water Pollution Prevention Plan** and monitoring criteria required by the **NC DENR Storm Water General Permit** shall be observed.

5.11.4 Utilities – Electrical power, water, telephone, and restrooms will be provided at the scale house. Other sanitary facilities shall be provided for the field staff, as needed. Two-way radios or cell phones shall be provided to the field staff for communication with the scale house. Portable light plants may be required to promote safe operation of the processing facility in the late afternoon or evening.

5.11.5 Vector Control – Steps shall be employed to minimize the risk of disease carrying vectors associated with the landfill (e.g., birds, rodents, dogs, mosquitoes). The

C&D wastes should be mostly inert (subject to the waste screening procedures) and not attractive to animals. Operations should be conducted to avoid pools of standing water in and around the disposal area.

5.11.6 Air Quality Criteria

Dust Control – Measures shall be taken to control dust from the operations. Dusty wastes shall be covered immediately with soil, and water shall be sprinkled on roads and other exposed surfaces (including operational cover and/or the working face, as needed) to control dust. Disposal activities may need to be suspended during high winds

Open Burning – No open burning of any waste shall be allowed.

State Implementation Plan – Compliance with the State Implementation Plan (SIP) for air quality under Section 110 of the Clean Air Act, as required by the 2006 Solid Waste Rules, is demonstrated with the following discussion. Typically, the SIP focuses on industries that require air permits and activities that have regulated emissions that contribute to unhealthy levels of ozone (NOx , SO_4, VOC's), particularly coal combustion (electric power plants) and other "smokestack" industries. Compliance with the spirit of the SIP is demonstrated by the prohibition of combustion of solid waste, the fact that the wastes are generally inert and do not emit sufficient quantities of landfill gas to require active controls (such as flaring), and the current status of the regional attainment. The facility is not currently located in a designated area of non-attainment for ozone and/or fine particle emissions (e.g., VOC's, NOx), designation based on NCDENR Division of Air Quality (DAQ) web site information.

Based on information presented earlier this year concerning the possibility of certain areas of the state being designated as non-attainment areas for ozone, it does not appear that a non-attainment designation would affect existing facilities – a more impact might be expected on future industrial location in the region – and the three-year data that lead to this consideration is barely above the US-EPA's current threshold for attainment. State-wide, ozone monitoring data show general improvement since the implementation of the "clean smokestacks" legislation within the last five years, and if the next few months show continued improvement, US-EPA may not impose the non-attainment designation. [2] This leads to a conclusion that the facility is not contributing to an existing non-attainment condition in the local area, nor is it likely to in the future.

[2] Tom Mather, Public Information Officer, NC DENR DAQ, personal communication (2-12-09)

Nonetheless, proactive steps that can be taken at the facility include dust control measures (see below) to minimize airborne particle emissions, minimizing the idling time on trucks and equipment, keeping mechanized equipment in good operating condition, and the use of low-sulfur fuels, subject to availability. Adherence to the waste acceptance criteria will minimize VOC emissions. Regular application of periodic cover (in accordance with Solid Waste regulations) will reduce the risk of fires and curtail wind-blown debris; the proper use of vegetative cover will further minimize fugitive emissions of dust and particulates.

5.11.7 Litter Control – Appropriate measures will be taken to control trash and windblown debris within and around the facility, including litter on Bishop Road. The site and entrance will be policed for litter on a weekly basis and such materials will be collected and disposed of properly.

5.12 Operating Record

The **Operating Record** shall consist of one or more files, notebooks, or computerized records and associated maps that document the day-to-day facility operations, including the waste intake and sources, transfer records, routine waste placement, cover, and closure activities (for the CDLF), and routine or special maintenance requirements and follow up activities. The following records shall be maintained:

A Daily tonnage records - including source of generation

B Operation and Maintenance Checklist (completed forms)

C Copies of the facility map, tracking the current location of waste placement activities, interim closure and completed final closure activities – including the date and time of placement of cover material

D Waste inspection records (on designated forms); fire notification forms;

E Quantity, location of disposal, generator, and special handling procedures employed for all special wastes disposed of at the site

F Generators or haulers that have attempted to dispose of restricted wastes

G Employee training procedures and records of training completed

H Ground water quality monitoring information including:

1. Copy of the current Sampling and Analysis Plan (Monitoring Plan)
2. Monitoring well construction records
3. Sampling reports with statistical analyses
4. Records of inspections, repairs, etc.

I Closure and post-closure information, where applicable, including:

1. Testing
2. Certification
3. Completion records

J Cost estimates for financial assurance documentation

K Annual topographic survey of the active disposal phase

L Records of operational problems or repairs needed at the facility, e.g., slope maintenance, upkeep of SE&C measures, other structures

M Equipment maintenance records

N Daily rainfall records (via on-site rain gauge).

O Landfill gas monitoring information:

1. Quarterly methane monitoring records
2. Landfill Gas Monitoring and Control Plan

P Updated Financial Assurance Documentation

Q Compliance Audit Records (by the Solid Waste Section) and documentation of follow up measures to ensure compliance

R Copies of the Operation Plan, Closure and Post Closure Plan, Sediment and Erosion Control Plan, Construction Drawings, Storm Water Pollution Prevention Plan, Storm Water General Permit Certificate of Coverage, Solid Waste Permit, and Mining Permit

The Owner or his designee will keep the **Operating Record** up to date. Daily logbooks or computerized files may be used for some items. Records shall be presented upon request to DWM for inspection. A copy of this **Operations Plan** shall be kept at the landfill and will be available at all times, along with the **Closure/Post-Closure Plan** and the **Monitoring Plan**.

5.13 Annual Report

The facility shall file an annual report with the NC DENR Division of Waste Management by August 1 of each year, detailing the activities for the preceding July 1 through June 30. Records shall be kept pertaining to the types and amounts of wastes received, as well as the types and amounts of materials reused, recycled, and distributed; material quantities shall be reported annually in tons. This report also shall be furnished to the **Guilford County Planning Department**.

New rules for C&D landfills require an annual survey to determine slope, height, and volume (see **Section 3.5**). The reporting requirements include an annual topographic map prepared by a licensed surveyor. The mining permit for this facility has a requirement for annual reporting of reclamation activities; generally reclamation at this site includes all backfilling (with beneficial fill) and completion of slopes (with permanent vegetation). The annual reclamation report has map submission requirements, as well as an estimate of percentage of the disturbed area reclaimed. In addition, the Storm Water General Permit, issued by NC DENR Division of Waste Quality, has an annual sampling and reporting requirement.

5.14 Contingency Plan

5.14.1 Hot Loads Contingency – In the event of a "hot" load attempting to enter the landfill, the scale house staff will turn away all trucks containing waste that is suspected to be hot, unless there is imminent danger to the driver. The vehicle will be isolated away from structures and other traffic and the fire department will be called. The vehicle will not be allowed to unload until the fire is out. If a hot load is detected on the working face, then the load will be treated as a fire condition (see **Section 5.9**), whereas the load will be spread as thin as possible and cover soil will be immediately placed on the waste to extinguish the fire. Other traffic will be redirected to another tipping area (away from the fire), or other waste deliveries may be suspended until the fire is out. The fire will be monitored to ensure it does not spread. If the fire cannot be controlled, the fire department will be notified and the area cleared of non-essential personnel.

5.14.2 Hazardous Waste Contingency – In the event that identifiable hazardous waste or waste of questionable character is detected at the scales or in the landfill, appropriate protective equipment, personnel, and materials will be employed as necessary to protect the staff and public. Hazardous waste identification may be based on (but not limited to) strong odors, fumes or vapors, unusual colors or appearance (e.g., liquids), smoke, flame, or excess dust.

The fire department will be called immediately in the event a hazardous material is detected. An attempt will be made to isolate the wastes in a designated area where runoff is controlled, preferably prior to unloading, and the vicinity will be cleared of personnel until trained emergency personnel (fire or haz-mat) take control of the scene. Staff will act prudently to protect personnel but no attempt will be made to remove the material until trained personnel arrive. A partial listing of regional **Hazardous Waste Responders** and disposal firms is found in **Appendix 4B**.

The Operator will notify the Division (see **Section 5.2.3**) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, attempts will be made to prevent that vehicle from leaving the site until it is identified (license tag, truck number driver and/or company information) or, if the vehicle leaves 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 landfill staff will assist the Division as necessary and appropriate in the removal and disposition of the hazardous waste (acting under qualified supervision) and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with on-site soils, tarps, or other covering 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 or reported to law enforcement authorities.

Any hazardous waste found at the scales or in the landfill that requires mitigation under this plan shall be documented by staff using the **Waste Screening Form** provided in **Appendix 4B**. Records of the waste screening programs will be placed in the **Operating Record** and maintained throughout the operational life of the facility.

5.14.3 Severe Weather Contingency – Unusual weather conditions can directly affect the operation of the landfill. Some of these weather conditions and recommended operational responses are as follows.

5.14.3.1 Ice Storms – An ice storm can hinder access to the landfill, prevent movement or placement of periodic cover, and, thus, may require closure of the landfill until the ice is removed or has melted and the access roads are passable without risk to personnel of the side slopes cover.

5.14.3.2 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 (or recycled aggregates) 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, aggregate should be replaced. 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.

Processing activities should be planned to avoid sorting and grinding during periods of rain. Ideally, waste deliveries should be suspended until the rain passes, but if unloading in the rain cannot be avoided the debris piles should be kept small as possible and covered with tarps. Sorting should be completed as soon as practical and all materials cleared from the tipping area to avoid contact with rain or runoff.

5.14.3.3 Electrical Storms – The open area of a landfill is susceptible to the hazards of an electrical storm. If necessary, landfill activities will be temporarily suspended during such an event. To promote the safety of field personnel, refuge will be taken in buildings or in rubber-tire vehicles.

5.14.3.4 Windy Conditions – High winds can create windblown wastes, typically paper and plastic, but larger objects have been known to blow in extreme circumstances. Operations should be suspended if blowing debris becomes a danger to staff, after the working face is secured. 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. Soil cover shall be applied whenever windblown wastes become a problem. Staff shall patrol the perimeter of the landfill periodically, especially on windy days, to remove windblown litter from tress and adjacent areas. Windscreens of various sorts have been used with mixed success at other facilities in the region. Good planning is essential on the operator's part to be prepared for windy conditions.

5.14.3.5 Violent Storms – In the event of a hurricane, tornado, or severe winter storm warning issued by the National Weather Service, landfill operations should be temporarily suspended until the warning is lifted. Daily cover will be placed on exposed waste and buildings and equipment will be properly secured. In the event of eminent danger to staff or the public, personal safety shall take precedence over other concerns.

6.0 PROCESSING FACILITY OPERATIONS PLAN (15A NCAC 13B .0542)

6.1 Overview

This section describes the general waste intake and handling operations for the Processing (Recycling) facility. These protocols shall be followed, regardless of whether the material is source-sorted and delivered by affiliated waste transport vehicles or brought to the facility by private contractors or the general public.

6.2 Acceptable Wastes

The Facility shall only accept these waste types generated within approved service area:

- **Construction Debris**: Unpainted and untreated wood, plywood, particle board, hardboard, gypsum board, siding, flooring, shingles, etc., from new residential or commercial construction;

- **Demolition Debris**: Concrete, brick, block and asphalt will be accepted; unpainted and untreated wood, roofing, insulation, piping, wallboard, siding, etc., from residential and commercial remodeling, repair, or demolition operations, will be accepted *after the Facility produces certificates of training for the staff* pertaining to the identification and safe handling of hazardous materials (e.g., asbestos, lead paint)

- **Land Clearing and Inert Debris**: Stumps, trees, limbs, brush, other vegetation, concrete, brick, concrete block, clean soils and rock, untreated/unpainted wood, etc.;

6.3 Prohibited Wastes

No municipal solid waste (MSW), hazardous waste as defined by **15A NCAC 13A .0102**, including hazardous waste from conditionally exempt small quantity generators (CESQG waste), or liquid waste will be accepted at this facility. In addition, no tires, batteries, polychlorinated biphenyl (PCB) waste, electronic devices (computer monitors), or mercury switches and fluorescent lamps will be accepted. Animal carcasses will not be accepted. No oils, grease, solvents, or fluids of any kind will be accepted, nor will bagged wastes or any putrescible or household wastes. A partial listing of prohibited wastes is presented on **Table 1** following this section.

6.4 Waste Processing

In order to assure that no prohibited waste enters the Facility, a waste screening program will be implemented (see **Section 6.4.1**). Waste received at the scale house will be

inspected by trained personnel. These individuals will be trained to spot indications of suspicious wastes, including: hazardous material placards 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 will be an ongoing part of the Facility operation.

6.4.1 Waste Receiving and Screening

All incoming vehicles must stop at the scale house located near the entrance of the facility, and visitors are required to sign-in. All waste transportation vehicles shall be uncovered prior to entering the scales to facilitate inspection; all incoming loads shall be weighed and the content of the load assessed. The attendant shall request from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the Facility. Signs informing users of the acceptable and unacceptable types of waste shall be posted near the facility entrance. The attendant shall visually check the vehicle as it crosses the scale. Suspicious loads will be pulled aside for inspection prior to leaving the scale area. Loads with unacceptable materials or wastes generated from outside of the service area will be directed to the nearby Transfer Station.

Once passing the scales, incoming transport vehicles will be routed to the tipping area for unloading, inspection, sorting and appropriate processing, depending on the nature of the load – C&D and LCID materials will go to separate areas (**Sections 6.4.2** and **6.4.3**).

Incoming vehicles shall be selected at random for screening a minimum of three times per week. The selection of vehicles for screening might be based on unfamiliarity with the vehicle/driver or based on the driver's responses to interrogation about the load content. Vehicles selected for inspection shall be directed to an isolated area away from the stockpile of materials to be stockpiled, where the vehicle will be unloaded and the waste shall be carefully spread using suitable equipment. An attendant trained to identify unacceptable wastes shall inspect the waste, using the **Waste Screening Form** (**Appendix 4A**) to document the waste screening activity. After the waste screening inspection of a load, one of the following activities will occur:

- If no unacceptable waste is found, the load will be pushed to the active recycling area and processed with the remainder of the day's intake.

- If unacceptable materials are found, the entire load will be isolated and secured via soil berms or barricades, then loaded into roll-off boxes for disposal at a permitted facility, or

- Non-hazardous materials will be reloaded onto the delivery vehicle – the hauler will be escorted to the nearby MSW Transfer Station;

- If hazardous materials are detected, the **Hazardous Waste Contingency Plan** outlined in **Section 5.14** will be followed.

The hauler will be responsible for removing unacceptable waste from the Facility. The rejection of the load shall be noted on the Waste Screening Form, along with the identification of the driver and vehicle. A responsible party to the load generator or hauler shall be notified that the load was rejected. The generator or hauler may be targeted for more frequent waste screening and/or banished from delivering to the facility, depending on the nature of the violation of the waste acceptance policy. State and County authorities may be notified of severe or repeat offenders.

6.4.2 LCID Processing

The Facility may recycle LCID to make mulch, boiler fuel, and aggregates. The T&P intake generally will consist of brush, limbs, tree trunks, stumps, leaves, dirt, inert debris, and other materials defined as LCID by the NC DENR Solid Waste rules. LCID materials will be stockpiled and processed via shredding or grinding within the approved CDLF footprint separate from working face. Some LCID materials may be combined with similar C&D materials post-processing – e.g., wood wastes that can be ground into boiler fuel and inert debris that can be processed into aggregates. LCID materials will not be commingled with other materials prior to processing, ***except for concrete debris***.

6.4.3 C&D Processing

The Facility may recycle C&D wastes aggregates, boiler fuel, mulch, and beneficial fill. Typically, C&D materials are anticipated to arrive source-sorted, having been transported by an affiliated hauler, but some private hauling will occur. ***Sorting and grinding shall be separated from the tipping area by at least 50 feet; appropriate runoff controls and S&EC measures shall be maintained.*** Sorted materials will be redirected to appropriate stockpiles and/or roll-off boxes. Non-recyclable C&D materials will be pushed into the CDLF working face (**Section 7.0**). Co-mingling interim stage processed materials from the C&D and LCID waste streams will NOT be allowed – ***except for concrete debris*** – separate stockpiles or containers will be maintained. ***The only allowable co-mingling of raw waste streams is concrete debris, which occurs within the designated area.*** All materials will be strictly accounted for, including those in various stages of processing, stockpiled finished goods, on-site beneficial-use materials and/or distribution off-site.

6.4.4 Disposal of Rejected Wastes

All waste loads will be inspected upon arrival, in order to reject inappropriate material before it is unloaded or such that it can be reloaded onto the transport vehicle and sent to an appropriate facility. One or more roll-off boxes will be kept on-site for disposal of any "reject" materials that are found in the waste during material sorting, e.g., small quantities of garbage (chiefly food containers), plastic packaging, paint cans, insulation, carpet, etc. Such "rejects" will be placed into the roll-off boxes and removed from the site for disposal at an approved facility, e.g. the nearby Transfer Station on Bishop Road or another approved MSW facility. ***The roll-off boxes will be removed on a weekly basis.*** The number of roll-off boxes required will depend on the market trends; A-1 and affiliated businesses own an ample supply of roll-off boxes. ***Operations will be conducted to minimize the amount of reject materials through source sorting – this facility will not become a MSW transfer station.***

6.4.5 Processing of Finishing Goods

Processing activities shall be limited to grinding, shredding, or chipping land clearing debris, unpainted/untreated wood waste (including pallets and new construction waste), and certain engineered wood products (plywood, particle board), to make boiler fuel or mulch (but not compost). Inert materials will be processed and recycled into aggregates. The operation of the Processing Facility will include the following:

- Processed LCID and sorted C&D (raw materials) will be stockpiled temporarily in the designated areas.
- Woody materials suitable for making mulch and/or boiler fuel (including pallets) will be ground or shredded and stored in over-the-road shipping containers.
- Earthen inert materials (dirt, rocks, concrete debris) suitable for "beneficial fill" and/or for processing into aggregates, will be ground or shredded and stockpiled.
- Metals will be placed in roll-off boxes and kept clean and ready to haul to off-site recycling operations until a full load is reached.

The Owner intends to process incoming material and remove sorted materials from the tipping area to covered bins or stockpiles by the end of each working day. Plans are to move the finished materials off-site or use them in the mine reclamation activities on a quarterly (or more frequent) basis. If the stockpiles of finished products must remain on site for longer periods of time, these materials will be wetted and turned quarterly (as needed) to prevent composting and/or fires (see **Section 5.5**).

6.4.6 Maximum Stockpile Size

Maximum volumes of processed and raw materials to be stored in stockpiles at the processing facility (for those materials not stored in roll-off boxes) shall be 6000 cy – this is consistent with Solid Waste Sections rules and guidelines for "notification" stockpiles, e.g., LCID stockpiles. The following provides guidance for determining the maximum allowable stockpile dimensions to meet this requirement at various heights with 2H:1V maximum side slope ratios. The selection of maximum size of stockpile needs to incorporate the factors of safe operation, storage, and fire prevention.

Height of Pile, ft	Top of Pile Diameter, ft	Bottom of Pile Diameter, ft	Average Cross Section Area, sf	Volume, cy
20	20	100	60	2,093
20	40	80	80	3,721
25	20	120	70	3,562
25	40	140	90	5,887
30	20	140	80	5,582

6.4.7 Maximum Processed Material Storage Volumes

Tentative estimates of maximum stored volumes of various materials such as aggregates, boiler fuel and mulch (described in **Sections 6.4.2** and **6.4.3**) and rejected materials (**Section 6.4.4**) are as follows. These bulky materials will be stockpiled, except the rejects. It should be realized that the finished goods are marketable commodities and will have market value, as well as being relatively easy to move. The facility is located across from a MSW Transfer Station that will be the destination for reject materials (those that cannot be disposed in the on-site landfill). Once the operations are underway, more specific volume determinations can be made – these numbers are tentative estimates.

Aggregate (recycled concrete)	2,000 cy
Boiler Fuel	4,000 cy
Mulch	4,000 cy
Reject Materials (roll-off boxes)	200 cy

6.5 Contingency Plan

Refer to **Section 5.14**

6.6 Annual Reporting

Refer to **Sections 5.12** and **5.13**

Table 1

Prohibited Wastes at the Processing Facility*

- Putrescible wastes (garbage and/or food wastes)
- Demolition Wastes
- Hazardous wastes: Pesticides
  Herbicides
  Used motor oil
  Antifreeze
  Solvents
  Paint thinners
- Hazardous materials as defined by 15A NCAC 13A
- Radioactive materials
- Lead acid batteries
- Regulated medical wastes
- Polychlorinated biphenyls (PCB) wastes
- All sludges except sludge from water treatment plants
- White Goods
- Liquid wastes
- Animal carcasses
- Asbestos wastes
- Yard Wastes
- Tires

*References: 15A NCAC 13B .0103
15A NCAC 13B .1626

7.1 Waste Acceptance Criteria

7.1.1 Permitted Wastes

The C&D Landfill shall only accept (for disposal) the following wastes generated within approved areas of service:

- Construction and Demolition Debris Waste: (Waste or debris derived from construction, remodeling, repair, or demolition operations on pavement or other structures);
- Land Clearing and Inert Debris Waste: (yard waste, stumps, trees, limbs, brush, grass, concrete, brick, concrete block, uncontaminated soils and rock, untreated and unpainted wood, etc.);
- Other Wastes as approved by the NC DENR Solid Waste Section.

7.1.2 Asbestos

A-1 Sandrock may dispose of asbestos within the C&D landfill, or within a special designated area, only if the asbestos has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Handling asbestos requires advance arrangements between the hauler and the landfill and special placement techniques (see (**Section 7.3.5**).

7.1.3 Wastewater Treatment Sludge

Sludges of any kind may **not** be disposed in the C&D Landfill, per Division rules. Waste Water Treatment Plant sludge may be used as a soil conditioner to enhance the final cover, upon receipt of permission from the Division, to be applied at agronomic rates.

7.2 Waste Exclusions

No municipal solid waste (MSW), hazardous waste as defined by 15A NCAC 13A .0102, or hazardous waste from conditionally exempt small quantity generators (CESQG waste), sludges or liquid wastes will be accepted. No drums or industrial wastes shall be accepted. No tires, batteries, polychlorinated biphenyl (PCB), electronic devices (computer monitors), medical wastes, radioactive wastes, septage, white goods, yard trash, fluorescent lamps, mercury switches, lead roofing materials, transformers, or CCA

treated wood shall be accepted. No pulverized or shredded C&D wastes may be accepted – except those materials received and inspected in a whole condition and shredded on-site. The Facility will implement a waste-screening program, described in **Section 7.3** below, to control these types of waste. **Solid Waste Rule .0542 (e)** contains further exclusions (see **Table 2** at the end of this section).

7.3 Waste Handling Procedures

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 placards 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 are an ongoing part of the landfill operation.

7.3.1 Waste Receiving and Inspection

All incoming vehicles must stop at the scale house located near the entrance of the facility, and visitors are required to sign-in. All waste transportation vehicles shall be uncovered prior to entering the scales to facilitate inspection; all incoming loads shall be weighed and the content of the load assessed. The scale attendant shall request 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.

Signs informing users of the acceptable and unacceptable types of waste shall be posted at the entrance near the scale house. The scales attendant shall visually check the vehicle as it crosses the scale. Any suspicious loads will be pulled aside for a more detailed inspection prior to leaving the scale house area. Loads with unacceptable materials will be required to be covered (with a tarp) and turned away from the facility. Wastes from outside of the service area will be rejected.

Once passing the scales, the vehicles containing C&D wastes are routed to the working face. ***Vehicles shall be selected for random screening a minimum of three times per week.*** The selection of vehicles for screening might be based on unfamiliarity with the vehicle/driver or based on the driver's responses to interrogation about the load content. The Operator shall use the **Waste Screening Form** (see **Appendix 4A**) to document the waste screening activities. Completion of three random waste screenings shall be documented on the weekly **O&M Checklist** (**Appendix 4D**).

Selected vehicles shall be directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded and the waste shall be carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill shall inspect the waste discharged at the screening site. If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell.

- If unacceptable wastes that are non-hazardous are found, the load will be reloaded onto the delivery vehicle and directed to the Transfer Station.

- For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 5.14** will be followed.

The hauler is responsible for removing unacceptable waste from the landfill property. The rejection of the load shall be noted on the **Waste Screening Form**, along with the identification of the driver and vehicle. A responsible party to the load generator or hauler shall be notified that the load was rejected. ***The generator or hauler may be targeted for more frequent waste screening and/or banished from delivering to the facility***, depending on the nature of the violation of the waste acceptance policy. If the violation is repetitive or severe enough, State and/or County authorities may be notified.

7.3.2 Disposal of Rejected Wastes

Attempts will be made to inspect waste as soon as it arrives in order to identify the waste hauler; ideally, the hauler can be stopped from leaving the site and the rejected materials reloaded onto the delivery vehicle. Non-allowed materials that are found in the waste during sorting or placement, i.e., after the delivery vehicle has left the site, shall be taken to the on-site Transfer Station.

Small quantities of garbage (chiefly food containers) will inevitably wind up in the C&D waste stream from job sites. These may be disposed with the C&D wastes as long as the materials are non-liquid and non-hazardous. If large quantities of garbage, "black bags" or any prohibited wastes are detected, the Operator shall be responsible for removing these materials and placing them into the Transfer Station at the earliest practical time.

7.3.3 C&D Disposal 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, only a certain number of vehicles will be allowed on the working face at a time. The superintendent and/or equipment operator(s), who will serve as 'spotters', will determine the actual number. 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 that will promote the efficient movement of vehicles to and from the working face, and to expedite the unloading of waste. At no time during normal business hours will the working face be left unattended. Scale house and field staff shall be in constant communication regarding incoming loads and the movement of vehicles on the site, irrespective of facility vehicles or private vehicles. It is the responsibility of the working face superintendent to know where each vehicle in the facility is located and what they are doing at all times.

Portable signs with directional arrows and barricades will be used to direct traffic to the correct unloading area. The approaches 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. Personnel will direct traffic as 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 to control windblown waste, preserve aesthetics, and minimize the amount of required periodic cover.

Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either periodic or final cover, as appropriate. 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: IV max.) using a minimum number of three full passes. Depending on the nature of the wastes and long-term volume analysis of in-situ density, the waste placement geometry and compaction procedures may require adjustment to optimize airspace.

7.3.4 Spreading and Compaction

The working face shall be restricted to the smallest possible area; ideally, the maximum working face area with exposed waste shall be one-quarter to one-half acre. Wastes shall be compacted as densely as practical. Appropriate methods shall be employed to reduced wind-blown debris including (but not limited to) the use of wind fences, screens, temporary soil berms, and periodic cover. Any wind-blown debris shall be recovered and placed back in the landfill and covered at the end of each working day.

7.3.5 Special Wastes: Asbestos Management

Any asbestos handling and disposal will follow specific NC DENR regulations with proper shipping manifests and documentation of disposal. Asbestos shall arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator and if accompanied by a proper NC DMV transport manifest. Once the hauler brings the asbestos to the landfill, operations personnel will direct the hauler to the designated asbestos disposal area. Operations personnel will prepare the designated disposal area 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 shall record the location and elevation of the asbestos waste once cover is in-place. Records of the disposal activity shall be entered into the **Operating Record**. Once disposal and recording for asbestos waste is completed, the disposal area may be covered with C&D waste. No further excavation into recorded asbestos disposal areas will be permitted.

7.4 Cover Material

7.4.1 Periodic Cover

The working face of the CDLF shall be covered on a weekly basis, or sooner if the area of exposed waste exceeds one-half acre in size. Periodic cover shall consist of a 6 inch layer of earthen material that completely covers the waste to control vectors, fire, odors,

and blowing debris. Alternative periodic cover may be considered, subject to a demonstration project with prior approval from the Division. Placement of periodic cover shall be documented on the **O&M Checklist** (**Appendix 4D**) and on a copy of the facility map – these items shall be filed with the **Operating Record**.

7.4.2 Interim Soil Cover

An interim soil cover (at least 24 inches in thickness) shall be placed on inactive slopes, subject to the following conditions:

- Interior slopes adjacent to future expansion (such as a cell or phase boundary) no later than 30 days following the last waste receipt, providing that further waste disposal will occur within one year of the last waste receipt*

- Exterior slopes that have attained final grade but which are to be left for no more than 20 days without temporary vegetation, until an area of no more than 10 acres is ready to be closed simultaneously.**

*North Carolina Solid Waste Rule 15A NCAC 13B .0543 requires final cover to be placed if the slope shall remain inactive for more than one year

**Typically, it is advantageous to close the final slopes in 2 to 3 acre increments, observing the placement of erosion control benches; 10 acres is the regulatory maximum

Interim cover soils shall be vegetated in accordance with the Seeding Schedule presented in the Facility Drawings. Either temporary or permanent vegetation may be required – and alternate ground cover may be considered – depending on the time duration of inactivity. Placement of interim cover shall be documented on the **O&M Checklist** and on a copy of the facility map – these items shall be filed with the **Operating Record**.

7.4.3 Final Cover

Exterior slopes shall be closed upon reaching final grades in increments throughout the operation of the facility. Placement of final cover shall conform to the design and CQA requirements presented in the **Closure and Post-Closure Plan** (**Section 8.0**) and shall be documented on the **O&M Checklist** (**Appendix 4D**) and on the facility map.

The permitted final cover for Phase 1A consists of a minimum of 18 inches of compacted soil cover (maximum 10^{-5} cm/sec permeability requirement), overlain by 18 inches of

vegetation support soil. In general, the final soil cover shall be spread in at least two uniform lifts (maximum of 9 inches before compaction, 6 inches after compaction), and soils shall be compacted by "tracking" with dozers or other equipment. North Carolina Solid Waste regulations require a maximum permeability, achieved through proper material selection and compaction criteria, confirmed by the testing program outlined in the **CQA** section of the **Closure and Post-Closure Plan**.

All disturbed soils shall be vegetated with a seed mix that is suitable to climatic conditions (see construction plans) within 20 days following completion of the grading, in accordance with the **Sedimentation and Erosion Control Rules, 15A NCAC 4**. All seeded areas should be provided with lime, fertilizer and straw mulch. An emulsified tack may be required to prevent wind damage. Other stabilization treatments, e.g., curled wood matting of synthetic slope stabilization blankets may be employed.

At the operator's discretion, wood mulch may be spread evenly over the final surfaces – at a maximum thickness of 2 inches – to help retain moisture and retard erosion while the vegetation develops. By SWS definition this material is not recognized to provide nutrient value but the partial decomposition of the wood mulch over time does introduce organic content to the soils, which were typically derived from deep within the borrow pit. Typically, the mulch takes about a year to break down and does benefit the effort of establishing vegetation, as long as the mulch is not applied too thick. This allows the operator some flexibility is establishing vegetation at optimum times of the year – ***the S&EC rules require seeding within 20 days following completion of the grading***.

A nurse crop of seasonal vegetation can be sown at the time the slopes are finished and a permanent crop can be sown later, typically requiring manual sowing to prevent damaging the existing vegetation (refer to the **Seeding Schedule** in the **Closure Plan construction drawings**). ***All protective measures must be maintained until permanent ground cover is established and is sufficient to restrain erosion on the site.***

If settlement occurs after the cover is placed, the cover shall be fortified with additional soil. In the case of extreme settlement (unlikely), the old cover can be stripped and the affected area built up with waste prior to replacing the cover. The sedimentation and erosion control criteria governing the final closure of this facility are performance-based; some trial and error may be required, but the goal is to protect the adjacent water bodies and buffers throughout the operational and post-closure periods.

7.5 Survey for Compliance

7.5.1 Height Monitoring

The landfill staff will monitor landfill top and side slope elevations on a weekly basis or as needed to ensure proper slope ratios, in accordance with the approved grading plan, and to ensure the facility is not over-filled. This shall be accomplished by use of a surveyor's level and a grade rod. When such elevations approach the grades shown on the Final Cover Grading Plan, the final top-of-waste grades will be staked by a licensed surveyor to limit over-placement of waste.

7.5.2 Annual Survey

The working face shall be surveyed on an annual basis to verify slope grades and to track the fill progression. In the event of problems (slope stability, suspected over-filling), more frequent surveys may be required at the request of the Division.

7.6 Contingency Plan

Refer to **Section 5.14**

7.7 Annual Reporting

Refer to Sections **5.12** and **5.13**

Table 2
Prohibited Wastes in the CDLF Unit**

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

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

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

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

(5) Liquid wastes,

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

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

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

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

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

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

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

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

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

(15) The following wastes cannot be received if separate from C&DLF waste:

- lamps or bulbs, e.g., halogen, incandescent, neon or fluorescent;
- lighting ballast or fixtures;
- thermostats and light switches;
- batteries, e.g., those from exit and emergency lights and smoke detectors;
- lead pipes;
- lead roof flashing;
- transformers;
- capacitors; and
- copper chrome arsenate (CCA) and creosote treated woods.

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

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

(18) Waste that is generated outside the boundaries of a unit of local government ordinance (i.e., areas not approved by County Commissioners).

**Reference: 15A NCAC 13B .0542

8.1 Summary of Regulatory Requirements

8.1.1 Final Cap

The final cap design for all phases of the CDLF shall conform to the minimum requirements of the Solid Waste Rules, i.e., the compacted soil barrier layer shall exhibit a thickness of 18 inches and a field permeability of not more than 1.0×10^{-5} cm/sec. The overlying vegetative support layer shall be 18 inches thick. **Drawings E2 – E5** show final contours and **Drawings EC1 – EC3** show final cover cross-section and details.

8.1.2 Construction Requirements

Final cap installation shall conform to the approved plans (see accompanying plan set), inclusive of the approved Sedimentation and Erosion Control Plan. The CQA plan must be followed (see **Section 4.0**) and all CQA documentation must be submitted to the Division. Post-settlement surface slopes must not be flatter than 5% (on the upper cap) and not steeper than 25% (on the side slopes). Per the **2006 C&D Rules**, a gas venting system is required for the cap. A passive venting system will be specified, which will consist of a perforated pipe in crushed stone-filled trench – installed just below the final cap soil barrier layer – with a ***tentative minimum vent spacing of three vents per acre.*** **Drawing EC2** shows the gas vent system details.

8.1.3 Alternative Cap Design

The **2006 C&D Rules** make a provision for an alternative cap design, to be used in the event that the permeability requirements for the compacted soil barrier layer cannot be met. Past experience indicates that on-site soils may not meet the required field permeability of not more than 1.0×10^{-5} cm/sec, as supported by the laboratory data for the soils discussed in **Section 4.0**. Tentative final closure plans have assumed that on-site soils will be used for the compacted barrier layer – alternative cap designs may be researched and submitted for Division approval at a future time.

8.1.4 Division Notifications

The Operator shall notify the Division prior to beginning closure of any final closure activities. The Operator shall place documentation in the Operating Record pertaining to the closure, including the CQA requirements and location and date of cover placement.

8.1.5 Required Closure Schedule

The Operator shall close the landfill in increments as various areas are brought to final grade. The final cap shall be placed on such areas subject to the following:

- No later than 30 days following last receipt of waste;
- No late that 30 days following the date that an area of 10 acres or greater is within 15 feet of final grades;
- No later than one year following the most recent receipt of waste if there is remaining capacity.

Final closure activities **shall be completed within 180 days** following commencement of the closure, unless the Division grants extensions. Upon completion of closure activities for each area (or unit) the Owner shall notify the Division in writing with a **certification by the Engineer** that the closure has been completed in accordance with the approved closure plan and that said documentation has been placed in the operating record.

8.1.6 Recordation

The Owner shall record on the title deed to the subject property that a CDLF has been operated on the property and file said documentation with the Register of Deeds. Said recordation shall include a notation that the future use of the property is restricted under the provision of the approved closure plan.

8.2 Closure Plan

The following is a tentative closure plan for CDLF Phase 2, based on the prescribed operational sequence and anticipated conditions at the time of closure.

8.2.1 Final Cap Installation

8.2.1.1 Final Elevations – Final elevation of the landfill shall not exceed those depicted on **Drawing E2** when it is closed, subject to approval of this closure plan. The elevations shown include the final cover. A periodic topographic survey shall be performed to verify elevations.

8.2.1.2 Final Slope Ratios – All upper surfaces shall have at least a 5 percent slope, but not greater than a 10 percent slope. The cover shall be graded to promote positive

drainage. Side slope ratios shall not exceed 3H:1V. A periodic topographic survey shall be performed to verify slope ratios.

8.2.1.3 Final Cover Section – The terms "final cap" and "final cover" both apply. The final cover will subscribe to the minimum regulatory requirement for C&D landfills:

- An 18-inch thick compacted soil barrier layer (CSB), i.e., the "infiltration layer," with a hydraulic conductivity not exceeding 1 x 10^{-5} cm/sec,

  overlain by

- An 18-inch thick "topsoil" or vegetated surface layer (VSL), i.e., the "erosion layer."

8.2.1.4 Final Cover Installation – All soils shall be graded to provide positive drainage away from the landfill area and compacted to meet applicable permeability requirements (see **Section 4.0**). Suitable materials for final cover soil shall meet the requirements defined above. Care shall be taken to exclude rocks and debris that would hinder compaction efforts. The surface will then be seeded in order to establish vegetation.

Test Pad – Whereas the lab data indicate that the required permeability is attainable, the ability to compact the materials in the field to achieve the required strength and permeability values shall be verified with a field trial involving a test pad, to be sampled with drive tubes and laboratory density and/or permeability testing, prior to full-scale construction. The materials, equipment, and testing procedures should be representative of the anticipated actual final cover construction. The test pad may be strategically located such that the test pad may be incorporated into the final cover.

Compacted Barrier – Materials shall be blended to a uniform consistency and placed in two loose lifts no thicker than 9 inches and compacted by tamping, rolling, or other suitable method – the targeted final thickness is 18 inches minimum. A thicker compacted barrier is acceptable. The cover shall be constructed in sufficiently small areas that can be completed in a single day (to avoid desiccation, erosion, or other damage), but large enough to allow ample time for testing without hindering production. The Contractor shall take care not to over-roll the cover such that the underlying waste materials would pump or rut, causing the overlying soil layers to crack – adequate subgrade compaction within the upper 36 inches of waste materials and/or the intermediate cover soil

underlying the final cover is critical. All final cover soils shall be thoroughly compacted through the full depth to achieve the required maximum permeability required by Division regulations of 1.0×10^{-5} cm/sec, based on site-specific test criteria (see below). Compaction moisture control is essential for achieving adequate strength and permeability.

Vegetated Surface Layer – Materials shall be blended and placed in two loose lifts no thicker than 12 inches and compacted by tamping, rolling, or other suitable method – the targeted final layer thickness is 18 inches minimum per the design criteria. A thicker soil layer is acceptable. A relatively high organic content is also desirable. The incorporation of decayed wood mulch or other organic admixtures (WWTP sludge, with advance permission from the Division) is encouraged to provide nutrient and enhanced field capacity. These surface materials are not subject to a permeability requirement, thus no testing will be specified. Care should be taken to compact the materials sufficiently to promote stability and minimize erosion susceptibility, but not to over-compact the materials such that vegetation would be hindered. Following placement and inspection of the surface layer, seed bed preparation, seeding and mulching should follow immediately. The work should be scheduled to optimize weather conditions, if possible.

Inspection and Testing – Soils for the barrier layer are subject to the testing schedule outlined in the Construction Quality Assurance plan (see **Section 4.0**). The proposed testing program includes a minimum of one permeability test per lift per acre and four nuclear density gauge tests per lift per acre, to verify compaction of the compacted barrier layer. The moisture-density-permeability relationship of the materials has been established by the laboratory testing (discussed elsewhere in this report). The Contractor shall proof roll final cover subgrade materials (i.e., intermediate cover), which consist of essentially the same materials as the compacted barrier layer (without the permeability requirements), to assure that these materials will support the final cover.

8.2.1.5 Final Cover Vegetation – Seedbed preparation, seeding, and mulching shall be performed accordance the specifications provided in the Construction Plans (see **Drawing EC2**), unless approved otherwise (in advance) by the Engineer). In areas to be seeded, fertilizer and lime typically should be distributed uniformly at a rate of 1,000 pounds per acre for fertilizer and 2,000 pounds per acre for lime, and incorporated into the soil to a depth of at least 3 inches by disking and harrowing. The incorporation of the fertilizer and lime may be a part of the cover placement operation specified above. Distribution by means of an approved seed drill or hydro seeder equipped to sow seed and distribute lime and fertilizer at the same time will be acceptable. Please note that the seeding schedule varies by season.

All vegetated surfaces shall be mulched with wheat straw and a bituminous tack. Areas identified as prone to erosion mat be secured with curled-wood excelsior, installed and pinned in accordance with the manufacturer's recommendations. Certain perimeter channels will require excelsior or turf-reinforcement mat (TRM), as specified in the Channel Schedule. Alternative erosion control products may be substituted with the project engineer's prior consent. All rolled erosion control materials should be installed according to the generalized layout and staking plan found in the Construction Plans or the manufacturer's recommendations.

Irrigation for landfill covers is not a typical procedure, but consideration to temporary irrigation may be considered if dry weather conditions prevail during or after the planting. Care should be taken not to over-irrigate in order to prevent erosion. Collected storm water will be suitable for irrigation water. Maintenance of the final cover vegetation, described in the Post-Closure Plan (see below), is critical to the overall performance of the landfill cover system.

8.2.1.6 Documentation – The Owner shall complete an "as-built" survey to depict final elevations and to document any problems, amendments or deviations from the Construction Plan drawings. Records of all testing, including maps with test locations, shall be prepared by the third-party CQA testing firm. All materials pertaining to the closure shall be placed in the Operational Record for the facility. Whereas the closure will be incremental, special attention shall be given to keeping the closure records separate from the normal operational records.

8.2.2 Maximum Area/Volume Subject to Closure

The largest anticipated area that will require final closure at any one time within the next 5-year period – including all of Phase 1 is **8.18 acres** (stated in the Permit to Construct).

Intermediate cover shall be used on areas that have achieved final elevations until the final cover is installed. It is fully anticipated that portions of Phase 1 (i.e., Phase 1A) will be closed prior to the opening of Phase 2. An annual adjustment is required by the Division for the open area (and the bond requirement). Based on the volumetric analysis for Phase 1 (**Appendix 1**), the volume of Phase 1 is 478,484 cubic yards (**Section 1.3**).

8.2.3 Closure Schedule

Refer to the requirements outlined in **Section 8.1.5** (above).

8.2.4 Closure Cost Estimate

The foregoing cost estimate is considered suitable for the **Financial Assurance** requirements (see **Section 9.0**).

TABLE 8A
ESTIMATED FINAL CLOSURE COSTS FOR PHASE 1 (2010 dollars) [1]

VSL (topsoil)[2] – 8.18 ac	19,795 c.y.	@	$4 / cubic yard	$ 79,182
CSB (barrier)[2] – 8.18 ac	22,764 c.y.	@	$10 / cubic yard	$227,640
Establish Vegetation	8.18 acres	@	$1,800 per acre	$ 14,724
Storm Water Piping [3]	200 LF	@	$35.00 / LF	$ 7,000
Erosion Control Stone [3]	10 tons	@	$40.00 / ton	$ 400
Cap Gas Vents (3/acre)	24	@	$100 ea	$ 2,400
Testing and Surveying [4]	Estimated 20 percent of above			$ 65,781
Contingency	Estimated 15 percent of above			$ 49,343
	Total Construction Cost (if contracted out)			**$ 446,470**

Notes:

1 Intended to represent likely third-party construction costs (hired contractor, not the Owner/Operator), based on knowledge of local construction costs for similar projects – these estimates provided to meet NC DENR Division of Waste Management financial assurance requirements; actual costs may be lower for construction by the Owner/Operator; final closure work will be performed incrementally, spreading out the costs over the life of the project.

2 Includes soil work for regulatory requirements of the 2006 C&D Rules, i.e., a minimum of 18 inches of compacted soil barrier (max. permeability of 1×10^{-5} cm/sec) and 18 inches of topsoil (total soil thickness is 36 inches). For the compacted soil barrier, use a shrinkage factor of 15%; costs include surface preparation, soil procurement and transport costs, soil placement and compaction, machine/equipment costs, fuel costs

3 Conservative estimate based on similar project history; includes materials and installation

4 Includes Construction document and bidding, construction administrative fee, CQA field monitoring and lab testing, CQA reporting and certification, final survey for as-built drawings, recordation/notation fee

8.3 Post-Closure Plan

8.3.1 Monitoring and Maintenance

8.3.1.1 Term of Post-Closure Care – The facility shall conduct post-closure care for a minimum of 30 years after final closure of the landfill, unless justification is provided for a reduced post-closure care period. The post-closure care period may be extended by the Division if necessary to protect human health and the environment.

8.3.1.2 Maintenance of Closure Systems – Inspections of the final cover systems and sediment and erosion control (S&EC) measures shall be conducted quarterly. Maintenance will be provided during post-closure care as needed to protect the integrity and effectiveness of the final cover. The cover will be repaired as necessary to correct the effects of settlement, subsidence, erosion, or other events. Refer to the **Post Closure Monitoring and Maintenance Schedule** (below).

8.3.1.3 Landfill Gas Monitoring – Quarterly methane monitoring will be conducted during the operational period and for at least five years following closure via bar-hole punch tests at selected locations (see Drawing MP-1), and by sampling the head-space in monitoring wells with an Organic Vapor Analyzer (OVA), or similar equipment, during routine sampling events and continual monitoring in on-site buildings via a gas detection meter. If, after 5 years of post-closure landfill gas monitoring, no explosive gas is detected the permittee may apply to the Solid Waste Section for reducing or discontinuing the landfill gas sampling. If gas is detected the Division will be notified and an evaluation of protective measures will be performed.

Locations for the initial detection monitoring of methane were based on site conditions (physical barriers to gas migration, i.e. surface streams), the presence of man-made conduits for potential gas migration (i.e., pipelines), and past experience with numerous gas monitoring and remediation programs at other facilities. The bar-hole punch tests are intended to provide early indication of deep gas migration outside the waste unit boundary, so accomplished by monitoring the backfill zones of the pipelines – notice the elevation at the pipelines relative to the horizontal and vertical waste limits on Drawing MP-1. The pipelines are generally across the "north" unnamed tributary from the CDLF boundary – for a short distance the sanitary sewer pipeline is on the south bank of the stream, but the gas is unlikely to cross beneath the stream with the pipeline because the backfill is saturated. The facility boundary is across the streams in three directions, but attention will be given to the east side of the landfill, the directions in which occupied structures are located, which is up gradient and not separated by a stream.

If the data so warrant, future consideration will be given to permanent gas sampling probes, using the bar hole punch data as a guide for selecting the probe locations.

8.3.1.4 Ground Water Monitoring – Groundwater monitoring will be conducted under the current version of the approved **Sampling and Analysis Plan** (see **Appendix 6.0**). This plan will be reviewed periodically and may change in the future. Approximately one year prior to the landfill reaching permitted capacity, the facility will submit post-closure monitoring and maintenance schedules, specific to the ground water monitoring. Procedures, methods, and frequencies will be included in this plan. This future plan, and all subsequent amendments, will be incorporated by reference to this document.

8.3.1.5 Record Keeping – During the post closure period, maintenance and inspection records, i.e., a **Post Closure Record**, shall be kept as a continuation of the **Operating Record** that was kept during the operational period. The Post Closure Record shall include future inspection and engineering reports, as well as documentation of all routine and non-routine maintenance and/or amendments. The Post Closure Record shall include the ground water and gas monitoring records collected for the facility.

8.3.1.6 Certification of Completion – At the end of the post-closure care period the facility manager shall contact the Division to schedule an inspection. The facility manager shall make the Post Closure Record available for inspection. A certification that the post-closure plan has been completed, signed by a North Carolina registered professional engineer, shall be placed in the operating/post closure record. C&D Landfill, Inc. shall maintain these records indefinitely.

TABLE 8B
POST-CLOSURE MONITORING AND MAINTENANCE SCHEDULE

Activity	Frequency Yrs. 1 - 5	Frequency Yrs. 6-15	Frequency Yrs. 16-30
General - Inspect access gates, locks, fences, signs, site security	Quarterly	Quarterly	Quarterly
Maintain access roads, monitoring well access	As needed	As needed	As needed
Final Cover Systems/Stability - Inspect cap and slope cover for erosion, sloughing, bare spots in vegetation, make corrections as needed (1)	Quarterly	Semi-Annually	Annually
Storm Water/Erosion Control Systems - Inspect drainage swales and sediment basin for erosion, excess sedimentation (1)	Quarterly	Semi-Annually	Annually
Mow cover vegetation and remove thatch	Semi-Annually	Annually	None (2)
Inspect vegetation cover and remove trees	Annually	Annually	Annually
Landfill Gas Monitoring	Quarterly (3)	Quarterly (3)	Quarterly (3)
Ground Water Monitoring System - Check well head security, visibility	Semi-Annually	Semi-Annually	Semi-Annually
Ground Water Monitoring (4)	Semi-Annually	Semi-Annually	Semi-Annually

Notes:

1. Inspect after every major storm event, i.e., 25-year 24-hour design storm
2. Dependent on vegetation type, periodic mowing may be required
3. The Solid Waste Section may be petitioned for discontinuation of gas monitoring if no detections occur in gas sampling locations or on-site buildings
4. See current Ground Water Sampling and Analysis Plan

8.3.2 Responsible Party Contact

Mr. R.E. 'Gene' Petty, Sr. – Owner
Mr. Ronnie E. Petty, III – Operator
A-1 Sandrock, Inc.
2091 Bishop Road
Greensboro, NC 27406 Tel. 336-855-8195

8.3.3 Planned Uses of Property

Currently, there is no planned use for the landfill area following closure. The closed facility will be seeded with grass to prevent erosion. Any post-closure use of the property considered in the future will not disturb the integrity of the final cover or the function of the monitoring systems unless necessary (and to be accompanied by repairs or upgrades). Future uses shall not increase the potential threat to human health and the environment.

8.3.4 Post-Closure Cost Estimate

The following cost estimate is considered representative of post-closure care costs for the **Financial Assurance** (see **Section 10.0**).

TABLE 8C
ESTIMATED POST-CLOSURE COSTS FOR PHASE 1 (in 2010 dollars)

Annual Events	Units		Unit Cost	Cost/ Event	Annual Costs
Reseeding/mulching and erosion repair (Assume 5% of 25 ac., once per year)	0.60	ac.	$1,600	$960.00	$960.00
Mow final cap (twice per year)	11.5	ac.	$25	$287.50	$575.00
Ground Water (semi-annual, 5 wells)*	5	ea.	$400	$2000.00	$4000.00
Surface Water (semi-annual, 4 locations)*	4	ea.	$350	$1400.00	$2800.00
Water quality analysis and reporting	2	ea.	$2250	$4500.00	$4500.00
Landfill Gas Monitoring (semi-annual)	4	ea.	$500	$2000.00	$2000.00
Engineering inspection (annual basis)	1	ea.	$1,500	$1,500.00	$1,500.00
Maintain storm water conveyances	1	ea.	$1,000	$1,000.00	$1,000.00
Maintain access roads, gates, buildings	1	ea.	$500	$500.00	$500.00
*Appendix I Detection Monitoring (**Section 9.0**)	**Total Estimated Annual Cost**				**$17,835.00**

9.1 Summary of Regulatory Requirements

Detection phase monitoring for ground water and surface water is required of all C&D landfills. Typical monitoring programs include one or more up gradient background wells and several down gradient (or cross gradient) compliance wells, along with several strategically placed surface water sampling locations (with up gradient and down gradient coverage). Well placement is based on the site's hydraulic and topographic characteristics; compliance wells are located at a regulatory "review boundary" approximately half the distance to the "compliance boundary" – established 50 feet inside the facility boundary, or 150 feet from the waste boundary at a C&D landfill.

Detection phase monitoring for all landfills includes semi-annual sampling and analysis for ensuring compliance with North Carolina ground water standards, i.e., **15A NCAC 2L .0300** (the "2L rules"). The detection phase sampling list includes organic constituents on the Appendix 1 list [3] (i.e., volatiles and semi-volatiles that are analyzed by US-EPA Method 8260 and the eight RCRA metals), key indicator parameters (measured in the field), and – new for the **2006 C&D Rules** – several additional constituents (mercury, manganese, sulfate, iron, alkalinity, and total dissolved solids). Assuming no detects of ground water constituents that exceed a 2L standard, the term of detection phase monitoring runs for the operational life of the facility plus the post-closure period (minimum of 30 years beyond closure). Should one or more detected constituents exceed a 2L standard, the facility must undergo an expanded assessment monitoring program to determine the source, extent, and rate of contaminant migration, plus an evaluation of potential human receptors and/or other environmental impacts.

The **Sampling and Analysis Plan** (discussed below, see **Appendix 6**), considers both present and anticipated future needs of the assessment monitoring program, with respect to surface water sampling and strategic placement of monitoring wells, but the program described herein stands alone for detection phase monitoring for the C&D landfill.

9.2 Ground Water Monitoring

The following discusses the rationale behind planned amendments to the detection phase monitoring program for the C&D landfill, reflected in the **Sampling and Analysis Plan** (see **Appendix 6**). The format of the SAP is consistent with that used for numerous Division-accepted landfill monitoring programs.

[3] 40 CFR Part 258

9.2.1 Monitoring System Requirements

The 2002 Design Hydrogeologic study indicated a radial ground water flow pattern toward the west, southwest, and northwest. This flow pattern reflects surface topography along a pronounced ridge, surrounded on three sides by surface streams (i.e., ground water receptors). Based on site topography and hydrogeologic conditions, predominant ground water flow direction is to the west (toward Hickory Creek). Medium dense to dense sandy surficial soils serves as the uppermost (unconfined) aquifer (**Unit 1**), which transitions with depth to bedrock **(Unit 2**). The transition zone includes a layer of dense but porous saprolite called "partially weathered rock" in engineering parlance, which has been identified as the primary water bearing zone. This zone exhibits both partial confinement – resulting in water levels typically higher than the actual water bearing zone – and good dispersive characteristics with nearly ubiquitous presence.

Wells screened within the deeper **Unit 1** zone have a high probability of intersecting the uppermost ground water flow zones for effective monitoring of the facility, but the well screens will likely be beneath the static water levels much of the time. Streams that surround the site serve as the discharge points for a relatively confined, closed-loop aquifer system. The radial flow pattern toward the streams and distinct topographic features – reflective of the underlying regional joint pattern – makes well selection based on topographic features relatively straightforward. With the on-site discharge points, the ground water flow regime is well defined, thus the monitoring system can be effective with fewer wells. Current well locations (see **Drawing MP1**) are appropriate for monitoring Phase 1.

9.2.2 Background Water Quality

Low concentrations of metals have been detected at the facility background wells and the baseline sampling of the compliance wells. No concentrations of inorganic constituents were present that affect the ability to monitor the site.

9.2.3 Point of Compliance Water Quality

The 15A NCAC 2L ground water standards are applicable for the compliance boundary, tempered with background water quality data. For constituents that do not have promulgated 2L standards, the Division will consider the Solid Waste Section Limits for future compliance issues.

9.2.4 Sampling and Analysis Procedures

Industry accepted protocols (also consistent with Division guidelines)[4] are discussed in the **Sampling and Analysis Plan** (see **Appendix 6**).

9.2.5 Detection-phase Monitoring Parameters

The sampling parameters consist of the **EPA Appendix I** list of organic constituents and metals, modified by the **2006 C&D Rules**.

9.2.6 Sampling Frequency

The detection phase sampling frequency shall be semi-annually.

9.2.7 Water Level Elevations

During each sampling event, water levels shall be measured from the top-of-casing at each monitoring well.

9.2.8 Reporting

Data analysis and reporting, consistent with Division requirements, are described in the **Sampling and Analysis Plan** (see **Appendix 6**).

9.2.9 Source Demonstration

In the event of the detection of a ground water constituent that exceeds a 2L standard, an evaluation may be made in accordance with Division policy to determine the source, e.g., sampling error, laboratory contamination, extenuating circumstances (improper repairs to a well or incidental spill near a well). Typically, such evaluations are accompanied by re-sampling and, if appropriate, correction of conditions that may have lead to the detection. If such demonstrations cannot be made, the landfill might be considered as the source.

9.2.10 Monitoring Well Design

Wells shall be (and currently are) designed in accordance with **15A NCAC 2C**.

[4] NC DENR Division of Waste Management Guidance Document, Ground Water Sampling for Construction and Demolition, Closed or Industrial Landfills, http://www.wastenotnc.org/swhome/enviro_monitoring.asp

9.2.11 Monitoring Well Layout

The layout takes advantage of topographic features, the shape of the top of the confining unit (as indication of buried former channels), regional flow conditions and access considerations within the generally hilly terrain.

9.2.12 Alternative Monitoring Systems

None are proposed at this time.

9.2.13 Assessment Monitoring

Requirements of assessment monitoring, if required, are outlined in **Rule .0545** of the **2006 C&D Rules**. If such conditions exist in the future at the CDLF that requires assessment monitoring, a plan will be prepared for review by the Division. It is not anticipated at this time that future assessment activities will be required.

9.3 Surface Water Monitoring

Surface water monitoring should (and does) focus on the creek and unnamed tributaries shown to be shallow ground water discharge features to the north, west, and south of the Phase 1 footprint. Upstream monitoring on these water bodies, which converge at the site margins, and monitoring of the larger stream at the point it leaves the property will provide excellent monitoring of the surface water. The surface water sampling locations are shown on **Drawing MP1**. The North Carolina 2L ground water standards will apply. Samples will be analyzed for Appendix I parameters, consistent with the ground water samples. A separate storm water sampling program focuses on turbidity and sediment, with sampling conducted under the purview of the NC DENR Division of Water Quality and in accordance with a NPDES General Storm Water Permit.

9.4 Landfill Gas Monitoring and Control Plan

Landfill gas is a by-product from the decomposition of organic waste in a sanitary landfill, including certain C&D wastes. Landfill gas typically includes methane, which can be explosive under certain conditions, and gas has been known to promote the migration of contaminants into ground water. The Solid Waste Rules typically focus on the explosive properties from a public safety standpoint. Normally, gas migrates above the ground water table and is restricted laterally by streams. Pipelines are present that may serve as potential conduits for off-site landfill gas migration at this facility – the

nearest pipeline (sewer line) is the target for gas monitoring – although the on-site soils are porous and can potentially serve as gas migration pathways, the pipelines and nearest occupied structures are located across surface streams, which act as natural barriers to gas migration. No structures exist nearby that appear to be at risk for gas migration.

The landfill gas management plan for **A-1 Sandrock, Inc. CDLF** is currently proposed to include monitoring of subsurface soil-gas adjacent to the landfill via bar-hole punch tests and headspace analysis of monitoring wells (see **Drawing MP1**). Some of the gas monitoring locations will be situated along the nearest pipeline corridor. Passive landfill gas vents will be installed along with the final cover system at a density of approximately three vents per acre of final cap surface area – these will not be monitored. A construction detail of these vents is included on **Drawing EC2**.

Landfill gas monitoring will be performed during the active life of the landfill and throughout the post-closure care period. Quarterly methane monitoring will be conducted at all subsurface gas detection locations and in all occupied structures located on the landfill property. The passive gas vents, when installed, are not required to be monitored. Additional sampling may be performed in the future and/or remedial measures will be implemented as required to mitigate a potential gas migration problem.

9.4.1 Regulatory Limits

NCDENR rules require monitoring to the following explosive gas limits:

- 25% of the Lower Explosive Limit (LEL, 5% methane in standard atmosphere), within occupied on-site structures – excluding gas collection/venting structures
- 100% LEL at the facility boundary
- No detectable concentration at off-site occupied structures.

Solid Waste Rule .0544 (d)(3) requires the following responses in the event that methane concentrations are detected that exceed the foregoing methane concentration limits:

(A) Immediately take all steps necessary to ensure protection of human health and notify the Division – at a minimum, occupied structures should be evacuated and ventilated until the methane concentrations subside; close monitoring of structures shall be implemented; for facility boundary violations, further evaluation is warranted (subject to notification and approval by the Division).

(B) Within seven days of detection, place in the operating record the methane or explosive gas levels detected and a description of the steps taken to protect human health; and

(C) Within 60 days of detection, implement a remediation plan for the methane or explosive gas releases, place a copy of the plan in the operating record, and notify the Division that the plan has been implemented. The plan must describe the nature and extent of the problem and the proposed remedy.

(D) Based on the need for an extension demonstrated by the operator, the Division may establish alternative schedules for demonstrating compliance with the limits.

(E) The "lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25 degrees C and atmospheric pressure.

9.4.2 Gas Monitoring Program

Gas monitoring will be conducted along the perimeter boundary of the facility, at locations shown approximately on **Drawing MP1**, within occupied structures on the site (scale house), and in the head-space of monitoring wells.

Equipment: A portable combustible gas monitor, e.g., an Organic Vapor Analyzer (OVA) or Photo-Ion Detector (PID), shall be used to measure the concentration of combustible gases at sampling locations in units of percent of lower explosive limit. Lower explosive limit (LEL) means the lowest percent by volume of a mixture of combustible gas in air that will propagate a flame at 25 degrees Celsius and atmospheric pressure. The gas monitor shall be calibrated to methane using the manufacturer's calibration kit and procedure before the monitoring activities begin.

On-site Structures: Gas monitoring in on-site structures will be conducted during regular quarterly monitoring events at the earliest possible time after the structure has been unused (e.g., early morning). The monitoring locations will be in corners along floors and ceilings, at cracks in the floor, and at other areas likely to accumulate gas. Gas monitoring will also be conducted in any confined space requiring the entry of personnel for maintenance or inspection. The monitoring will take place prior to entry by personnel in accordance with OSHA regulations.

Gas Detection Bar-Hole Punch Locations: Gas monitoring in bar-hole punches will consist of punching a hole with a 3-foot probe. Tubing that is open-ended and perforated on the bottom should be placed in the bottom of the hole, taking care not to plug the bottom of the tubing with soil. The peak methane reading should then be recorded for each bar-hole probe location.

Monitoring Well Head-Space: The well heads will be sampled during routing ground water monitoring events.

Record Keeping: The operator will record the date, time, location, sampling personnel, atmospheric temperature, reported barometric pressure, and general weather conditions at the time of sampling, in addition to the concentration of combustible gases (see the example **Landfill Gas Monitoring Field Log** in **Appendix 6**). These monitoring records shall be maintained in the landfill operating record book.

9.4.3 Corrective Action

Prior to initiating corrective action, the monitoring plan may be augmented to include more sampling locations (possibly focusing on occupied structures in the area), permanent probes (in lieu of bar-hole punch tests), and /or more frequent sampling. Corrective action to control gas migration, if any is required, might consist of additional passive venting and/or active gas recovery. The likelihood of such measures ever being required is remote – this issue is addressed in the interest of compliance with the rules.

9.5 Adherence to Waste Acceptance Criteria

Monitoring of the waste intake is addressed in the **Operations Plan** (see **Section 5.0**). The plan calls for routine waste screening and record keeping with respect to waste types, sources, and haulers. Maintaining strict adherence to the waste acceptance criteria is the sure way to maintain compliance with ground water quality criteria.

9.6 Plan Preparation and Certification

This monitoring plan for the C&D Landfill, Inc., disposal units has been prepared by, or under the responsible charge of, one or more North Carolina Licensed Geologists or Professional Engineers. The individual signature and seal below attests to compliance with this rule requirement.

Signed _____

Printed _____

Date _____

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

The **2006 C&D Rules** require that Owners/Operators demonstrate financial assurance for closure and post-closure activities. Typically, for local government-owned facilities, said demonstration is based on a local government test. For private facilities, the posting of a performance bond or insurance policy is typically acceptable to the Division.

Cost estimates for closure and post-closure of CDLF Phase 1 are presented in **Sections 8.2.4** and **8.3.4**, respectively. The following is a detailed analysis of the closure and post closure costs, based on the preceding, all in 2009 dollars, projected over the anticipated life of the landfill and 30 years of post-closure care. It should be realized that the bond requirement is for the whole landfill that has a Permit to Operate – the liabilities both increase and decrease with time as phases are opened and others are closed. Thus, the amount of the post-closure instrument should be adjusted on an annual basis, consistent with Division policy. Acceptable financial assurance instruments include performance bonds, insurance policies, cash deposits and irrevocable letters of credit.

SUMMARY OF CLOSURE AND POST-CLOSURE COST

1.	Final Closure Construction (see **Table 8A**)	$ 446,470
2.	Projected Post-Closure Costs (see **Table 8C**)	
	$17,835 x 30 years =	$ 535,050
	TOTAL CLOSURE/POST-CLOSURE COST	**$ 981,520**

Upon approval of the financial assurance amount (and issuance of the Permit) by NC DENR Division of Waste Management, Owners/Operators must furnish an acceptable financial assurance instrument (e.g., performance bond, irrevocable letter of credit, insurance policy, other fiduciary instrument) within 30 days of notification of approval.

Based on earlier estimates of the closure and post-closure costs, a bond has been secured in the amount of **$988,912**, which exceeds the current total estimated closure/post-closure costs. Said documentation has been furnished to the Division and is included in **Appendix 5.0.**

11.0 CERTIFICATION

This engineering plan for the A-1 Sandrock, Inc., C&D Landfill Phase 1 disposal unit has been prepared by, or under the responsible charge of, a North Carolina Licensed Professional Engineer to meet the requirements of 15A NCAC 13B .0539. The individual signature and seal below attests to compliance with this rule requirement.

Signed _____

Printed _____

Date _____

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

OPERATIONS AND MAINTENANCE CHECKLIST Rev. 1-30-09

Check appropriate box to indicate item was inspected. Complete this form and file in Operating Record daily.

	Weekly	Monthly	Semi-Annual	Annual
TRANSFER STATION				
Trash or Debris on Ground or Driveway at Tipping Door				
Trash or Debris on Ground or Driveway behind Building				
Windblown Debris in Trees behind Building				
Spills or Leaks on Tipping Floor or Driveways (including Loading Bay)				
Tipping Floor Clear at End of Shift (if not, note why below)				
Waste Inspection Forms Filed (Minimum 3 per Week)				
Tipping Floor Washed Down (Minimum Once per Week)				
C&D LANDFILL				
Access Road Passable				
Spills or Leaks on Access Road or Working Face				
Inactive Disposal Areas Covered				
Windblown Debris Escaping Working Face				
Working Face under One-Half Acre (200 x 200 feet)				
Waste Inspection Forms Filed (Minimum 3 per Week)				
Periodic Cover Placed (note When and Where on Map)				
Excess Erosion on Slopes or Benches and Ditches				
Excess Sediment Buildup in Ditches and Basins				
Sediment Basin Primary Outlet Functional (Holding Water over 5 days)				
CLOSED MSWLF AND CDLF UNITS				
Erosion of Slopes, Benches, Ditches				
Vegetation Healthy and Correct Type				
Vegetation Mowed (Minimum Twice per Year)				
Slopes Cracking, Sloughing, Bulging				
MULCH AREA				
Check for Foreign Materials or Trash				
Check for Proper Drainage Conditions				
Note when Materials Ground or Shredded				
Turned or Removed Entire Pile (Minimum Twice per Year)				
ANIMAL BURIAL AREA				
Check for Proper Soil Coverage/Erosion				
Runoff Directed to Sediment Basin				
TIRE AREA				
Spills or Leaks on Roadway				
Trash or Debris on Ground				
All Materials Removed (Check Box on Date When Performed)				
WHITE GOODS AREA				
Proper Drainage Conditions				
All Materials Removed (Check Box on Date When Performed)				
GENERAL SITE CONDITIONS				
Inspect Gates, Locks, Fences, Signs				
Communication and Surveillance Equipment				
Staff Training Certifications Up to Date				
Mow Clear Access Paths to Monitoring Wells				

NOTE ANY UNUSUAL CIRCUMSTANCES OR REQUIRED MAINTENANCE _____

_____

NOTE FOLLOW UP ACTION AND COMPLETION DATE _____

_____

INSPECTED BY _____ DATE _____

REVIEWED BY _____ DATE _____

Attachment 2
Geologist's Subgrade Report

David Garrett & Associates
Engineering and Geology

November 17, 2010

Mr. Ed Mussler, PE
NC DENR Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Engineer's Subgrade Inspection Report
A-1 Sandrock C&D Landfill Phase 1B
Greensboro (Guilford County), North Carolina
Solid Waste Permit No. 41-17

Dear Mr. Mussler:

On behalf of A-1 Sandrock, I am pleased to present this subgrade inspection report pertaining to the referenced landfill construction. Cell 1B is located at the east side of Phase 1, within a previously approved footprint (see **Drawing E1A** which accompanies this text). This report is based in part on multiple first-hand inspections of subgrade conditions between December 2009, when the Six-Month Demonstration Report was completed for Phase 1A operations, through November 2010, when the subgrade was considered finished and an "as-built" survey was performed by Clint Osborn, RLS. The construction of Phase 1B is substantially complete per the approved plans.

The subgrade inspection was made per North Carolina Solid Waste regulations, 15A NCAC 13B .0500 and/or subsequent regulatory protocols. Said inspection requires that the owner's geologist or engineer examine the cell excavation and note any pertinent geologic features exposed during the construction process. The Owner shall notify the NC DENR Solid Waste Section Hydrogeologist of these findings prior to placement of any waste material. In recent experience, a certification has been required stating that the subgrade soils and other conditions are consistent with the approved plans, or noting any differences. This letter completes said required notification and certification.

Subgrade soils consist of clayey and silty fine to medium sand, in general accordance with the findings of earlier test boring investigations. There were scattered pockets of soil containing stringers of small rock fragments (angular, gravel-size quartz fragments); these were considered minor and not deleterious. The subgrade surface was generally dry with no cracking observed. There were pockets of harder materials (not identified as bedrock based on the permitting studies), which were difficult to excavate, i.e., boulders, thus these areas were covered with soil to bring the vertical separation to the required minimum of 4 feet. Test pits with photographic documentation of the vertical separation are found attached to this report (see **Drawing E1A**).

5105 Harbour Towne Drive • Raleigh • North Carolina • 27604
919-231-1818 (Office and Fax) • 919-418-4375 (Mobile) • E-mail: david@davidgarrettpe.com

Overall, the conditions exposed in the Phase 1B subgrade appear consistent with expectations based on the earlier permitting studies, e.g., no obvious large veins, dikes or distinct linear features were visible in the subgrade. I recommend no modifications to the Ground Water Monitoring Plan or Operations Plan based on these findings. I conclude that Phase 1B has been constructed in accordance with the approved plans, with the exception that portions of the subgrade were left a few inches to a couple of feet higher than the planned grades. No further subgrade evaluations are warranted, and I recommend that Phase 1B be approved for operations.

I look forward to meeting with representatives of the NC DENR Solid Waste Section, if needed, to review the work. Please contact me if I can provide any additional data.

Sincerely,

G. David Garrett, P.G., P.E.
Consulting Engineer

Test Pit #1 showing fine grained soil types (note smearing of the sidewalls)

Test Pit #1 showing closeup view of tape measure used to gauge the depth

Test Pit #2 showing minimum 4 feet of vertical separation – no water was present

Test Pit #2 showing the 49 inches depth at the red mark

Attachment 3
As-built survey of Cell B
(Drawing E1A)

DATE	NO.	REVISION
01/24/06	1	REVISED CELL LAYOUT PER OWNER
02/18/09	2	UPDATED C&D PROCESSING FACILITY FOR PERMIT TO OPERATE
03/31/09	3	UPDATED FACILITY PLAN FOR PERMIT TO OPERATE
11/15/10	4	UPDATED FACILITY PLAN FOR CELLS B & C PTC

NOTES:
1. THE REVISED PHASE 1 LAYOUT AS SHOWN HEREON IS AN ADMENDMENT TO THE PHASING LAYOUT AS SHOWN IN THE MINING PERMIT APPLICATION, PERMIT #41-22, ISSUED BY NCDENR DIVISION OF LAND RESOURCES, LAND QUALITY SECTION, NOVEMBER 25, 2005. AND AS SHOWN IN THE C&D PERMIT APPLICATION, PERMIT #41-17 (PERMIT TO CONSTRUCT), ISSUED BY NCDENR DIVISION OF WASTE MANAGEMENT, SOLID WASTE SECTION, FEBRUARY 24, 2004.
2. FOR SEDIMENTATION & EROSION CONTROL DETAILS REFER TO THE C&D PERMIT APPLICATION DRAWINGS, PERMIT #41-17 (PERMIT TO CONSTRUCT), ISSUED BY NCDENR DIVISION OF WASTE MANAGEMENT, SOLID WASTE SECTION, FEBRUARY 24, 2004.

REFERENCE NOTES:
1. GUILFORD COUNTY TAX MAP FOR SUMTER TOWNSHIP: ACL-3-185-755S-7, D.B. 4459, PG. 780.
2. TOPOGRAPHY WITHIN PROPERTY BOUNDARY FROM AERIAL PHOTOGRAPHY DATED 3-27-01, BY SPATIAL DATA. TOPOGRAPHY OUTSIDE PROPERTY BOUNDARY FROM AERIAL PHOTOGRAPHY DATED 1995, BY GUILFORD COUNTY GIS DEPARTMENT.
3. BOUNDARY INFORMATION FROM BOUNDARY MAP PREPARED BY L. DENNIS LEE, P.A., DATED NOV. 14, 2002.

BASE GRADES SHOWN ARE CONSISTENT OR SLIGHTLY HIGHER THAN PERMITTED IN FEBRUARY 2004 BY NCDENR DIVISION OF WASTE MANAGEMENT (PERMIT #41-17).

0 30′ 60′ 90′
1′ = 30′

UNAMED TRIBUTARY "NORTH"
MINOR ROAD REALIGNMENT
50' STREAM BUFFER (TYP.)
CITY OF GREENSBORO SANITARY SEWER EASEMENT
TEST PIT #2
TEST PIT #1
EXIST. SED. TRAP (TYP.)
NEW ALIGNMENT OF ROAD
FINAL GRADES ON SIDE SLOPES
ACTIVE MINING AND LCID PROCESSING FACILITY IN PHASE 1C
APPROXIMATE GRADES (NOT SURVEYED)
LIMITS OF SURVEY NOVEMBER 27, 2010 BY ALLIED ASSOCIATES, INC. CLINT OSBORN, RLS WITH SURVEY POINT NUMBER AND CUT/FILL TO DESIGN GRADE (TYPICAL)
CURRENT WORKING FACE
PHASE 1B BASE GRADES
ORIGINAL CELL A LIMIT (2.54 AC)
PHASE 1A ACTIVE C&D PROCESSING AND DISPOSAL AREA
APPROX. INTERIM GRADES
FUTURE DRAINAGE PATH
COMBINED CELL A AND B FOOTPRINT LIMIT (6.16 AC)
LIMITS OF PHASE 1 2 SHOWN IN 2006 PTC APPLICATION (10.45 ACRES)
ISSUED FOR REGULATORY REVIEW
LCID STOCKPILES
SOIL STOCKPILES
DRAINAGE PATH
E 1749500
E 1750000
N 816500

David Garrett, PG, PE.
Engineering and Geology
5105 Harbour Towne Drive, Raleigh, North Carolina 27604
Email: david_garrett_pg@mindspring.com
919-418-4375 (mobile)
919-231-1818 (Office and Fax)

SEAL
NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER SEAL 019402 DAVID G. GARRETT
11-15-2010

PROJECT TITLE:
A-1 SANDROCK SOUTH MINE
OPERATIONS AND CLOSURE
GUILFORD COUNTY, N.C.
SOLID WASTE PERMIT #41-17

DRAWING TITLE:
PERMIT TO OPERATE
PHASE 1, CELLS A & B
AS-BUILT NOVEMBER 2010

DESIGNED BY:	DRAWN BY:
G.D.G.	A.W.H.
CHECKED BY:	PROJECT NO.:
G.D.G.	SANDROCK-2
SCALE:	DATE:
AS SHOWN	FEBRUARY 2009
FILE NAME	
SROCK-D092	
SHEET NO.	DRAWING NO.
3A	E1A

C:\DGA DOCUMENTS\A1 SANDROCK\OPERATIONS DRAWINGS\SROCK-D092_CELL B_NOV 2010 DATE: NOV 15, 2010 TIME: 6:00 PM

Attachment 4
Updated Facility Plan map
(Drawing E1B)

RM445 ELEV. 742.90
NAIL IN U.S.C.E. CAP IN
S.E. WINGWALL OF BRIDGE

N 817000

N 816500

N 816000

E 1749000

E 1749500

E 1750000

COLONIAL PIPELINE
50-FT R.O.W.

CONCRETE PROCESSING
AND STOCKPILE AREA

CITY OF GREENSBORO
SANITARY SEWER EASEMENT

UNAMED TRIBUTARY "NORTH"

FACILITY BOUNDARY

50' STREAM
BUFFER (TYP.)

MINOR ROAD
REALIGNMENT

EXIST. SED
TRAP (TYP.)

TYPICAL TRAFFIC PATTERN

ACTIVE MINING AND LCID
PROCESSING FACILITY IN
PHASE 1C

APPROXIMATE GRADES
(NOT SURVEYED)

FUTURE DRAINAGE PATH
ALONG 8.18 ACRE LIMIT

SEDIMENT BASIN #1

ACTIVE MINING IN
FUTURE PHASE 2

PHASE 1 LIMITS SHOWN IN ORIGINAL PTC
DRAWINGS - APPROX. 10.45 ACRES

LCID STOCKPILE

TUB GRINDER

MAINTAIN 50-FOOT MINIMUM SPACING BETWEEN PUBLIC ACCESS
AREAS (TIPPING ZONES) AND ACTIVE PROCESSING OR DISPOSAL
AREAS, USE BARRICADES FOR SEPARATION AS NEEDED

PHASE 1B
DISPOSAL AREA
BASE GRADES SHOWN

LCID
TIPPING
AREA

LCID STOCKPILE

DISPOSAL AREA

CONTAINER
STAGING

FINAL GRADES ON
SIDE SLOPES

ORIGINAL CELL A
LIMIT (2.54 AC)

UNPROCESSED
MATERIAL
STOCKPILE

MECHANIZED
PICKING LINE

C&D
TIPPING
AREA

TRAFFIC RAMP
AS NEEDED

TRAFFIC RAMP
AS NEEDED

DRAINAGE PATH

SOIL STOCKPILES

PHASE 1A C&D PROCESSING
AND DISPOSAL AREA
APPROX. INTERIM GRADES
(NOT SURVEYED)

DATE	NO.	REVISION
01/24/06	1	REVISED CELL LAYOUT PER OWNER
02/18/09	2	UPDATED C&D PROCESSING FACILITY FOR PERMIT TO OPERATE
03/31/09	3	UPDATED FACILITY PLAN FOR PERMIT TO OPERATE
11/15/10	4	UPDATED FACILITY PLAN FOR CELLS B AND C PTC

NOTES:
1. THE REVISED PHASE 1 LAYOUT AS SHOWN HEREON IS AN ADMENDMENT TO THE PHASING LAYOUT AS SHOWN IN THE MINING PERMIT APPLICATION, PERMIT #41-22, ISSUED BY NCDENR DIVISION OF LAND RESOURCES, LAND QUALITY SECTION, NOVEMBER 25, 2005. AND AS SHOWN IN THE C&D PERMIT APPLICATION, PERMIT #41-17 (PERMIT TO CONSTRUCT), ISSUED BY NCDENR DIVISION OF WASTE MANAGEMENT, SOLID WASTE SECTION, FEBRUARY 24, 2004.

2. FOR SEDIMENTATION & EROSION CONTROL DETAILS REFER TO THE C&D PERMIT APPLICATION DRAWINGS, PERMIT #41-17 (PERMIT TO CONSTRUCT), ISSUED BY NCDENR DIVISION OF WASTE MANAGEMENT, SOLID WASTE SECTION, FEBRUARY 24, 2004.

REFERENCE NOTES:
1. GUILFORD COUNTY TAX MAP FOR SUMTER TOWNSHIP: ACL-3-185-755S-7, D.B. 4459, PG. 780.
2. TOPOGRAPHY WITHIN PROPERTY BOUNDARY FROM AERIAL PHOTOGRAPHY DATED 3-27-01, BY SPATIAL DATA.
   TOPOGRAPHY OUTSIDE PROPERTY BOUNDARY FROM AERIAL PHOTOGRAPHY DATED 1995, BY GUILFORD COUNTY GIS DEPARTMENT.
3. BOUNDARY INFORMATION FROM BOUNDARY MAP PREPARED BY L. DENNIS LEE, P.A., DATED NOV. 14, 2002.

BASE GRADES SHOWN ARE CONSISTENT OR SLIGHTLY HIGHER THAN PERMITTED IN FEBRUARY 2004 BY NCDENR DIVISION OF WASTE MANAGEMENT (PERMIT #41-17).

ISSUED FOR
REGULATORY REVIEW

0 50' 100' 150'
1" = 50'

David Garrett, PG, PE.
Engineering and Geology
5105 Harbour Towne Drive, Raleigh, North Carolina 27604
Email: david_garrett_pg@mindspring.com
919-418-4375 (mobile)
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SEAL

NORTH CAROLINA REGISTERED PROFESSIONAL GEOLOGIST DAVID G. GARRETT 1782 11-15-2010

PROJECT TITLE:
A-1 SANDROCK SOUTH MINE
OPERATIONS AND CLOSURE
GUILFORD COUNTY, N.C.
SOLID WASTE PERMIT #41-17

DRAWING TITLE:
FACILITY LAYOUT FOR
PHASE 1 DISPOSAL AREA
AND RECYCLING FACILITY

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: SANDROCK-2
SCALE: AS SHOWN	DATE: FEBRUARY 2009
FILE NAME: SROCK-D092	
SHEET NO.: 3B	DRAWING NO.: E1B

C:\DCA DOCUMENTS\A1 SANDROCK\OPERATIONS DRAWINGS\SROCK-D092_CELL B_NOV 2010.DATE: NOV 15, 2010 TIME: 6:00 PM