North Carolina Concrete Pavement Conference

Concord, NC – October 28-29, 2014
Diamond Grinding Slurry

What do we do with it NOW???
NC Department of Transportation

STRATEGIC HIGHWAY CORRIDORS

Vision Plan Division 10
Adopted by The North Carolina Board of Transportation
Plan Date: September 2, 2004
Revised: July 10, 2008

Legend:
- Strategic Highway Corridors
- Freeways: Existing, Needs Upgrade, Recommended
- Expressways: Existing, Needs Upgrade, Recommended
- Boulevards: Existing, Needs Upgrade, Recommended
- Thoroughfares: Existing, Needs Upgrade, Recommended
- US/Other Major Route
- Division Primary Routes
- Division Secondary Routes
- State Port
- Intermodal Connector
- Coast Guard Station
- Major Military Base
- Urban Area
- County Boundaries
- Water Features

Prepared by
The North Carolina Department of Transportation
March 26, 2004
ALL CONCRETE PAVEMENT!!! (Almost 1 Million SY)

The Big Three! - $400m Contract Value
Charlotte’s turbine interchange was named the top road project in the October 2012 issue of “Roads and Bridges” magazine. Rather than build the proposed four-level stack interchange, the turbine uses the existing right-of-way, features smaller bridges, and will be easier to maintain. Savings estimate $50 million.
I485 to I85 Interchange

- R-2123CE: I-85/I-485 Interchange Reconstruction
- Design Build Project
  - Initial Estimated Cost $155 Million
- Lane/STV-Ralph Whitehead Associates awarded contract @ $92,162,250
- Completion scheduled for December, 2014
- Design Build team modified 4-Level Stack to Turbine Interchange
I-85 Cabarrus County

I-3803B: I-85 from Bruton Smith Blvd. to NC 73

- Widens 7 mi. of I-85 from 4-lane divided to 8-lane divided and reconstructs interchanges at Poplar Tent Road and NC 73.

- Lane Construction/HDR submitted winning price proposal @ $125,159,110

- Innovative Design Features at Poplar Tent Rd & NC 73

- Construction began August 2011

- Completion scheduled for December, 2014
Innovative Design Features

Diverging Diamond Interchanges

Roundabouts

Superstreets
National Asphalt Paving Association’s (NAPA) 2012 Asphalt Operations Safety Innovations Award
Concrete Plant Setup
Challenges

• All-Grind Not part of these contracts.

• Our contract required smoothness testing by Rainhart Profilograph but NCDOT wanted to use IRI (Upgrade to 2012 Specs.) This required a change order (SA).

• Lane knew this would require some diamond grinding, but initial results indicated about 40% required corrective action – much more than anticipated.

• Lane proposed to all-grind both projects with a 60/40 split of the cost.
Challenges (Continued)

• Assumptions made at that time about slurry disposal methods were incorrect.

Language from Supplemental Agreement:

The method and location of disposal for the concrete slurry produced by the grinding will be submitted for approval prior to beginning work and must abide by the NC Department of Environment and Natural Resources permit requirements for slurry disposal.
North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Charles Wacker, P.E.
Director

John E. Skvarla, III
Secretary

April 24, 2013

Subject: Permit No. WQ0035749
Diamond Grinding/Hydrodemolition
Land Application of Diamond Grinding and Hydrodemolition Operation Slurry (503 exempt)
Statewide

Dear Mr. Gibson:

In accordance with your permit modification request received March 19, 2013, we are forwarding herewith Permit No. WQ0035749, dated April 24, 2013, to the NC Department of Transportation for the operation of the subject residuals management program.

Modifications to the subject permit are as follows:

- Update the permit to allow both Diamond Grinding Slurry (DGS) and Hydrodemolition Operation Slurry (HOS) to be land applied or distributed statewide in accordance with 15A NCAC 02T.1100.

Please note that DGS or HOS shall not be land applied if its pH is greater than or equal to 12.5 and the pH shall be sampled for each truckload in accordance with Condition IV.3 and IV.4.

This permit shall be effective from the date of issuance until May 31, 2017, and shall be subject to the conditions and limitations as specified therein. Please pay particular attention to the monitoring requirements listed in Section IV. Failure to establish an adequate system for collecting and maintaining the required operational information shall result in future compliance problems.

If any parts, requirements or limitations contained in this permit are unacceptable, the Permitee has the right to request an adjudicatory hearing upon written request within 30 days following receipt of this permit. This request shall be in the form of a written petition, conforming to Chapter 150B of the North Carolina General Statutes, and filed with the Office of Administrative Hearings at 6714 Mail Service Center, Raleigh, NC 27699-6714. Unless such demands are made, this permit shall be final and binding.
4. Pollutant concentrations in DGS or HOS applied to any land application site shall not exceed the following Ceiling Concentrations or Monthly Average Concentrations (i.e., dry weight basis):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ceiling Concentration (milligrams per kilogram)</th>
<th>Monthly Average Concentration (milligrams per kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>75</td>
<td>41</td>
</tr>
<tr>
<td>Cadmium</td>
<td>85</td>
<td>39</td>
</tr>
<tr>
<td>Copper</td>
<td>4,300</td>
<td>1,500</td>
</tr>
<tr>
<td>Lead</td>
<td>840</td>
<td>300</td>
</tr>
<tr>
<td>Mercury</td>
<td>57</td>
<td>17</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>75</td>
<td>n/a</td>
</tr>
<tr>
<td>Nickel</td>
<td>420</td>
<td>420</td>
</tr>
<tr>
<td>Selenium</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Zinc</td>
<td>7,500</td>
<td>2,800</td>
</tr>
</tbody>
</table>
Contacts

NCDOT - Robin Maycock  
Environmental Operations Engineer II  
919-861-3780  rmaycock@ncdot.gov

NCDENR - Michael E. Scott  
Chief Solid Waste Section  
919-707-8246  michael.scott@ncdenr.gov
Comparison of laboratory reported metal concentrations in the diamond grinding slurry dewatered cake product vs HSB preliminary remedial goals

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Basis</th>
<th>Lab Results (Total Metals) (mg/kg)</th>
<th>Lab Method</th>
<th>Preliminary Residential - Health Based Soil Remediation Goal (PSRG) (mg/kg)</th>
<th>FSRG Health Based Adjusted Values¹ (mg/kg)</th>
<th>Protection of Groundwater PSRG (mg/kg)</th>
<th>Lab Results (SFLP Method) (ug/L)</th>
<th>NCAC 2L Groundwater Quality Standards (ug/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>C</td>
<td>1.3</td>
<td>0020</td>
<td>0.61</td>
<td>30.5</td>
<td>5.8</td>
<td>&lt; 1.0</td>
<td>10</td>
</tr>
<tr>
<td>Barium</td>
<td>N</td>
<td>1.0</td>
<td>8010B</td>
<td>3000</td>
<td>6000</td>
<td>300</td>
<td>360</td>
<td>600</td>
</tr>
<tr>
<td>Cadmium</td>
<td>N</td>
<td>&lt; 0.46</td>
<td>8010B</td>
<td>14</td>
<td>22.3</td>
<td>3.0</td>
<td>&lt; 6.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Hexavalent Chromium*</td>
<td>C/M</td>
<td>3.1</td>
<td>7196</td>
<td>0.10</td>
<td>14.5</td>
<td>3.8</td>
<td>&lt; 10</td>
<td>10</td>
</tr>
<tr>
<td>Lead*</td>
<td>C/M</td>
<td>4.7</td>
<td>8010B</td>
<td>400</td>
<td>400</td>
<td>270</td>
<td>&lt; 5.0</td>
<td>15</td>
</tr>
<tr>
<td>Mercury</td>
<td>N</td>
<td>&lt; 0.08</td>
<td>7471</td>
<td>2.0</td>
<td>3.3</td>
<td>1.0</td>
<td>&lt; 0.20</td>
<td>1.0</td>
</tr>
<tr>
<td>Selenium</td>
<td>N</td>
<td>4.0</td>
<td>8010B</td>
<td>78</td>
<td>130.0</td>
<td>2.1</td>
<td>&lt; 20</td>
<td>20</td>
</tr>
<tr>
<td>Silver</td>
<td>N</td>
<td>&lt; 0.90</td>
<td>8010B</td>
<td>78</td>
<td>130.0</td>
<td>3.4</td>
<td>&lt; 10</td>
<td>20</td>
</tr>
</tbody>
</table>

- Concentration reported in the sample is greater than the non-adjusted PSRG.
- Concentration reported in the sample is greater than the Protection of Groundwater Remedial Goal.
- Hexavalent chromium has the most restrictive goal for the different forms of chromium. Total chromium and trivalent chromium have also been reported and are below PSLG Goal.
- Lead is based on USEPA guidance on lead cleanup levels. The value cannot be adjusted.

**Preliminary PSLG Health Based Goal, Adjusted Values¹ (methodology taken from reference 2 above):**

For carcinogens = PSLG Health Goal x 100n, where n = number of carcinogens present (for the above example n = 2)
For non-carcinogens = PSLG Health Goal x 5n, where n = the number of non-carcinogens present (for the above example n = 3)

**Basis**

C = The PSLG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000
N = The PSLG is based on the non-carcinogen endpoint and corresponds to a hazard quotient of 0.2.
M = Contaminant is a mutagen

**References:**

1. Inactive Hazardous Site Branch, Preliminary Soil Remediation Goals (PSRG) Table, July 2013
2. Registered Environmental Consultant Program, Implementation Guidance, November 2012 (Edited 12/12/12)
OPTIONS???
(Approximately 2.6M Gallons of Slurry)

• Haul to Waste Water Treatment Plant (Local Plant Would Not Accept.)
• Land Apply on Agricultural Fields Flatter than 6:1
• Land Apply on Project Where Flatter than 6:1
  (Both Require no Rainfall within 48 Hours.)
• Haul to a Permitted Landfill. (Closest was 19 miles & Tipping Fee was $75/ton.)
• Dewater and mix with soil. Cap with 5’ compacted soil. All must be above ground water elevation.
Lane Construction Enlisted the Help of...

Bio-Nomic Services, Inc.
516 Rountree Road
Charlotte, NC 28217-2133

Toll Free: 1.800.782.6798
Phone: 704.529.0000
Fax: 704.529.1648

Email: office@bio-nomic.com

For more information, please visit the Carylon Corporation website.
Equipment and Processing

The Lane Construction Corporation intends to sub-contract with Bio-Nomic Services, Inc. (Bio-Nomic) to perform Concrete Grinding Slurry processing. Bio-Nomic will furnish slurry mixing tanks, water holding tanks with transfer pumps and generator as necessary to introduce slurry to a Trailer Mounted 110 CF Plate & Frame Filter Press. Slurry produced by the grinding operation will be transported to a receiving tank with mixers necessary to homogenize the material brought to the dewatering operation. The Plate & Frame Press operation is a batch process where each discharge from the unit will be 4 cubic yards. It is expected that the cycle time for each discharge will be approximately 1 to 1 ½ hours. The effluent water from the dewatering system will be transferred to a holding tank for re-use in the grinding operation or other disposal. A schematic of the “Slurry Processing Center” is attached in Figure 1-A.

Initial receiving tanks for the slurry will be open topped 30 yard roll off containers. These containers, which will be water-tight, have been chosen to handle the large volume of slurry anticipated during peak grinding operations. Roll Off #1 will be used to receive and will be connected to Roll Off #2 via an 8” pipe. Roll Off #1 is the first holding location for slurry to accommodate the early settlement of solids. The 8” pipe will allow flow of slurry into Roll Off #2. Bio-Nomic will draw slurry from Roll Off #2 into the slurry mixing tanks to create “homogenized” slurry for processing thru the Plate & Frame Filter Press.
Process Layout
Step 1: Grind and Collect Slurry in Tanker.
Step 2: Dump into Holding Tanks.
Step 3: Separate Liquids from Solids
Step 4: Dump Solids and Mix with Soil.
Added 30 Mil Geomembrane Lined Pit to Keep up with Production. Pit Dimensions are 120’x120’x4’
Procedure Continues to Function Adequately.
Total Cost for Diamond Grinding Including Slurry Disposal.

2 Design Build Projects with approx. 650,000 SY Concrete. (Added as a Supplemental Agreement)

NCDOT $1,000,000
Lane $ 666,000

Total = $1,666,000
Robin Maycock
NCDOT Environmental Operations Engineer II
November 15, 2013.

“I was pleased with the processing operation, the pH of the material received by the grinding operation and method of incorporating waste material into the pit. Modifications from the original permit application (ie shaker table, extra dumpster) appear to be operating fine. ”

“This method of slurry disposal is likely to be more prevalent in the future as EPA is restricting more conventional means of disposal, and we may be asked about it in the future. ”
UNC-Charlotte
Slurry Disposal App

Dr. Nicholas Tymvios
ntymvios@uncc.edu
Questions?