January 31, 2012

Ms. Elizabeth Werner
NCDENR
1646 Mail Service Center
Raleigh, NC 27699-1646

Ms. Werner,

Thank you for helping us with our project number 11.205, City of Winston-Salem Bahnson Site Fly Ash Relocation Plan. We have revised the drawings to reflect the 3:1 maximum fill slope that is required by the administrative code. Enclosed are grading and erosion control plans for the disposal site, along with the application package. Please let me know if you need additional plan sets and do not hesitate to call us with any questions regarding the application. We are submitting identical plans for erosion control review at the Winston-Salem Regional office as soon as we receive the fee from the city.

Included items for your use:
1 set – REVISED Plan drawings
1 – Application Package

Please call me or Carl von Isenburg at our office if you have any questions regarding the plan or the plan review.

Thank you!

Sincerely,
GeoScience & Technology, PA

John Alan Butler

(336) 896-1300 ph
(336) 896-1020 fax

GeoScience & Technology, P.A.
"Practical Engineering & Environmental Solutions"

2050 Northpoint Drive • Suite A
Winston-Salem, NC 27106
Phone: (336) 896-1300
Fax: (336) 896-1020
geosci@geotec.com
www.geotec.com



January 31, 2012

Elizabeth Werner
Permitting Hydrogeologist
NCDENR – Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

Ms. Werner:

Subject: Coal Combustion Fly Ash Use – Lowery Street, Winston-Salem, NC

The City Of Winston-Salem, N.C. requests via this letter to use coal fly ash as structural fill in an area that may be used as a materials storage yard at the above referenced address. The following submittal characterizes the site conditions and documents their conformance with the site requirements criteria in the .1704 rules. Further, Geoscience and Technology, PA has designed the CCBP structural fill facility controls to comply with .1705 and .1706 in the rules. The CCB will come from a local development site that contains previously placed material. Erosion Control Plans for the borrow area has been designed by others and approval has been granted by the NCDENR Land Quality office in Winston-Salem, N.C.

As required by section .1703, we submit the following for your consideration and subsequent approval:

1. The general location of the fly ash placement is shown on the submitted 24X36 plan sheets. Specifically, the location of the site is:

   Latitude: 36d 05' 34.7"
   Longitude: 80d 13' 05.2"

2. The general location of the fly ash borrow site is the north-west quadrant of the Interstate 52/Interstate Business 40 intersection where the Piedmont Triad Research park is currently under construction. The location of the borrow site is:

Latitude: 36d 05' 46.4"
Longitude: 80d 14' 12.4"

This location is accurate to within 10'+/- for a multi-acre site.

3. The placement of the material will begin as soon as approval is received. The estimated completion date of fill placement is April 15, 2012.
4. The estimated volume of CCB to be placed is 40,000 CY.
5. The TCLP analysis of both the bottom ash and fly ash are included.
6. A signed and dated statement by from the owners of the land on which the fly ash and bottom slag is to be placed is attached.
7. The material to be excavated and placed at the project site has been in situ for an unknown time. It is unknown exactly when it was generated and by whom. We submit the following as the generator and current land owner of the borrow site:

Physical Address and Contact:

Andy Allen, Special Projects Coordinator
The City of Winston-Salem
101 North Main Street
Winston-Salem, NC 27101

Phone (336) 747-6968

Mailing Address:

P.O. Box 2511
Winston-Salem, NC 27102-2511

8. A letter from the NCDENR division of Land Quality stating the approval of the erosion control plan for the disposal site as designed by Geoscience and technology, PA is attached. The erosion control plan for the borrow site was designed by others.

If you have any question please call us at 336-896-1300.

Sincerely,

NORTH CAROLINA PROFESSIONAL SEAL 024697 ENGINEER CARL VON ISENBURG 1/31/12

Carl von Isenburg, PE
Senior Civil Engineer

John A. Butler, EIT
Project Designer, Permitting

# Fly Ash Disposal Grading and Erosion Control Plan Application Package
2000 Lowery Street
Winston-Salem, N.C.

Prepared For:

The City of Winston-Salem
101 North main Street
Winston-Salem, NC 27101

Prepared By:
Geoscience & Technology, P.A.
2050 Northpoint Drive
Winston-Salem, NC 27106

January 30, 2012

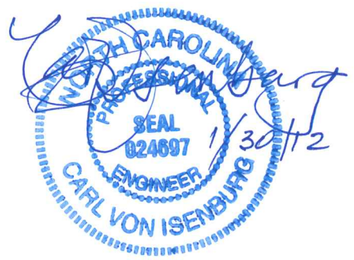


Table of Contents

Notification (.1703)

**Notification (.1703)**

**Project Description:**

The name of this project is "The City of Winston-Salem Fly Coal Combustion Byproduct Lowery Street Disposal Site". The project involves the removal of approximately 40,000 CY of fly ash and boiler slag from the slated Piedmont Triad Research Park (hereafter PTRP) and disposing of the ash on city owned property located at 2000 Lowery Street in Winston-Salem, NC. The PTRP is located on the north-eastern quadrant of the Business Interstate 40/Highway 52 confluence. The ash at PTRP originated from an unknown source. Due to the substantial age of the deposit, the original generator cannot be identified.

Lowery Street is heavily developed with primarily industrial uses. The surrounding uses directly bordering the site are as follows:

1. The north side is bordered by Lowery Street, a public roadway owned and maintained by the NCDOT.
2. The east side is bordered by a currently inactive industrial manufacturing complex.
3. The south side of the site is bordered by Norfolk and Southern Railroad Property that includes three primary tracks and a switching yard.
4. The west side is bordered by Brushy Fork Creek. No issues with stream impacts have been identified in previous NCDENR Land Quality reviews.

The city owned property at 2000 Lowery Street in Winston-Salem is 13.58 acres in size. The disposal area will impact 6.70 acres upon completion of filling operations. The property lies partially in the flood plain of Tar Branch, but no new fill will be placed in this area. The remaining portion of the property was filled at some time in the past, most likely with excess soil from the adjacent industrial property. The CCBP will be placed as structural fill atop this previously placed soil.

Upon completion of the fly ash placement, it is possible that the City of Winston-Salem will use this area as a storage area for construction materials such as pipe or aggregate. At the present time there is no intention of constructing a building of any kind within the confines of the CCBP placement area. Detailed grading plans and construction sequence information is included with the attached and approved erosion control plan.

The need for placement of the CCBP is immediate. Placement of the CCBP will begin immediately upon approval from NCDENR Solid Waste Section, but pending the installation of all the erosion control measures required by the approved plan.

The estimated value of the property after completion of the improvements is difficult to estimate due to the fluctuating economic condition of the area. The current value of the property is not listed. It is unlikely that the project will serve to improve economic

conditions in the area. It is also unlikely that the project will negatively impact real estate values or economic conditions in the immediate area.

This project will not involve the North Carolina Department of Transportation.

**Property Boundary:**

As depicted on the attached "Grading and Erosion Control Plan" the CCBP placement area is located no closer than 50 feet to any exterior property line. An existing overhead electrical transmission line owned and operated by Duke Power Corporation bisects the upper and lower CCBP placement areas. The right of way width was verified by the City of Winston-Salem as being 30' in width. No CCBP will be placed within the Duke Power right of way. All property lines shown are taken from an actual field survey performed by City of Winston-Salem survey personnel. Recorded metes and bounds descriptions of the site parcels are included in the attached erosion control submittal.

**Design, Construction, and Operation Requirements (.1705)**

All criteria required under section .1705 will be met throughout the design, construction, and subsequent operation of this structural fill project.

# Toxicity Characteristic Leaching Procedure Analysis

# (TCLP Analysis)

The attached TCLP analysis was performed by Zebra Environmental in December 2012.

**PTRP Road ROW TCLP Metals Analyses**
TABLE 2 TCLP
Methods: 7470A ; 6010B

| Method | | 7470A | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | | Mercury | Arsenic | Barium | Cadmium | Chromium | Lead | Selenium | Silver |
| Units | | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| Client Sample ID | Collect Date | Value | Value | Value | Value | Value | Value | Value | Value |
| Fly-Ash Material | | | | | | | | | |
| 1+75L 0-6FT | 11/8/11 | ND | ND | 1.2 | ND | ND | ND | ND | ND |
| 1+80C 10-12 FT | 10/13/11 | ND | ND | 1.8 | ND | ND | ND | ND | ND |
| 1+85R 14-16 FT | 10/13/11 | ND | 0.051 | 0.68 | ND | ND | ND | ND | ND |
| 2+25R 6-8 FT | 10/13/11 | ND | ND | 1.4 | ND | ND | ND | ND | ND |
| 2+50C 2-4 FT | 10/13/11 | ND | ND | 1.2 | ND | ND | ND | ND | ND |
| 2+50L 3-11FT | 11/8/11 | ND | ND | 1.2 | ND | ND | ND | ND | ND |
| 3+00L 5-7FT | 11/8/11 | ND | ND | 0.75 | ND | ND | ND | ND | ND |
| 3+00R 2-3 FT | 10/13/11 | ND | ND | 2 | ND | ND | ND | ND | ND |
| Bottom-Ash Material | | | | | | | | | |
| 12+50L 0-2FT | 11/8/11 | ND | ND | 0.59 | ND | ND | ND | ND | ND |
| 14+00L 0-1FT | 11/8/11 | ND | ND | 0.25 | ND | ND | ND | ND | ND |
| 14+50L 0-2FT | 11/8/11 | ND | ND | 1.4 | ND | ND | 5.3 | ND | ND |
| 15+50L 0-3FT | 11/8/11 | ND | ND | 0.27 | ND | ND | 0.18 | ND | ND |
| 16+00L 0-5FT | 11/8/11 | ND | ND | 0.25 | ND | ND | 0.085 | ND | ND |
| 17+55R 0-3FT | 11/8/11 | ND | ND | 0.48 | ND | ND | 0.06 | ND | ND |
| 17+85C 0-1FT | 11/8/11 | ND | ND | 0.41 | ND | ND | ND | ND | ND |
| 19+13R 0-1FT | 11/8/11 | ND | ND | 0.35 | ND | ND | ND | ND | ND |
| 19+27C 0-1FT | 11/8/11 | ND | ND | 0.29 | ND | ND | ND | ND | ND |
| 20+00C 0-1FT | 11/8/11 | ND | ND | 0.22 | ND | ND | ND | ND | ND |
| 20+00R 0-1FT | 11/8/11 | ND | ND | 0.45 | ND | ND | 0.073 | ND | ND |
| 21+00C 2-3FT | 11/4/11 | ND | ND | 1.2 | ND | ND | 0.072 | ND | ND |
| 21+00L 1-2FT | 11/4/11 | ND | ND | 1.6 | ND | ND | 0.072 | ND | ND |
| 21+00R 2-4FT | 11/4/11 | ND | ND | 0.42 | ND | ND | 0.058 | ND | ND |
| 22+00L 0-2FT | 11/4/11 | ND | ND | 0.52 | ND | ND | 0.12 | ND | ND |
| 22+00R 2-3FT | 11/4/11 | ND | ND | 0.5 | ND | ND | ND | ND | ND |
| 24+00L 2-4FT | 11/4/11 | ND | ND | 0.37 | ND | ND | 0.16 | ND | ND |
| NC HWS Standard (mg/l) | | 0.2 | 5 | 100 | 1 | 5 | 5 | 1 | 5 |

**TABLE 2**
**ISSP SOIL SAMPLE ANALYSES - TCLP METALS**
**WINSTON SALEM EMPLOYEES CREDIT UNION**
**711 SALEM AVENUE**
**WINSTON-SALEM, NORTH CAROLINA**

| Analytical Methods Detected Constituents (mg/l) | | | 7471 1311 | 6010B 1311 | 6010B 1311 | 6010B 1311 | 6010B 1311 | 6010B 1311 | 6010B 1311 | 6010B 1311 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Contaminant of Concern → | | | | | | | | | |
| | Date Collected | Sample Depth (ft.) | MERCURY | ARSENIC | BARIUM | CADMIUM | CHROMIUM | LEAD | SELENIUM | SILVER |
| MW-1 | 3/22/10 | 2 to 3 | ND | 0.75 | 1.7 | ND | ND | ND | 0.053 | ND |
| MW-2 | 3/22/10 | 2 to 3 | ND | ND | 2.8 | ND | ND | ND | 0.050 | ND |
| MW-3 | 3/22/10 | 2 to 3 | ND | ND | 2.2 | ND | ND | ND | ND | ND |
| MW-4 | 3/22/10 | 2 to 3 | ND | ND | 1.4 | ND | ND | ND | ND | ND |
| 10A | 1/5/11 | 0.5 to 1.5 | ND | ND | 1.8 | ND | ND | ND | ND | ND |
| 21A | 1/31/11 | 0.5 to 1.5 | ND | ND | 0.78 | ND | ND | 3.4 | ND | ND |
| 30B | 1/31/11 | 5 to 6 | ND | ND | 2.6 | ND | ND | ND | ND | ND |
| 43B | 1/31/11 | 5 to 6 | ND | ND | 2.1 | ND | ND | ND | ND | ND |
| 50A | 1/31/11 | 0.5 to 1.5 | ND | ND | 2.5 | ND | ND | 0.11 | ND | ND |
| 55B | 1/31/11 | 5 to 6 | ND | ND | 2.2 | ND | ND | ND | ND | ND |
| 58A | 1/31/11 | 0.5 to 1.5 | ND | ND | 2.1 | ND | ND | ND | ND | ND |
| 63A | 1/31/11 | 0.5 to 1.5 | ND | ND | 2.2 | ND | ND | ND | ND | ND |
| 70A | 1/31/11 | 0.5 to 1.5 | ND | ND | 2.3 | ND | ND | ND | ND | ND |
| 73B | 1/31/11 | 5 to 6 | ND | ND | 2.1 | ND | ND | 0.062 | ND | ND |
| 74B | 1/31/11 | 5 to 6 | ND | ND | 2.4 | ND | ND | ND | ND | ND |
| 75B | 1/31/11 | 5 to 6 | ND | 0.11 | 1.8 | ND | ND | ND | ND | ND |
| 79A | 1/31/11 | 0.5 to 1.5 | ND | ND | 2 | ND | ND | ND | ND | ND |
| 82B | 1/31/11 | 5 to 6 | ND | ND | 1.8 | ND | ND | ND | ND | ND |
| 88B | 1/31/11 | 5 to 6 | ND | ND | 2.2 | ND | ND | 0.83 | ND | ND |
| 89A | 1/31/11 | 0.5 to 1.5 | ND | ND | 1.8 | ND | ND | ND | ND | ND |
| 90B | 1/31/11 | 5 to 6 | ND | ND | 2.6 | ND | ND | ND | ND | ND |
| 92A | 1/31/11 | 0.5 to 1.5 | ND | ND | 2.7 | ND | ND | ND | ND | ND |
| 109A | 1/31/11 | 0.5 to 1.5 | ND | ND | 5.2 | ND | ND | ND | ND | ND |
| 110B | 1/31/11 | 5 to 6 | ND | 0.11 | 3.6 | ND | ND | ND | ND | ND |
| Pit 58 | 2/22/11 | 3 | ND | ND | 3.1 | ND | ND | 50 | ND | ND |
| Pit 90 | 2/22/11 | 2 | ND | ND | 3 | ND | ND | 430 | 0.059 | ND |
| Pit 98 | 2/22/11 | 5 to 6 | ND | ND | 4 | ND | ND | 2.2 | 0.050 | ND |
| | | | | | | | | | | |
| NC HWS STANDARD (mg/l) | | | 0.2 | 5 | 100 | 1 | 5 | 5 | 1 | 5 |

ND: Below Detection Limit

**TABLE 3**
**ISSP GROUND WATER SAMPLE ANALYSES**
**WINSTON SALEM EMPLOYEES CREDIT UNION**
**711 SALEM AVENUE**
**WINSTON-SALEM, NORTH CAROLINA**

| Analytical Methods Detected Constituents (ug/l) | | | 7470A | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Contaminant of Concern → | | | | | | | | | |
| | Date Collected | Sample Depth (ft. | MERCURY | ARSENIC | BARIUM | CADMIUM | CHROMIUM | LEAD | SELENIUM | SILVER |
| MW-1 | 3/26/10 | 13.30 | ND | ND | 300 | ND | 12 | 28 | 33 | ND |
| MW-1 | 2/1/11 | 14.12 | ND | ND | 320 | ND | 42 | 75 | ND | ND |
| | | | | | | | | | | |
| MW-2 | 3/26/10 | 12.86 | 0.39 | ND | 200 | ND | 18 | 38 | ND | ND |
| MW-2 | 2/1/11 | 13.71 | ND | ND | 300 | ND | 34 | 66 | ND | ND |
| | | | | | | | | | | |
| MW-3 | 3/26/10 | 15.05 | ND | ND | 360 | ND | ND | 8.3 | ND | ND |
| MW-3 | 2/1/11 | 15.85 | ND | ND | 570 | ND | 37 | 22 | ND | ND |
| | | | | | | | | | | |
| MW-4 | 3/26/10 | 13.98 | ND | ND | 180 | ND | 26 | 220 | ND | ND |
| MW-4 | 2/1/11 | 14.80 | ND | ND | 330 | ND | 94 | 340 | ND | ND |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| NCAC 2L STANDARD (ug/l) | | | 1 | 10 | 700 | 2 | 10 | 15 | 20 | 20 |

ND: Below Detection Limit
N/A: Not Applicable

**TABLE 4**
**ISSP SURFACE WATER SAMPLE ANALYSES**
**WINSTON SALEM EMPLOYEES CREDIT UNION**
**711 SALEM AVENUE**
**WINSTON-SALEM, NORTH CAROLINA**

| Analytical Methods Detected Constituents (ug/l) | | | 7470A | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Contaminant of Concern → | | | | | | | | | |
| | Date Collected | Sample Depth (ft | MERCURY | ARSENIC | BARIUM | CADMIIUN | ROMIUM | LEAD | ELENIUM | SILVER |
| W-1 | 2/1/11 | N/A | ND | ND | 36 | ND | ND | ND | ND | 140 |
| W-2 | 2/1/11 | N/A | ND | ND | 36 | ND | ND | ND | ND | ND |
| W-3 | 2/1/11 | N/A | ND | ND | 36 | ND | ND | ND | ND | ND |
| W-4 | 2/1/11 | N/A | ND | ND | 35 | ND | ND | ND | ND | ND |
| W-5 | 2/1/11 | N/A | ND | ND | 37 | ND | ND | ND | ND | ND |
| W-6 | 2/1/11 | N/A | ND | ND | 37 | ND | ND | ND | ND | ND |
| W-7 | 2/1/11 | N/A | ND | ND | 39 | ND | ND | ND | ND | ND |
| W-8 | 2/1/11 | N/A | ND | ND | 36 | ND | ND | ND | ND | ND |
| W-9 | 2/1/11 | N/A | ND | ND | 80 | ND | ND | 5.6 | ND | ND |
| W-10 | 2/1/11 | N/A | ND | ND | 79 | ND | ND | ND | ND | ND |
| USEPA Surface Water Chronic Screening Values | | | 0.012 | 190 | NS | 0.66 | 117.32 | 1.32 | 5 | 0.012 |
| USEPA Surface Water Acute Screening Values | | | 2.4 | 360 | NS | 1.79 | 984.32 | 33.78 | 20 | 1.23 |

NS: No Published Standard Found
ND: Below Detection Limit
N/A: Not Applicable

**TABLE 5**
**ISSP STREAM SEDIMENT ANALYSES**
**WINSTON SALEM EMPLOYEES CREDIT UNION**
**711 SALEM AVENUE**
**WINSTON-SALEM, NORTH CAROLINA**

| Analytical Methods Detected Constituents (mg/kg) | | | 7471 | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B | 6010B |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Contaminant of Concern → | | Mercury | Arsenic | Barium | Cadmium | Chromium | Lead | Selenium | Silver |
| SED-1 | 2/1/11 | N/A | ND | ND | 49 | ND | 14 | 17 | ND | ND |
| SED-2 | 2/1/11 | N/A | ND | ND | 75 | ND | 20 | 40 | ND | ND |
| SED-3 | 2/1/11 | N/A | ND | ND | 67 | ND | 15 | 21 | ND | ND |
| SED-4 | 2/1/11 | N/A | ND | 2.3 | 28 | ND | 11 | 10 | ND | ND |
| SED-5 | 2/1/11 | N/A | ND | 3 | 35 | ND | 11 | 180 | ND | ND |
| SED-6 | 2/1/11 | N/A | ND | 2.7 | 46 | ND | 34 | 100 | 1.9 | ND |
| SED-7 | 2/1/11 | N/A | ND | 2.5 | 28 | ND | 9.8 | 36 | ND | ND |
| SED-8 | 2/1/11 | N/A | ND | 5.7 | 68 | ND | 22 | 35 | 2.6 | ND |
| SED-9 | 2/1/11 | N/A | ND | 2.2 | 30 | ND | 42 | 570 | 2.3 | ND |
| SED-10 | 2/1/11 | N/A | ND | 3.6 | 82 | ND | 21 | 38 | 3.5 | 0.72 |
| USEPA Sediment Screening Values | | | 0.13 | 7.24 | NS | 1 | 52.3 | 30.2 | NS | 2 |
| USEPA Sediment Effects Values | | | 0.13 | 7.24 | NS | 0.676 | 52.3 | 30.2 | NS | 0.733 |

NS: No Published Standard Found
ND: Below Detection Limit
N/A: Not Applicable

# Statement From the Owner Acknowledging CCB Placement On Their Property

The flowing attached statement from the owner was signed and notarized in January 2012 and shall serve as verification that the owner is aware that CCB are being placed on their property.

Winston-Salem

Public Works Department
Stormwater Administration

City of Winston-Salem
P.O. Box 2511
Winston-Salem, NC 27102
Tel 336.747.7480
Fax 336.747.6917
www.cityofws.org

January 18, 2012

Ms. Elizabeth Werner
Permitting Hydrogeologist
NCDENR, Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

Subject: Notice of Intent to encapsulate coal combustion by-product (CCBP) at 2000 Lowery Street, Winston-Salem, NC.

Dear Ms. Werner:

The City of Winston-Salem is notifying the Solid Waste Section (via this letter) that the City intends to use CCBP as structural fill for the construction of an equipment and materials storage yard at the above-referenced address. The fly ash will come from a city-owned development site where the material was previously placed many years ago, prior to city ownership. This fly ash will be relocated due to the grading requirements of a new medical research park for downtown revitalization within Winston-Salem.

Upon completion of the fly ash placement, a legal description of the actual placement area, a referenced map, and a sealed survey by a North Carolina registered land surveyor shall be recorded at the Forsyth County Register of Deeds. These documents will serve as a permanent denotation of the CCBP encapsulation area, in accordance with legislative recordation requirements.

Signed Keith D. Huff

Printed Name Keith D. Huff

Title Stormwater Director

Date 1-18-2012

STATE OF NORTH CAROLINA )
)
COUNTY OF FORSYTH )

I, Robin M. Watson, a notary public of the County and State aforesaid, certify that Keith Huff, personally came before me this day and acknowledged that he is the Stormwater Director of the City of Winston-Salem, a North Carolina municipal government, and that by authority duly given and as the act of the municipal government, the foregoing instrument was signed by his name as its Stormwater Director, certifies that the information contained within this notification letter is accurate and complete, and he then signed said letter in my presence.

Witness my hand and notarial seal, this the 18th day of January, A.D., 2012.

Robin M. Watson
Notary Public (signature)

ROBIN M. WATSON NOTARY PUBLIC FORSYTH COUNTY, NC My Comm. Expires Dec. 7, 2013

My commission expires: 12.7.2013

# Water Table Study

This site was investigated by Geoscience and Technology in December 2012 in order to identify potential site features that may conflict with current .1704 requirements. Our findings are as follows:

1. There are no jurisdictional wetlands within the impact area as determined by an onsite field inspection by Geoscience and Technology, PA in October 2011.
2. There are no visible rock outcroppings.
3. The seasonal high water table was not encountered within 16.5' below grade at the lowest point of the fill site.
4. The site and surrounding area is served by a public water supply. We did not observe any wells within 100 horizontal feet of the intended CCBP placement area.


| Title: | Project: | Job No.: | Location: | Scale: | |
|---|---|---|---|---|---|
| Boring Location Map<br>Adapted from<br>Forsyth County GeoData Explorer<br>2010 Aerial Photography | City of WS<br>Former Bahnson Site<br>Geotechnical Investigation | 11.205 | Lowery Street<br>Winston-Salem, NC | NTS<br>Figure No.: 2 | GeoScience & Technology, P.A.<br>"Practical Engineering & Environmental Solutions"<br>Winston-Salem, NC (336) 896-1300 |

| Client: City of Winston-Salem | Boring Number: B1 | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

W WATER CONTENT (%)
P PLASTIC LIMIT (%)
L LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

| Depth (feet) | Sample Number | Sample Type | Soil Stratigraphy Depth (ft.) | Description | 10 20 30 40 50 |
|---|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | red brown gray micaeous silty sand SM | 10 |
| 10 | S-2 | SS | 10.0-11.5 | red brown gray micaeous silty sand with rock fragments SM | 12 |
| 15 | S-3 | SS | 15.0-16.5 | gray micaeous silty sand with rock fragments SM | 10 |
| 20 | | | | BT @ 16.5' | |
| 25 | | | | | |
| 30 | | | | | |

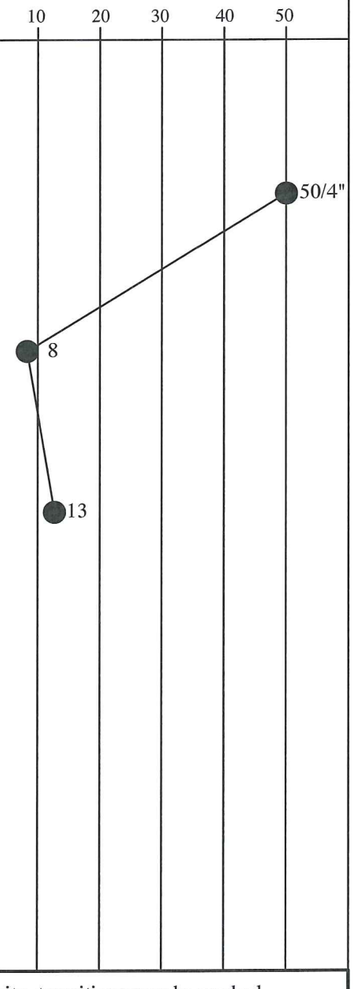
The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: ~~GeoSci~~ | Driller: RJW | Drill Type: | Drill Method: HSA |

| Client: City of Winston-Salem | Boring Number: B2 | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

W WATER CONTENT (%)
P PLASTIC LIMIT (%)
L LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

| Depth (feet) | Sample Number | Sample Type | Soil Stratigraphy Depth (ft.) | Description |
|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | red tan brown micaeous sandy silt<br>Rock at bottom<br>SM |
| 10 | S-2 | SS | 10.0-11.5 | tan brown white micaeous silty sand<br>SM |
| 15 | S-3 | SS | 15.0-16.5 | striated tan orange gray micaeous silty sand SM |
| 20 | | | | BT @ 16.5' |
| 25 | | | | |
| 30 | | | | |



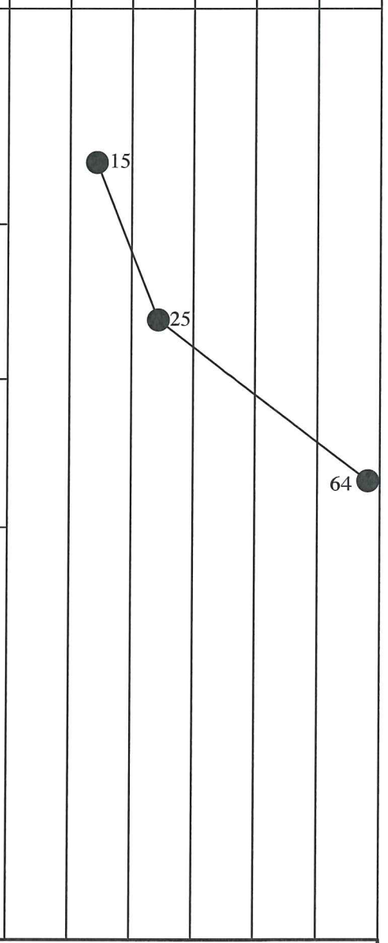

The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: ~~GeoSci~~ | Driller: RJW | Drill Type: | Drill Method: HSA |

| Client: City of Winston-Salem | Boring Number: B3 | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

W WATER CONTENT (%)
P PLASTIC LIMIT (%)
L LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

| Depth (feet) | Sample Number | Sample Type | Depth (ft.) | Soil Stratigraphy Description |
|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | tan brown micaeous silty sand SM |
| 10 | S-2 | SS | 10.0-11.5 | tan brown micaeous silty sand SM |
| 15 | S-3 | SS | 15.0-16.5 | tan brown micaeous silty sand SM |
| 20 | | | | BT @ 16.5' |
| 25 | | | | |
| 30 | | | | |




The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: GeoSci | Driller: RJW | Drill Type: | Drill Method: HSA |

| Client: City of Winston-Salem | Boring Number: B4 | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

W WATER CONTENT (%)
P PLASTIC LIMIT (%)
L LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

| Depth (feet) | Sample Number | Sample Type | Soil Stratigraphy Depth (ft.) | Description | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | Rock at 2.0' | | | | | |
| 10 | S-2 | SS | 10.0-11.5 | AR@ 2.0' | | | | | |
| 15 | S-3 | SS | 15.0-16.5 | | | | | | |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |

The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: GeoSci | Driller: RJW | Drill Type: | Drill Method: HSA |

| Client: City of Winston-Salem | Boring Number: B4 A | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

W WATER CONTENT (%)
P PLASTIC LIMIT (%)
L LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

| Depth (feet) | Sample Number | Sample Type | Soil Stratigraphy Depth (ft.) | Description |
|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | Rock at 1.0' |
| 10 | S-2 | SS | 10.0-11.5 | AR@ 1.0' |
| 15 | S-3 | SS | 15.0-16.5 | |
| 20 | | | | |
| 25 | | | | |
| 30 | | | | |

10 20 30 40 50

The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: GeoSci | Driller: RJW | Drill Type: | Drill Method: HSA |

| Client: City of Winston-Salem | Boring Number: B4 B | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

**W** WATER CONTENT (%)
**P** PLASTIC LIMIT (%)
**L** LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

10 20 30 40 50

| Depth (feet) | Sample Number | Sample Type | Soil Stratigraphy Depth (ft.) | Description |
|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | Rock at 1.0' |
| 10 | S-2 | SS | 10.0-11.5 | AR@ 1.0' |
| 15 | S-3 | SS | 15.0-16.5 | |
| 20 | | | | |
| 25 | | | | |
| 30 | | | | |

The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: GeoSci | Driller: RJW | Drill Type: | Drill Method: HSA |

| Client: City of Winston-Salem | Boring Number: B5 | Boring Started: Date: 10.6.11 Time: | Boring Completed: Date: 10.6.11 Time: |
|---|---|---|---|
| Project Name: CoWS Bahnson Site | Geologist/Engineer: GeoScience & Technology, P.A. | | |
| Boring Location: Winston Salem, Forsyth Co., NC | Job Number: 11.205 | | |

W WATER CONTENT (%)
P PLASTIC LIMIT (%)
L LIQUID LIMIT (%)
● STANDARD PENETRATION (N-VALUE)

| Depth (feet) | Sample Number | Sample Type | Soil Stratigraphy Depth (ft.) | Description | 10 20 30 40 50 |
|---|---|---|---|---|---|
| 5 | S-1 | SS | 5.0-6.5 | brown gray micaeous sandy silt SM | 38 |
| 10 | S-2 | SS | 10.0-11.5 | gray tan brown white micaeous silty sand SM | 26 |
| 15 | S-3 | SS | 15.0-16.5 | brown gray micaeous sandy silt SM | 50/4" |
| | | | | BT @ 16.5' | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

The stratification lines represent approximate boundaries between soil types. In-situ, transitions may be gradual.

| Water Table Data: Not encountered | Logged By: SEM | Checked By: RJW | Approved By: CVI |
|---|---|---|---|
| Drilling Contractor: ~~GeoSci~~ | Driller: RJW | Drill Type: | Drill Method: HSA |

# Onsite Soils Map

The attached soils map was obtained from the USDA website.

Search

Map Unit Legend

**Forsyth County, North Carolina (NC067)**

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| FfC | Fairview-Urban land complex, 2 to 10 percent slopes | 1.2 | 2.2% |
| HaA | Hatboro loam, 0 to 2 percent slopes, frequently flooded | 11.5 | 20.4% |
| PcF2 | Pacolet clay loam, 15 to 45 percent slopes, moderately eroded | 1.3 | 2.4% |
| Ud | Udorthents, loamy | 42.5 | 75.1% |
| **Totals for Area of Interest** | | **56.6** | **100.0%** |

Soil Map

Legend

Scale (not to scale)

# FEMA Flood Map

Based on publically available flood information (FEMA), the CCB placement area is not within a designated flood area. This was independently verified by the City Of Winston-Salem's acting flood plain manager by referencing their own analysis of this stream section.

# FIRM


- Major Cities
- Benchmarks
- DFIRM Grid
- Rivers and Streams
- Transects (Coastal)
- County Boundaries
- Coastal Barrier Resource Systems
- Roads
- NC Highway
- US Highway
- Interstate Highway
- Political Areas
- Extraterritorial Jurisdictions
- Coastal Sounds
- 100yr Flooding - Floodway (AE)
- 100yr Flooding - Has BFE's (AE)
- 100yr Flooding - No BFE's (A)
- 100yr Flooding - Velocity Zone
- 500yr Flooding (Shaded X)
- Base Flood Elevation (Symbol)
- Cross Sections

0 300 Feet

North Carolina
Floodplain Mapping Program

# Erosion Control Plan Application (Copy)

The attached calculations were approved by NCDENR – Land Quality, Erosion Control Section in January 2012. Please see the attached 24X36 plan set for additional information regarding erosion control measures.

January 27, 2011



Matthew Osborne
Environmental Specialist
NCDENR - Land Quality Section
Winston-Salem Regional Office
585 Waughtown Street
Winston-Salem, NC 27107
(336)771-5042

Mr. Osborne,

Enclosed are **revised** erosion control plans for a fly ash disposal site located on Lowery Street in Winston-Salem, NC. All fill slopes have been flattened to 3:1 to conform to solid waste requirements. This caused a significant reduction in earthwork volume, and so at the City of Winston-Salem's request the easternmost fly ash stockpile has been expanded horizontally and vertically to allow more ash placement volume. The westernmost fly ash stockpile has increased in height only.

The easternmost stockpile will be constructed in two stages. As fill is placed, it will be stabilized in order to allow a corresponding reduction in the size of the skimmer basins that guard that area. Final finish grades are shown on sheet C5.1.

I am submitting for your approval a revised plan package as itemized below.

Included items for your use:

3 sets - Plan drawings
1 set - relevant calculations

Please call me or Carl von Isenburg at our office if you have any questions regarding the plan or the plan review.

Thank you for allowing us to be of service.

Sincerely,
GeoScience & Technology, PA

John Alan Butler
(336) 896-1300 ph
(336) 896-1020 fax

# Erosion Control Plan Calculations

Bahnson Property
Fly Ash Relocation Site
Lowery Street
Winston-Salem, North Carolina


Engineer:

Carl von Isenberg
Geoscience and Technology
2050 Northpoint Drive
Winston-Salem, NC 27106
Phone 336-896-1300


Client:

The City of Winston-Salem
Bryce A. Stuart Municipal Building
100 East 1st Street, Suite 235
Winston-Salem, NC 27101

## FINANCIAL RESPONSIBILITY/OWNERSHIP FORM
## SEDIMENTATION POLLUTION CONTROL ACT

No person may initiate any land-disturbing activity on one or more acres as covered by the Act before this form and an acceptable erosion and sedimentation control plan have been completed and approved by the Land Quality Section, N.C. Department of Environment and Natural Resources. (Please type or print and, if the question is not applicable or the e-mail and/or fax information unavailable, place N/A in the blank.)

**Part A.**

1. Project Name: Fly Ash Relocation – Grading and Erosion Control Plan

2. Location of land-disturbing activity: County: Forsyth City or Township: Winston-Salem

   Highway/Street: Lowery Street Latitude: 36° 5'36.59"N Longitude: 80°12'59.21"W

3. Approximate date land-disturbing activity will commence: January 31, 2012

4. Purpose of development (residential, commercial, industrial, institutional, etc.): Material Stockpile

5. Total acreage disturbed or uncovered (NOT including off-site borrow and waste areas): 5.1 acres
   *Note: Three (3) permitted borrow areas with corresponding projects names and permit numbers:*
   Project "A" Stream/Stormwater project: Forsy-2008-007
   Project "B" Research Park Blvd: Forsy-2011-028
   Winston-Salem Employee Credit Union: Forsy-2012-016

6. Amount of fee enclosed: **$390.00**. The application fee of $65.00 per acre (**rounded up to the next acre**) is assessed without a ceiling amount (Example: a 9-acre application fee is $585).

7. Has an erosion and sediment control plan been filed? Yes_____ No_____ Enclosed **X**

8. Person to contact should erosion and sediment control issues arise during land-disturbing activity:

   Name: Andy Allen, Special Projects Coordinator Email Address: andrewa@cityofws.org

   Telephone: 336-747-6968 Cell #: (336)413-0765 Fax #: 336-748-3173

9. Landowner(s) of Record (attach accompanied page to list additional owners):

   The City of Winston-Salem (ATTN: Keith Huff) (Name) 336-747-6962 (Telephone) 336-748-3713 (Fax Number)

   P.O. Box 2511 (Current Mailing Address) 101 North Main Street Suite 53, City Hall (Current Street Address)

   Winston-Salem (City) NC (State) 27102-2511 (Zip Code) Winston-Salem (City) NC (State) 27101 (Zip Code)

10. Deed Book Number: 3000 Page Number: 13 Please provide a copy of the most current deed.

**Part B.**

1. Person(s) or firm(s) who are financially responsible for the land-disturbing activity (Provide a comprehensive list of all responsible parties on an attached sheet):

   The City of Winston-Salem (Name) keithh1@cityofws.org (E-mail Address)

   P.O. Box 2511 (Current Mailing Address) 101 North Main Street Suite 53, City Hall (Current Street Address)

Winston-Salem City | NC State | 27102-2511 Zip | Winston-Salem City | NC State | 27101 Zip Code

Telephone: 336-747-6962 Fax Number: 336-748-3173

2. (a) If the Financially Responsible Party is not a resident of North Carolina, give name and street address of the designated North Carolina Agent:

Name | E-mail Address

Current Mailing Address | Current Street Address

City State Zip | City State Zip

Telephone | Fax Number

(b) If the Financially Responsible Party is a Partnership or other person engaging in business under an assumed name, **attach a copy of the Certificate of Assumed Name.** If the Financially Responsible Party is a Corporation, give name and street address of the Registered Agent:

Name of Registered Agent | E-mail Address

Current Mailing Address | Current Street Address

City State Zip | City State Zip

Telephone | Fax Number

The above information is true and correct to the best of my knowledge and belief and was provided by me under oath (This form must be signed by the Financially Responsible Person if an individual or his attorney-in-fact, or if not an individual, by an officer, director, partner, or registered agent with the authority to execute instruments for the Financially Responsible Person). I agree to provide corrected information should there be any change in the information provided herein.

Keith D. Huff | Stormwater Director

Type or print name | Title or Authority

Keith D. Huff | 12/8/11

Signature | Date

I, Robin M. Watson, a Notary Public of the County of Forsyth State of North Carolina, hereby certify that Keith D. Huff appeared personally before me this day and being duly sworn acknowledged that the above form was executed by him.

ROBIN M. WATSON NOTARY PUBLIC FORSYTH COUNTY, NC My Comm. Expires Dec. 7, 2013

Witness my hand and notarial seal, this 8th day of December, 2011

Robin M. Watson

Notary

My commission expires 12.7.2013

North Carolina Department of Environment and Natural Resources

**Division of Land Resources**

**Land Quality Section**

James D. Simons, PG, PE
Director and State Geologist

Beverly Eaves Perdue, Governor
Dee Freeman, Secretary

December 30, 2011

**LETTER OF APPROVAL**

City of Winston-Salem
Attn: Keith Huff
101 N. Main Street, Suite 232
Winston-Salem, NC 27101

RE: Project Name: Fly Ash Relocation - Grading and Erosion Control Plan
Project ID: Forsy-2012-017 Acres Approved: 5.10
County: Forsyth, Lowery Street, Winston-Salem
River Basin: Yadkin-PeeDee Stream Classification: Other
Submitted By: John A Butler, GeoScience & Technology, PA
Date Received by LQS: December 16, 2011
Plan Type: New

Dear Mr. Huff:

This office has reviewed the subject erosion and sedimentation control plan. We find the plan to be acceptable and hereby issue this Letter of Approval. The enclosed Certificate of Approval must be posted at the job site. This plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, as is required by Title 15A NCAC 4B .0129.

Title 15A NCAC 4B .0118(a) requires that a copy of the approved erosion control plan be on file at the job site. Also, this letter gives the notice required by G.S. 113A-61.1(a) of our right of periodic inspection to insure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Act is performance-oriented, requiring protection of existing natural resources and adjoining properties. If, following the commencement of this project, the erosion and sedimentation control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute 113A-51 through 66), this office may require revisions to the plan and implementation of the revisions to insure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with Federal and State

# CERTIFICATE OF PLAN APPROVAL

The posting of this certificate certifies that an erosion and sedimentation control plan has been approved for this project by the North Carolina Department of Environment and Natural Resources in accordance with North Carolina General Statute 113A – 57 (4) and 113A – 54 (d) (4) and North Carolina Administrative Code, Title 15A, Chapter 4B.0107 (c). This certificate must be posted at the primary entrance of the job site before construction begins and until establishment of permanent groundcover as required by North Carolina Administrative Code, Title 15A, Chapter 4B.0127 (b).

CITY OF WINSTON-SALEM FLY ASH RELOCATION FORSY-2012-07

Project Name and Location

12/30/2011

Date of Plan Approval

NCDENR

Regional Engineer

2011016292 00200
FORSYTH CO, NC FEE $31.00
STATE OF NC REAL ESTATE EXTX
$5000.00
PRESENTED & RECORDED:
04-29-2011 02:16:40 PM
C. NORMAN HOLLEMAN
REGISTER OF DEEDS
BY: PATSY RUTH DAVIS
DPTY
BK: RE 3000
PG: 13-17

# NORTH CAROLINA GENERAL WARRANTY DEED

Excise Tax: $ 5,000.00

Parcel Identifier No._____ Verified by _____ County on the ____ day of_____, 20__
By:_____

Mail/Box to: Grantee - Box 5

This instrument was prepared by: John C. MacNeill, Jr., 6743-A Fairview Road, Charlotte, NC 28210

Brief description for the Index: Lots 2 + 3 Plat of Fred D. Godley Plat Book 47, page 118 et al

THIS DEED made this 28th day of April, 20 11, by and between

| GRANTOR | GRANTEE |
|---|---|
| FRED D. GODLEY and wife,<br>KATHRYN B. GODLEY<br>P.O. Box 1140<br>Cornelius, NC 28031 | CITY OF WINSTON-SALEM |

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

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of Winston-Salem, _____ Township, Forsyth County, North Carolina and more particularly described as follows:

SEE EXHIBIT A ATTACHED HERETO FOR DESCRIPTION OF PROPERTY.

All of the property herein conveyed does not incude the primary residence of Grantors.

Kathryn B. Godley joins in the execution of this Deed, but not its warranties, for the sole purpose of conveying any marital interest she may have in and to the property described herein under North Carolina law.

The property hereinabove described was acquired by Grantor by instrument recorded in Book 2085 page 1255.

A map showing the above described property is recorded in Plat Book 47 page 118.

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

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever, other than the following exceptions: Subject to lien of 2011 ad valorem taxes which have been prorated between Grantors and Grantee and payment of which Grantee assumes and easements of record.

IN WITNESS WHEREOF, the Grantor has duly executed the foregoing as of the day and year first above written.

_____ (Entity Name)

By: _____
Title: _____

By: _____
Title: _____

By: _____
Title: _____

Fred D. Godley (SEAL)
FRED D. GODLEY

Kathryn B. Godley (SEAL)
KATHRYN B. GODLEY

_____ (SEAL)

_____ (SEAL)

State of North Carolina - County of Mecklenburg

I, the undersigned Notary Public of the County and State aforesaid, certify that FRED D. GODLEY and KATHRYN B. GODLEY personally appeared before me this day and acknowledged the due execution of the foregoing instrument for the purposes therein expressed. Witness my hand and Notarial stamp or seal this 28th day of April, 2011

My Commission Expires: 11/20/2011

Notary Public

Anil R. Sanade
Notary Public
Mecklenburg County, NC

State of North Carolina - County of _____

I, the undersigned Notary Public of the County and State aforesaid, certify that _____ personally came before me this day and acknowledged that _he is the _____ of _____, a North Carolina or _____ corporation/limited liability company/general partnership/limited partnership (strike through the inapplicable), and that by authority duly given and as the act of such entity, __he signed the foregoing instrument in its name on its behalf as its act and deed. Witness my hand and Notarial stamp or seal, this _____ day of _____, 20__.

My Commission Expires: _____

_____
Notary Public

State of North Carolina - County of _____

I, the undersigned Notary Public of the County and State aforesaid, certify that _____

Witness my hand and Notarial stamp or seal, this _____ day of _____, 20__.

My Commission Expires: _____

_____
Notary Public

The foregoing Certificate(s) of _____ is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

_____ Register of Deeds for _____ County

By: _____ Deputy/Assistant - Register of Deeds

EXHIBIT 'A'

TRACT 1:

Commencing at NCGS Monument "Claremont," N:855794.60, E:1637723.78; thence South 83°14'09" East 4712.76 feet to a new iron pin in the southern right-of-way line of Lowery Street, the northwest corner of Piedmont Natural Gas Co., Inc. [PIN No. 6845-25-7262; DB 2793, Pg. 59], the point and place of BEGINNING; thence with the western boundary of Piedmont Natural Gas Co., Inc. South 08°07'46" East 398.89 feet to an existing iron pin in the northern boundary of the Norfolk Southern Railway Company [PIN No. 6845-04-1145], also the southeastern corner of Piedmont Natural Gas Co., Inc.; thence with the northern boundary of Norfolk Southern Railway Company the following courses and distances: (1) South 61°23'22" West 402.83 feet to an existing iron pin; (2) South 63°40'06" West 321.76 feet to an existing iron pin; (3) South 81°03'43" West 724.69 feet to an existing iron pin; and (4) North 82°52'29" West 1901.06 feet to a point in the centerline of Brushy Fork Creek, also the southeast corner of GTL Properties, LLC [PIN No. 6835-94-1733; DB 2020, Pg. 3334]; thence with the eastern boundary of GTL Properties, LLC (also the centerline of Brushy Fork Creek) the following courses and distances: (1) North 46°59'02" East 87.95 feet; (2) North 61° 31'48" East 96.10 feet; (3) North 48° 16'48" East 142.43 feet; (4) North 87° 29'48" East 91.90 feet; (5) North 51° 17'48" East 104.20 feet; (6) North 38° 36'48" East 79.68 feet; (7) North 19° 17'12" West 130.82 feet; (8) North 34° 54'48" East 112.71 feet; (9) North 67° 06'48" East 116.33 feet; (10) North 50° 21'48" East 110.75 feet; (11) North 81° 06'48" East 142.05 feet; (12) North 18° 36'12" West 22.00 feet; (13) North 54° 00'33" East 44.51 feet and (14) North 63° 56'43" East 63.22 feet to a point in the southern right-of-way line of Lowery Street, the northeast corner of GTL Properties, LLC; thence with the southern right-of-way line of Lowery Street the following courses and distances: (1) South 82° 44'55" East 905.34 feet to an existing iron pin; (2) South 77° 14'17" East 167.25 feet to an existing iron pin; (3) South 71° 46'24" East 172.82 feet to an existing iron pin; (4) South 79° 46'29" East 137.60 feet to an existing iron pin (nail); (5) North 88° 41'58" East 550.82 feet to a new iron pin (nail); and (6) a curve to the left having a radius of 1188.94 feet and a chord bearing and distance of North 79° 53'17" East 364.25 feet, an arc distance of 365.69 feet to the point and place of BEGINNING, containing 48.5812 acres, more or less, according to a survey by Christopher A. Wall, L-4200, dated April 28, 2011.

The above described property is identical to Lots 2 and 3 as shown on plat of Fred D. Godley as recorded in Plat Book 42, at page 118 of the Forsyth County Registry.

Being also known as Lots 2 and 3 as shown on plat of Fred D. Godley as recorded in Plat Book 42, at page 118 of the Forsyth County Registry, reference to which is hereby made for a more particular description.

Being also known as tax parcels 6845-04-0809.00 and 6845-14-3718.00 according to the Forsyth County Tax Records.

Property Address: 2000 Lowery Street, Winston-Salem, North Carolina

EXHIBIT 'A'
Page 2

TRACT 2:

BEGINNING at an existing iron pipe at the northern right-of-way line of Lowery Street (which has a 100' right-of-way), said iron pipe being the Southwestern corner of the Masonic Cemetery (Tax parcel 6845-15-8376); thence running from said BEGINNING along the northern right of way line of Lowery Street and the eastern right of way line of Lowery Court the following seven (7) courses and distances: South 87°56'23" West 74.32' to a point; thence running North 87°35'22" West 50.0'; thence running North 73°53'22" West 50.0'; thence running North 44°28'22" West 50.0'; thence running North 14°01'22" West 50.0'; thence running North 00°50'22" West 50.0'; thence running North 00°52'32" West 54.74' to an existing iron pipe in the eastern right of way line of Lowery Court and being also the Southwestern corner of parcel now owned by Clifton E. Graves, deed book 874, page 415 (tax parcel number 6845-15-3667); thence running along a new line with the southern line of Graves and Jacqueline Belton (see deed book 2710, page 3427) South 62°17'15" East 258.71' to an existing iron pipe in the western line of the Masonic Cemetery; thence running with the western line of the Masonic Cemetery South 05°36'54" West 82.31' to the POINT AND PLACE OF BEGINNING. Being 0.6857 acres, more or less, according to a survey by Christopher A. Wall and dated April 28, 2011.

Being also known as tax parcel 6845-15-4314.00 according to the Forsyth County Tax Records.

EXHIBIT B

EXHIBIT TO AGREEMENT FOR PURCHASE AND SALE OF REAL PROPERTY
BY AND BETWEEN
FRED GODLEY
AND
ABB FLAKT, INC., SELLER

PROPERTY CONDITION:

Purchaser will acquire the Property in its "as-is" condition and without any warranty, express or implied, with respect to the condition of the Property, except as herein represented. Purchaser acknowledges that the Examination Period will have afforded Purchaser the opportunity to make such inspections as it desires to make and Purchaser shall rely upon such inspections, subject to Seller's obligation to deliver fee simple title to Purchaser at closing, subject only to those liens and encumbrances as had been approved by Purchaser at the end of the Inspection Period.

ENVIRONMENTAL:

Seller, through its wholly owned subsidiary, Flakt Products, Inc., entered into a consent order dated October 17, 1997, with the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Superfund Section, in order to conduct a voluntary remedial action to address groundwater containing the presence of chlorinated solvents. Seller agrees to retain responsibility for implementing the terms and conditions of the consent order. Except as set forth herein, Seller represents and warrants that it has no actual knowledge of the disposal within the buildings or on the Property of hazardous or toxic waste or substance, which are defined as those substances, materials, and wastes, including but not limited to, those substances, materials and wastes listed in the United States Department of Transportation Hazardous Material Table (49 CFR 172.101) or by the Environmental Protection Agency as hazardous substances (40 CFR Part 302) and amendments thereto, or such substances, materials and wastes, which are or become regulated under any applicable local, state or federal law, including, without limitation, any material, waste or substance which is (i) petroleum, (ii) asbestos, (iii) polychlorinated biphenyls, (iv) designated as a Hazardous Substance pursuant to Section 331 of the Clean Water Act, 33 U.S.C. Section 1251, et. seq. (33 U.S.C. 1321) or listed pursuant to Section 307 of the Clean Water Act (33 U.S.C. Section 1371), (v) defined as a hazardous waste pursuant to Section 1004 of the Resource Conservation and Recovery Act, 42 U.S.C. Section 6901, et. seg. (42 U.S.C. Section 6903), or (vi) defined as a hazardous substance pursuant to Section 101 of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. Section 9601, et. seg. (42 U.S.C. 9601).

Initial

**NORTH CAROLINA DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES**
**LAND QUALITY SECTION**
**EROSION and SEDIMENTATION CONTROL PLAN PRELIMINARY REVIEW CHECKLIST**

The following items shall be incorporated with respect to specific site conditions, in an erosion & sedimentation control plan:

LOCATION INFORMATION

✓ Project location & labeled vicinity map (roads, streets, landmarks)
_____ North arrow and scale
✓ Identify River Basin.
✓ Provide a copy of site located on applicable USGS quadrangle and NRCS Soils maps if it is in a River Basin with Riparian Buffer requirements.

GENERAL SITE FEATURES (Plan elements)

✓ Property lines & ownership ID for adjoining properties
✓ Existing contours (topographic lines)
✓ Proposed contours
✓ Limits of disturbed area (provide acreage total, delineate limits, and label). Be sure to include all access to measures, lots that will be disturbed, and utilities that may extend offsite.
N/A Planned and existing building locations and elevations
✓ Planned & existing road locations & elevations, including temporary access roads
N/A Lot and/or building numbers
✓ Hydrogeologic features: rock outcrops, seeps, springs, wetland and their limits, streams, lakes, ponds, dams, etc. (include all required local or state buffer zones and any DWQ Riparian Buffer determinations)
N/A Easements and drainageways, particularly required for offsite affected areas. Include copies of any recorded easements and/or agreements with adjoining property owners.
N/A Profiles of streets, utilities, ditch lines, etc.
✓ Stockpiled topsoil or subsoil locations
✓ If the same person conducts the land-disturbing activity & any related borrow or waste activity, the related borrow or waste activity shall constitute part of the land-disturbing activity unless the borrow or waste activity is regulated under the Mining Act of 1971, or is a landfill regulated by the Division of Waste Management. If the land-disturbing activity and any related borrow or waste activity are not conducted by the same person, they shall be considered separate land-disturbing activities and must be permitted either through the Sedimentation Pollution Control Act as a one-use borrow site or through the Mining Act.
N/A Location and details associated with any onsite stone crushing or other processing of material excavated. If the affected area associated with excavation, processing, stockpiles and transport of such materials will comprise 1 or more acres, and materials will be leaving the development tract, a mining permit will be required.
N/A Required Army Corps 404 permit and Water Quality 401 certification (e.g. stream disturbances over 150 linear feet)

EROSION & SEDIMENT CONTROL MEASURES (on plan)

✓ Legend (provide appropriate symbols for all measures and reference them to the construction details)
✓ Location of temporary measures
✓ Location of permanent measures
✓ Construction drawings and details for temporary and permanent measures. Show measures to scale on plan and include proposed contours where necessary. Ensure design storage requirements are maintained through all phases of construction.
✓ Maintenance requirements for measures
✓ Contact person responsible for maintenance

SITE DRAINAGE FEATURES

✓ Existing and planned drainage patterns (include off-site areas that drain through project and address temporary and permanent conveyance of stormwater over graded slopes)
✓ Method used to determine acreage of land being disturbed and drainage areas to all proposed measures (e.g. delineation map)
✓ Size, pipe material and location of culverts and sewers
✓ Soil information: type, special characteristics
✓ Soil information below culvert storm outlets
✓ Name and classification of receiving water course or name of municipal operator (only where stormwater discharges are to occur)

STORMWATER CALCULATIONS

✓ Pre-construction runoff calculations for each outlet from the site (at peak discharge points). Be sure to provide all supporting data for the computation methods used (rainfall data for required storm events, time of concentration/storm duration, and runoff coefficients).
✓ Design calculations for peak discharges of runoff (including the construction phase & the final runoff coefficients for the site)
✓ Design calcs for culverts and storm sewers (include HW, TW and outlet velocities)
✓ Discharge and velocity calculations for open channel and ditch flows (easement & rights-of-way)
✓ Design calcs for cross sections and method of stabilization for existing and planned channels (include temporary linings). Include appropriate permissible velocity and/or shear stress data.
✓ Design calcs and construction details for energy dissipaters below culvert and storm sewer outlets (include stone/material specs & apron dimensions). Avoid discharges on fill slopes.
✓ Design calcs and dimension of sediment basins (note current surface area and dewatering standards as well as diversion of runoff to the basins). Be sure that all surface drains, including ditches and berms, will have positive drainage to the basins.

VEGETATIVE STABILIZATION

✓ Area & acreage to be stabilized with vegetation
✓ Method of soil preparation
✓ Seed type & rates (temporary & permanent)
✓ Fertilizer type and rates
✓ Mulch type and rates (include mulch anchoring methods to be used)

NOTE: Plan should include provisions for groundcover on exposed slopes within 21 calendar days following completion of any phase of grading; permanent groundcover for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM

✓ Completed, signed & notarized FR/O Form
✓ Accurate application fee payable to NCDENR ($65.00 per acre rounded up the next acre with no ceiling amount)
N/A Certificate of assumed name, if the owner is a partnership
N/A Name of Registered Agent (if applicable)
✓ Copy of the most current Deed for the site. Please make sure the deed(s) and ownership information are consistent between the plan sheets, local records and this form.
✓ Provide latitude & longitude (in decimal degrees) at the project entrance.

NOTE: For the Express Permitting Option, inquire at the local Regional Office for availability.

NARRATIVE AND CONSTRUCTION SEQUENCE

✓ Narrative describing the nature & purpose of the construction activity
✓ Construction sequence related to erosion and sediment control (including installation of critical measures prior to the initiation of the land-disturbing activity & removal of measures after areas they serve are permanently stabilized). Address all phases of construction and necessary practices associated with temporary stream bypasses and/or crossings.
N/A Bid specifications related only to erosion control

PROJECT: COWS - BAHNSON PROPERTY

PROJECT NO.: 11.205 SHEET: 2

DESIGNED BY: JAB DATE: 01/26/12

CHECKED BY: JAB

LOCATION:

SEDIMENT TRAP #2

# TEMPORARY SEDIMENT TRAP # 1

## CONTRIBUTING AREAS / RUNOFF COEFFICIENTS

| SURFACE TYPE | | 'C' COEFF | DISTURBED AREA AREA (AC) | DISTURBED AREA A*C | DRAINAGE BASIN AREA (AC) | DRAINAGE BASIN A*C |
|---|---|---|---|---|---|---|
| GRASS: (CLAY SOIL) | AVG < 7% | 0.20 | | | | |
| | STEEP > 7% | 0.35 | | | | |
| (SANDY SOIL) | AVG < 7% | 0.15 | | | | |
| | STEEP > 7% | 0.20 | | | | |
| WOODS: SPARCE GROUND LITTER | | 0.20 | | | | |
| DEEP GROUND LITTER | | 0.10 | | | | |
| BARE SOILS: SANDY, SMOOTH, AVG. SLOPE | | 0.30 | | | | |
| CLAY, SMOOTH, AVG SLOPE | | 0.50 | | | | |
| CLAY, SMOOTH, STEEP SLOPE | | 0.80 | 1.34 | 1.07 | 1.34 | 1.07 |
| | | | | 1.07 | | 1.07 |
| | TOTALS: | | 1.34 | ACRES | 1.34 | ACRES |
| | COMPOS. 'C' | | -----> | 0.80 | -----> | 0.80 |

## RAINFALL / RUNOFF / SEDIMENT LOAD / SURFACE AREA

| 10 YR (B D E) | SURFACE RUNOFF 10-YEAR | | SEDIMENT TRAP/BASIN REQUIREMENTS | |
|---|---|---|---|---|
| 57.1090 | Tc = | 10 min. | SEDIMENT STORAGE REQUIRED = | 1800 CF/AC |
| 10.7000 | C = | 0.80 | SEDIMENT VOLUME REQUIRED = | 2412 CF |
| 0.7570 | i = | 5.76 in/hr | SURFACE AREA RATIO (75% EFF.) = | 325.00 SF/CFS |
| i = B/(Tc+D)^E | A = | 1.34 ac. | REQ'D. SURFACE AREA = | 2007 SF |
| B, D & E CALC. FROM HYDRO-35 | Q10 = | 6.18 cfs | | |

## TRAP/BASIN DIMENSIONS AND VOLUMES

| | |
|---|---|
| LENGTH TO WIDTH RATIO = | 2.00 |
| SIDE SLOPES = | 3.00 |
| SEDIMENT STORAGE DEPTH = | 1.50 FT |
| SURFACE AREA PROVIDED = | 2048 SF OK |
| TOP WIDTH OF SED. STORAGE = | 32 FT |
| TOP LENGTH OF SED. STORAGE = | 64 FT |
| SEDIMENT VOLUME PROVIDED = | 2454 CF OK |
| BOTTOM WIDTH = | 23.00 FT |
| BOTTOM LENGTH = | 55.00 FT |
| OVERALL TOP WIDTH = | 41 FT |
| OVERALL TOP LENGTH = | 73 FT |
| OVERALL TRAP DEPTH = | 3 FT |
| WEIR LENGTH = | 5.0 FT |
| FLOW DEPTH OVER WEIR = | 0.6 FT |
| FREEBOARD = | 1.50 FT |

PROJECT: COWS - BAHNSON PROPERTY

PROJECT NO.: 11.205 SHEET: 2

DESIGNED BY: JAB DATE: 01/26/12

CHECKED BY: JAB

LOCATION:

SEDIMENT TRAP #2

# TEMPORARY SEDIMENT TRAP # 2

## CONTRIBUTING AREAS / RUNOFF COEFFICIENTS

| SURFACE TYPE | | | 'C' COEFF | DISTURBED AREA AREA (AC) | DISTURBED AREA A*C | DRAINAGE BASIN AREA (AC) | DRAINAGE BASIN A*C |
|---|---|---|---|---|---|---|---|
| GRASS: | (CLAY SOIL) | AVG < 7% | 0.20 | | | | |
| | | STEEP > 7% | 0.35 | | | | |
| | (SANDY SOIL) | AVG < 7% | 0.15 | | | | |
| | | STEEP > 7% | 0.20 | | | | |
| WOODS: SPARCE GROUND LITTER | | | 0.20 | | | | |
| DEEP GROUND LITTER | | | 0.10 | | | | |
| BARE SOILS: SANDY, SMOOTH, AVG. SLOPE | | | 0.30 | | | | |
| CLAY, SMOOTH, AVG SLOPE | | | 0.50 | | | | |
| CLAY, SMOOTH, STEEP SLOPE | | | 0.80 | | | | |
| | | | TOTALS: | 1.60 | 1.28 | 1.90 | 1.52 |
| | | | COMPOS. 'C' | -----> | 1.28 | -----> | 1.52 |
| | | | | 1.60 ACRES | | 1.90 ACRES | |
| | | | | -----> | 0.80 | -----> | 0.80 |

## RAINFALL / RUNOFF / SEDIMENT LOAD / SURFACE AREA

10 YR (B D E)
57.1090
10.7000
0.7570
i = B/(Tc+D)^E
B, D & E CALC. FROM HYDRO-35

SURFACE RUNOFF 10-YEAR

| | |
|---|---|
| Tc = | 10 min. |
| C = | 0.80 |
| i = | 5.76 in/hr |
| A = | 1.90 ac. |
| Q10 = | 8.76 cfs |

SEDIMENT TRAP/BASIN REQUIREMENTS

| | |
|---|---|
| SEDIMENT STORAGE REQUIRED = | 1800 CF/AC |
| SEDIMENT VOLUME REQUIRED = | 2880 CF |
| SURFACE AREA RATIO (75% EFF.) = | 325.00 SF/CFS |
| REQ'D. SURFACE AREA = | 2846 SF |

## TRAP/BASIN DIMENSIONS AND VOLUMES

| | |
|---|---|
| LENGTH TO WIDTH RATIO = | 2.00 |
| SIDE SLOPES = | 3.00 |
| SEDIMENT STORAGE DEPTH = | 1.50 FT |
| SURFACE AREA PROVIDED = | 2888 SF OK |
| TOP WIDTH OF SED. STORAGE = | 38 FT |
| TOP LENGTH OF SED. STORAGE = | 76 FT |
| SEDIMENT VOLUME PROVIDED = | 3593 CF OK |
| BOTTOM WIDTH = | 29.00 FT |
| BOTTOM LENGTH = | 67.00 FT |
| OVERALL TOP WIDTH = | 47 FT |
| OVERALL TOP LENGTH = | 85 FT |
| OVERALL TRAP DEPTH = | 3 FT |
| WEIR LENGTH = | 6.0 FT |
| FLOW DEPTH OVER WEIR = | 0.6 FT |
| FREEBOARD = | 1.50 FT |

PROJECT: COWS - BAHNSON PROPERTY

PROJECT NO.: 11.205 SHEET: 2

DESIGNED BY: JAB DATE: 01/26/12

CHECKED BY: JAB

LOCATION:

SEDIMENT TRAP #2

# TEMPORARY SEDIMENT TRAP # 3

## CONTRIBUTING AREAS / RUNOFF COEFFICIENTS

| SURFACE TYPE | | | 'C' COEFF | DISTURBED AREA AREA (AC) | DISTURBED AREA A*C | DRAINAGE BASIN AREA (AC) | DRAINAGE BASIN A*C |
|---|---|---|---|---|---|---|---|
| GRASS: | (CLAY SOIL) | AVG < 7% | 0.20 | | | | |
| | | STEEP > 7% | 0.35 | | | | |
| | (SANDY SOIL) | AVG < 7% | 0.15 | | | | |
| | | STEEP > 7% | 0.20 | | | | |
| WOODS: SPARCE GROUND LITTER | | | 0.20 | | | | |
| DEEP GROUND LITTER | | | 0.10 | | | | |
| BARE SOILS: SANDY, SMOOTH, AVG. SLOPE | | | 0.30 | | | | |
| CLAY, SMOOTH, AVG SLOPE | | | 0.50 | | | | |
| CLAY, SMOOTH, STEEP SLOPE | | | 0.80 | | | | |
| | | | TOTALS: | 1.32 | 1.06 | 1.32 | 1.06 |
| | | | COMPOS. 'C' | -----> | 0.80 | -----> | 0.80 |
| | | | | | ACRES | | ACRES |

## RAINFALL / RUNOFF / SEDIMENT LOAD / SURFACE AREA

10 YR (B D E)
57.1090
10.7000
0.7570
i = B/(Tc+D)^E
B, D & E CALC. FROM HYDRO-35

SURFACE RUNOFF 10-YEAR

| | |
|---|---|
| Tc = | 10 min. |
| C = | 0.80 |
| i = | 5.76 in/hr |
| A = | 1.32 ac. |
| Q10 = | 6.08 cfs |

SEDIMENT TRAP/BASIN REQUIREMENTS

| | |
|---|---|
| SEDIMENT STORAGE REQUIRED = | 1800 CF/AC |
| SEDIMENT VOLUME REQUIRED = | 2376 CF |
| SURFACE AREA RATIO (75% EFF.) = | 325.00 SF/CFS |
| REQ'D. SURFACE AREA = | 1977 SF |

## TRAP/BASIN DIMENSIONS AND VOLUMES

| | | |
|---|---|---|
| LENGTH TO WIDTH RATIO = | 2.00 | |
| SIDE SLOPES = | 3.00 | |
| SEDIMENT STORAGE DEPTH = | 1.50 FT | |
| SURFACE AREA PROVIDED = | 2592 SF | OK |
| TOP WIDTH OF SED. STORAGE = | 36 FT | |
| TOP LENGTH OF SED. STORAGE = | 72 FT | |
| SEDIMENT VOLUME PROVIDED = | 3189 CF | OK |
| BOTTOM WIDTH = | 27.00 FT | |
| BOTTOM LENGTH = | 63.00 FT | |
| OVERALL TOP WIDTH = | 45 FT | |
| OVERALL TOP LENGTH = | 81 FT | |
| OVERALL TRAP DEPTH = | 3 FT | |
| WEIR LENGTH = | 5.0 FT | |
| FLOW DEPTH OVER WEIR = | 0.5 FT | |
| FREEBOARD = | 1.50 FT | |

PROJECT: COWS - BAHNSON PROPERTY

PROJECT NO.: 11 . 205

SHEET: 2

DESIGNED BY: JAB

DATE: 01/27/12

CHECKED BY: JAB

LOCATION:

SEDIMENT TRAP #2

# TEMPORARY SEDIMENT TRAP # 4

## CONTRIBUTING AREAS / RUNOFF COEFFICIENTS

| SURFACE TYPE | | | 'C' COEFF | DISTURBED AREA AREA (AC) | DISTURBED AREA A*C | DRAINAGE BASIN AREA (AC) | DRAINAGE BASIN A*C |
|---|---|---|---|---|---|---|---|
| GRASS: | (CLAY SOIL) | AVG < 7% | 0.20 | | | | |
| | | STEEP > 7% | 0.35 | | | | |
| | (SANDY SOIL) | AVG < 7% | 0.15 | | | | |
| | | STEEP > 7% | 0.20 | | | | |
| WOODS: SPARCE GROUND LITTER | | | 0.20 | | | | |
| DEEP GROUND LITTER | | | 0.10 | | | | |
| BARE SOILS: SANDY, SMOOTH, AVG. SLOPE | | | 0.30 | | | | |
| CLAY, SMOOTH, AVG SLOPE | | | 0.50 | | | | |
| CLAY, SMOOTH, STEEP SLOPE | | | 0.80 | | | | |
| | | | | 1.52 | 1.22 | 1.52 | 1.22 |
| TOTALS: | | | | 1.52 | 1.22 | 1.52 | 1.22 |
| COMPOS. 'C' | | | -----> | ACRES | 0.80 | -----> | ACRES 0.80 |

## RAINFALL / RUNOFF / SEDIMENT LOAD / SURFACE AREA

10 YR (B D E)

57.1090

10.7000

0.7570

i = B/(Tc+D)^E

B, D & E CALC. FROM HYDRO-35

SURFACE RUNOFF 10-YEAR

| | |
|---|---|
| Tc = | 10 min. |
| C = | 0.80 |
| i = | 5.76 in/hr |
| A = | 1.52 ac. |
| Q10 = | 7.01 cfs |

SEDIMENT TRAP/BASIN REQUIREMENTS

SEDIMENT STORAGE REQUIRED = 1800 CF/AC

SEDIMENT VOLUME REQUIRED = 3330 CF

SURFACE AREA RATIO (75% EFF.) = 325.00 SF/CFS

REQ'D. SURFACE AREA = 2771 SF

## TRAP/BASIN DIMENSIONS AND VOLUMES

SIDE SLOPES = 3.00

SEDIMENT STORAGE DEPTH = 1.50 FT

SURFACE AREA PROVIDED = 2786 SF

SEDIMENT VOLUME PROVIDED = 3403 CF

## Calculate Skimmer Size

| | | | | |
|---|---|---|---|---|
| **Basin Volume in Cubic Feet** | 2,454 | Cu.Ft | **Skimmer Size** | **1.5** Inch |
| **Days to Drain*** | 2 | Days | Orifice Radius | **0.6** Inch[es] |
| | | | Orifice Diameter | **1.3** Inch[es] |

*In NC assume 3 days to drain

## Estimate Volume of Basin

| | Length | Width | | | |
|---|---|---|---|---|---|
| **Top of water surface in feet** | | | Feet | **VOLUME** | **0** Cu. Ft. |
| **Bottom dimensions in feet** | | | Feet | | |
| **Depth in feet** | | | Feet | | |

SKimmer Bason #1

## Calculate Skimmer Size

| | | | | |
|---|---|---|---|---|
| **Basin Volume in Cubic Feet** | 3,593 | Cu.Ft | **Skimmer Size** | **1.5** Inch |
| **Days to Drain*** | 3 | Days | Orifice Radius | **0.6** Inch[es] |
| | | | Orifice Diameter | **1.3** Inch[es] |

*In NC assume 3 days to drain

## Estimate Volume of Basin

| | Length | Width | | | |
|---|---|---|---|---|---|
| **Top of water surface in feet** | | | Feet | **VOLUME** | **0** Cu. Ft. |
| **Bottom dimensions in feet** | | | Feet | | |
| **Depth in feet** | | | Feet | | |

Skimmer Basin #2

## Calculate Skimmer Size

| | | | | |
|---|---|---|---|---|
| **Basin Volume in Cubic Feet** | 3,189 | Cu.Ft | **Skimmer Size** | **1.5** Inch |
| **Days to Drain*** | 3 | Days | Orifice Radius | **0.6** Inch[es] |
| | | | Orifice Diameter | **1.2** Inch[es] |

*In NC assume 3 days to drain

## Estimate Volume of Basin

| | Length | Width | | | |
|---|---|---|---|---|---|
| Top of water surface in feet | | | Feet | **VOLUME** | **0** Cu. Ft. |
| Bottom dimensions in feet | | | Feet | | |
| Depth in feet | | | Feet | | |

Skimmer Basin #3

## Calculate Skimmer Size

| | | | | | |
|---|---|---|---|---|---|
| **Basin Volume in Cubic Feet** | 3,403 | Cu.Ft | **Skimmer Size** | **1.5** | Inch |
| **Days to Drain*** | 3 | Days | Orifice Radius | **0.6** | Inch[es] |
| | | | Orifice Diameter | **1.2** | Inch[es] |

*In NC assume 3 days to drain

## Estimate Volume of Basin

| | Length | Width | | | |
|---|---|---|---|---|---|
| **Top of water surface in feet** | | | Feet | **VOLUME** | **0** Cu. Ft. |
| **Bottom dimensions in feet** | | | Feet | | |
| **Depth in feet** | | | Feet | | |

Skimmer Basin #4

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

## Slope Analysis

| | |
|---|---|
| Country | United States |
| State/Region | North Carolina |
| City | Winston-Salem |
| Annual R Factor | 150 |
| Adjusted R Factor | 150 |
| Total Slope Length | 110 |
| Protection Type | Permanent |
| Protection Period | 6 |
| Beginning Month | January |
| Slope Gradient (H:1) | 2:1 |
| Soil Type | Clay |
| K Factor | 0.100 |

Reach 1
Start: 0ft End: 110ft
Vegetation Type: ()

| Material | ASL bare | ASL mat | MSL bare | MSL mat | Soil Loss Tolerance | SF | Remarks | Staple / App Rate |
|---|---|---|---|---|---|---|---|---|
| C125 | 0.804 in | 0.072 in | 1.406 in | 0.127 in | 0.25 in | 1.976 | STABLE | C |
| C125BN | 0.804 in | 0.056 in | 1.406 in | 0.098 in | 0.25 in | 2.54 | STABLE | C |
| DS150 | 0.804 in | 0.145 in | 1.406 in | 0.253 in | 0.25 in | 0.988 | UNSTABLE | C |
| DS150 does not meet the longevity requirements you have specified. | | | | | | | | |
| DS75 | 0.804 in | 0.241 in | 1.406 in | 0.422 in | 0.25 in | 0.593 | UNSTABLE | C |
| DS75 does not meet the longevity requirements you have specified. | | | | | | | | |
| Estb. Veg. | 0.738 in | 0 in | 0 in | 0 in | 0.03 in | 0 | UNSTABLE | -- |
| S150 | 0.804 in | 0.145 in | 1.406 in | 0.253 in | 0.25 in | 0.988 | UNSTABLE | C |
| S150BN | 0.804 in | 0.08 in | 1.406 in | 0.141 in | 0.25 in | 1.778 | STABLE | C |
| S75 | 0.804 in | 0.241 in | 1.406 in | 0.422 in | 0.25 in | 0.593 | UNSTABLE | C |
| S75BN | 0.804 in | 0.241 in | 1.406 in | 0.422 in | 0.25 in | 0.593 | UNSTABLE | C |

Slope Analysis (Contd.)



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SC150 | 0.804 in | 0.088 in | 1.406 in | 0.155 in | 0.25 in | 1.616 | STABLE | C |
| SC150BN | 0.804 in | 0.064 in | 1.406 in | 0.112 in | 0.25 in | 2.222 | STABLE | C |

Tensar. | NORTH AMERICAN GREEN®

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

P300

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| P300 Unvegetated | Straight | 0.25 cfs | 3.31 ft/s | 0.04 ft | 0.034 | 3 lbs/ft2 | 1.14 lbs/ft2 | 2.63 | STABLE | E |

Rock Riprap

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| Rock Riprap Unvegetated | Straight | 0.25 cfs | 3.43 ft/s | 0.04 ft | 0.032 | 2 lbs/ft2 | 1.1 lbs/ft2 | 1.82 | STABLE | F |

Ditch #1

| | |
|---|---|
| PROJECT: | Bahnson - Fly Ash Disposal |
| PROJ. NO.: | 11.205 1 of 1 |
| DESIGNED BY: | 12/16/11 |
| CHECKED BY: | |
| LOCATION / DESCRIPTION: | |

# OPEN CHANNEL FLOW CALCULATIONS

## COMPOSITE RUNOFF COEFFICIENTS

| SURFACE TYPE | | | 'C' COEFF | DURING CONST AREA (SF) | DURING CONST A*C | ESTABLISHED SITE AREA (SF) | ESTABLISHED SITE A*C |
|---|---|---|---|---|---|---|---|
| ROOFS: | METAL / MEMBRANE | | 1.00 | | | | |
| | ASPHALT SHINGLE | | 0.85 | | | | |
| GRASS: | (CLAY SOIL) | FLAT < 2% | 0.15 | | | | |
| | | AVG 2% - 7% | 0.20 | | | | |
| | | STEEP > 7% | 0.35 | | | | |
| | (SANDY SOIL) | FLAT < 2% | 0.10 | | | | |
| | | AVG 2% - 7% | 0.15 | | | | |
| | | STEEP > 7% | 0.20 | | | | |
| WOODS: | SPARCE GROUND LITTER | | 0.20 | | | | |
| | DEEP GROUND LITTER | | 0.10 | | | | |
| BARE SOILS: | SANDY, SMOOTH, AVG SL. | | 0.30 | | | | |
| | CLAY, SMOOTH, AVG SL. | | 0.65 | 13098 | 8514 | 13098 | 8514 |
| PAVEMENT: | ASPHALT | | 0.90 | | | | |
| | CONCRETE | | 0.95 | | | | |
| COMPACTED ABC PARKING, ROADS | | | 0.80 | | | | |
| | | TOTALS: | | 13098 | 8514 | 13098 | 8514 |
| | | | | 0.30 ACRES | | 0.30 ACRES | |
| | | COMPOS. 'C' | -----> | | 0.65 | -----> | 0.65 |

## RAINFALL INTENSITY

i = B/(Tc+D)^E

10 YR 10 YR

B =
D =
E =

B, D & E CALC. FROM HYDRO-35

## SURFACE RUNOFF

| | DURING CONST | | ESTABLISHED SITE | |
|---|---|---|---|---|
| Tc = | 10.00 | MIN | 10.00 | MIN |
| C = | 0.65 | | 0.65 | |
| i = | 5.80 | IN/HR | 5.80 | IN/HR |
| A = | 0.30 | AC | 0.30 | AC |
| Q = | 2.50 | CFS | 2.50 | CFS |

## DITCH FLOW DEPTH, VELOCITY & LINER SHEAR STRESS:

DITCH GEOMETRY

| | | DURING CONST | | ESTABLISHED SITE | |
|---|---|---|---|---|---|
| S% = | 17.00 | n = | 0.020 | | 0.050 |
| Z1 = | 2.00 | DEPTH = | 0.39 | FT | 0.55 FT |
| Z2 = | 2.00 | Q = | 2.50 | CFS | 2.50 CFS |
| B = | 0.00 | AREA = | 0.30 | SF | 0.61 SF |
| | | WET PER = | 1.74 | LF | 2.46 LF |
| | | HYD RAD = | 0.17 | FT | 0.25 FT |
| | | VEL = | 8.22 | FT/SEC | 4.13 FT/SEC |
| | | V * HYD RAD = | 1.43 | SF/SEC | 1.02 SF/SEC |
| | | SHEAR = | 4.14 | LBS/SF | 5.83 LBS/SF |
| | | TOP WID. = | 1.56 | FT | 2.20 FT |

COMMENTS:

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

SC150

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| SC150 Unvegetated | Straight | 2.5 cfs | 2.2 ft/s | 0.38 ft | 0.05 | 2 lbs/ft2 | 0.72 lbs/ft2 | 2.78 | STABLE | D |
| SC150 Unvegetated | Bend | 2.5 cfs | 2.2 ft/s | 0.38 ft | 0.05 | 2 lbs/ft2 | 0.03 lbs/ft2 | 76.33 | STABLE | D |

Ditch # 3

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

SC150

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| SC150 Unvegetated | Straight | 2.5 cfs | 2.2 ft/s | 0.38 ft | 0.05 | 2 lbs/ft2 | 0.72 lbs/ft2 | 2.78 | STABLE | D |
| SC150 Unvegetated | Bend | 2.5 cfs | 2.2 ft/s | 0.38 ft | 0.05 | 2 lbs/ft2 | 0.03 lbs/ft2 | 76.33 | STABLE | D |

Unreinforced Vegetation - Class D - Mix (Sod & Bunch) - Fair 50-75%

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| Unreinforced Vegetation | Straight | 2.5 cfs | 1.55 ft/s | 0.5 ft | 0.081 | 3.33 lbs/ft2 | 0.93 lbs/ft2 | 3.58 | STABLE | -- |
| Underlying Substrate | Straight | 2.5 cfs | 1.55 ft/s | 0.5 ft | -- | 0.07 lbs/ft2 | 0.014 lbs/ft2 | 5.11 | STABLE | -- |
| Unreinforced Vegetation | Bend | 2.5 cfs | 1.55 ft/s | 0.5 ft | 0.08 | 3.33 lbs/ft2 | 0.03 lbs/ft2 | 98.36 | STABLE | -- |
| Underlying Substrate | Bend | 2.5 cfs | 1.55 ft/s | 0.5 ft | -- | 0.07 lbs/ft2 | 0.014 lbs/ft2 | 5.11 | STABLE | -- |

Ditch #3

| | |
|---|---|
| PROJECT: | bahnson - Fly Ash Disposal |
| PROJ. NO.: | 11.205 1 of 1 |
| DESIGNED BY: | 12/16/11 |
| CHECKED BY: | |
| LOCATION / DESCRIPTION: | |
| Ditch #2 0 - 300 | |

# OPEN CHANNEL FLOW CALCULATIONS

## COMPOSITE RUNOFF COEFFICIENTS

| SURFACE TYPE | | 'C' COEFF | DURING CONST AREA (SF) | DURING CONST A*C | ESTABLISHED SITE AREA (SF) | ESTABLISHED SITE A*C |
|---|---|---|---|---|---|---|
| ROOFS: | METAL / MEMBRANE | 1.00 | | | | |
| | ASPHALT SHINGLE | 0.85 | | | | |
| GRASS: | (CLAY SOIL) FLAT < 2% | 0.15 | | | | |
| | AVG 2% - 7% | 0.20 | | | | |
| | STEEP > 7% | 0.35 | | | | |
| | (SANDY SOIL) FLAT < 2% | 0.10 | | | | |
| | AVG 2% - 7% | 0.15 | | | | |
| | STEEP > 7% | 0.20 | | | | |
| WOODS: | SPARCE GROUND LITTER | 0.20 | | | | |
| | DEEP GROUND LITTER | 0.10 | | | | |
| BARE SOILS: | SANDY, SMOOTH, AVG SL. | 0.30 | | | | |
| | CLAY, SMOOTH, AVG SL. | 0.65 | 87500 | 56875 | 87500 | 56875 |
| PAVEMENT: | ASPHALT | 0.90 | | | | |
| | CONCRETE | 0.95 | | | | |
| COMPACTED ABC PARKING, ROADS | | 0.80 | | | | |
| | TOTALS: | | 87500 | 56875 | 87500 | 56875 |
| | | | 2.01 ACRES | | 2.01 ACRES | |
| | COMPOS. 'C' -----> | | 0.65 | | -----> | 0.65 |

## RAINFALL INTENSITY

i = B/(Tc+D)^E

10 YR 10 YR

| | |
|---|---|
| B = | |
| D = | |
| E = | |

B, D & E CALC. FROM HYDRO-35

## SURFACE RUNOFF

| | DURING CONST | ESTABLISHED SITE |
|---|---|---|
| Tc = | 10.00 MIN | 10.00 MIN |
| C = | 0.70 | 0.65 |
| i = | 5.80 IN/HR | 5.80 IN/HR |
| A = | 2.01 AC | 2.01 AC |
| Q = | 8.16 CFS | 7.57 CFS |

## DITCH FLOW DEPTH, VELOCITY & LINER SHEAR STRESS:

DITCH GEOMETRY

| | |
|---|---|
| S% = | 3.00 |
| Z1 = | 3.00 |
| Z2 = | 2.00 |
| B = | 2.00 |

| | DURING CONST | ESTABLISHED SITE |
|---|---|---|
| n = | 0.050 | 0.080 |
| DEPTH = | 0.68 FT | 0.30 FT |
| Q = | 7.53 CFS | 0.99 CFS |
| AREA = | 2.52 SF | 0.83 SF |
| WET PER = | 5.67 LF | 3.62 LF |
| HYD RAD = | 0.44 FT | 0.23 FT |
| VEL = | 2.99 FT/SEC | 1.20 FT/SEC |
| V * HYD RAD = | 1.33 SF/SEC | 0.27 SF/SEC |
| SHEAR = | 1.27 LBS/SF | 0.56 LBS/SF |
| TOP WID. = | 5.40 FT | 3.50 FT |

COMMENTS:

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

C125

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| C125 Unvegetated | Straight | 8.1 cfs | 6.13 ft/s | 0.43 ft | 0.022 | 2.25 lbs/ft2 | 1.07 lbs/ft2 | 2.1 | STABLE | D |

Ditch #2 0+00 - 3+00

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

C125

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| C125 Unvegetated | Straight | 8.1 cfs | 7.48 ft/s | 0.37 ft | 0.022 | 2.25 lbs/ft2 | 1.62 lbs/ft2 | 1.39 | STABLE | D |

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| Unreinforced Vegetation | Straight | 8.1 cfs | 3.19 ft/s | 0.68 ft | 0.072 | 4.2 lbs/ft2 | 2.99 lbs/ft2 | 1.41 | STABLE | -- |
| Underlying Substrate | Straight | 8.1 cfs | 3.19 ft/s | 0.68 ft | -- | 0.07 lbs/ft2 | 0.035 lbs/ft2 | 1.99 | STABLE | -- |

Ditch #2 0+00 - 3+00

| | |
|---|---|
| PROJECT: | Bahnson - Fly Ash Disposal |
| PROJ. NO.: | 11.205 1 of 1 |
| DESIGNED BY: | 12/16/11 |
| CHECKED BY: | |
| LOCATION / DESCRIPTION: | |
| Ditch #1 300-500 | |

# OPEN CHANNEL FLOW CALCULATIONS

## COMPOSITE RUNOFF COEFFICIENTS

| SURFACE TYPE | | 'C' COEFF | DURING CONST AREA (SF) | DURING CONST A*C | ESTABLISHED SITE AREA (SF) | ESTABLISHED SITE A*C |
|---|---|---|---|---|---|---|
| ROOFS: METAL / MEMBRANE | | 1.00 | | | | |
| ROOFS: ASPHALT SHINGLE | | 0.85 | | | | |
| GRASS: (CLAY SOIL) | FLAT < 2% | 0.15 | | | | |
| | AVG 2% - 7% | 0.20 | | | | |
| | STEEP > 7% | 0.35 | | | | |
| (SANDY SOIL) | FLAT < 2% | 0.10 | | | | |
| | AVG 2% - 7% | 0.15 | | | | |
| | STEEP > 7% | 0.20 | | | | |
| WOODS: SPARCE GROUND LITTER | | 0.20 | | | | |
| DEEP GROUND LITTER | | 0.10 | | | | |
| BARE SOILS: SANDY, SMOOTH, AVG SL. | | 0.30 | | | | |
| CLAY, SMOOTH, AVG SL. | | 0.65 | 29319 | 19057 | 29319 | 19057 |
| PAVEMENT: ASPHALT | | 0.90 | | | | |
| CONCRETE | | 0.95 | | | | |
| COMPACTED ABC PARKING, ROADS | | 0.80 | | | | |
| | TOTALS: | | 29319 | 19057 | 29319 | 19057 |
| | | | 0.67 ACRES | | 0.67 ACRES | |
| | COMPOS. 'C' | -----> | | 0.65 | -----> | 0.65 |

## RAINFALL INTENSITY

i = B/(Tc+D)^E

10 YR 10 YR

B =
D =
E =

B, D & E CALC. FROM HYDRO-35

## SURFACE RUNOFF

| | DURING CONST | ESTABLISHED SITE |
|---|---|---|
| Tc = | 10.00 MIN | 10.00 MIN |
| C = | 0.65 | 0.65 |
| i = | 5.80 IN/HR | 5.80 IN/HR |
| A = | 0.67 AC | 0.67 AC |
| Q = | 2.54 CFS | 2.54 CFS |

## DITCH FLOW DEPTH, VELOCITY & LINER SHEAR STRESS:

DITCH GEOMETRY

| | | DURING CONST | ESTABLISHED SITE |
|---|---|---|---|
| S% = | 3.00 | n = 0.020 | 0.050 |
| Z1 = | 3.00 | DEPTH = 0.24 FT | 0.39 FT |
| Z2 = | 2.00 | Q = 2.65 CFS | 2.57 CFS |
| B = | 2.00 | AREA = 0.62 SF | 1.16 SF |
| | | WET PER = 3.30 LF | 4.11 LF |
| | | HYD RAD = 0.19 FT | 0.28 FT |
| | | VEL = 4.24 FT/SEC | 2.22 FT/SEC |
| | | V * HYD RAD = 0.80 SF/SEC | 0.63 SF/SEC |
| | | SHEAR = 0.45 LBS/SF | 0.73 LBS/SF |
| | | TOP WID. = 3.20 FT | 3.95 FT |

COMMENTS:

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

SC150

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| SC150 Unvegetated | Straight | 2.5 cfs | 2.96 ft/s | 0.31 ft | 0.05 | 2 lbs/ft2 | 1.33 lbs/ft2 | 1.5 | STABLE | D |

Ditch # 2 300-500

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

**Erosion Control Materials Design Software**
**Version 5.0**

**Channel Analysis**

SC150

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| SC150 Unvegetated | Straight | 2.5 cfs | 2.96 ft/s | 0.31 ft | 0.05 | 2 lbs/ft2 | 1.33 lbs/ft2 | 1.5 | STABLE | D |

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Fair 50-75%

| Phase | Reach | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|---|---|---|---|---|---|---|---|---|---|---|
| Unreinforced Vegetation | Straight | 2.5 cfs | 1.68 ft/s | 0.47 ft | 0.111 | 4.2 lbs/ft2 | 2.05 lbs/ft2 | 2.05 | STABLE | -- |
| Underlying Substrate | Straight | 2.5 cfs | 1.68 ft/s | 0.47 ft | -- | 0.07 lbs/ft2 | 0.016 lbs/ft2 | 4.36 | STABLE | -- |

Ditch #2 300-500