Former Asphalt Testing Lab
420 Sugar Lake Road
Pittsboro, North Carolina

April 2013
Prepared by: Chris Niver, P.G., CHMM
North Carolina Department of Transportation
Presentation Topics

- Site History
- Site Status
- Remediation
- Path Forward
Site History

- **1968 – present** Site operation for asphalt production
  - 1968 – 2000 Lee Paving – site owner and operator
  - 2000 – present ST Wooten – site owner and operator

- **1968 – 1995** Solvents used in asphalt testing by NCDOT
  - *Solvent usage may have continued by other third parties*

- **1989 – present** Environmental assessment and remediation by NCDOT

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**Chronology**
- Work to Date
- Target Compounds

**Target Compounds**
- SVE
- AS
- Operation of pump and treat system
- Supplemental soil investigation
- Receptor Survey Update
- Fracture Trace Analysis

**Timeline**
- Installation of 25 wells; 29 sampling events for surface water and groundwater
- NCDOT stops the use of solvents
- CAP public notice to local residents and County Health Department
- Well Survey
- CSA
- CAP Approved
- Revised CAP
- Operation of pump and treat system
- Operate SVE and AS
- SVE Pilot Test
- ERH Bench Test
- Revised CAP
- 1997 1999 2001 2003 2005 2007 2009 2011 2013 CAP Approved
Priority Asphalt Sites

Site No. 8 Vulcan Materials Co.
Site No. 10 APAC – Thompson Arthur Paving Division
Site No. 25 Martin Marietta Aggregates
Site No. 61 Norfolk Southern Corp.
Site No. 72 Ivey/Joyce Riggs & LARCO Construction
Site No. 24 Ramey, Inc.

Site No. 38 Brown Brothers Construction Co.
Site No. 12 Boggs-Vaughn Construction Co.
Site No. 5  REA Construction Co.
Site No. 22 Asphalt Paving of Shelby
Site No. 23 Triangle Paving
Site No. 26 Martin Marietta Aggregates

Site No. 28 Patrick B. Stevens
Site No. 39 APAC – Carolina, Inc.
Site No. 40 Lula C. & Eleanor Harris
Site No. 33  Medussa Aggregates, Inc.
Site No. 41 Jim L. Bost Construction
Site No. 56 Blythe Construction Co., Inc.
Site No. 17 Blythe Construction Co., Inc.
Site No. 14 Vulcan Materials Co.
Site No. 5  REA Construction Co.
Site No. 13 REA Construction Co.
Site No. 14 Vulcan Materials Co.
Site No. 17 Blythe Construction Co., Inc.
Site No. 56 Blythe Construction Co., Inc.
Site No. 57 REA Construction Co.
Site No. 67 Crowder Construction Co.

Site No. 46 Vulcan Materials Co.
Site No. 73 BME Asphalt
Site No. 38 Brown Brothers Construction Co.
Site No. 2 Crowder Construction Co.
Site No. 5 REA Construction Co.
Site No. 13 REA Construction Co.
Site No. 14 Vulcan Materials Co.
Site No. 17 Blythe Construction Co., Inc.
Site No. 56 Blythe Construction Co., Inc.
Site No. 57 REA Construction Co.
Site No. 67 Crowder Construction Co.

Site No. 48  Lee Paving Co.
Site No. 30 Louisiana Pacific
Site No. 44 Quail Ridge Golf Course
Site No. 38 Brown Brothers Construction Co.
Site No. 39 APAC – Carolina, Inc.
Site No. 40 Lula C. & Eleanor Harris
Site No. 33  Medussa Aggregates, Inc.
Site No. 41 Jim L. Bost Construction
Site No. 56 Blythe Construction Co., Inc.
Site No. 17 Blythe Construction Co., Inc.
Site No. 14 Vulcan Materials Co.
Site No. 5  REA Construction Co.
Site No. 13 REA Construction Co.
Site No. 14 Vulcan Materials Co.
Site No. 17 Blythe Construction Co., Inc.
Site No. 56 Blythe Construction Co., Inc.
Site No. 57 REA Construction Co.
Site No. 67 Crowder Construction Co.

Site No. 22 Asphalt Paving of Shelby
Site No. 34 J.E.J. Ltd. Partnership
Site No. 35 Jim L. Bost Construction
Site No. 41 Jim Young
Site No. 45 The PAPCO Group, Inc.

Site No. 26 Martin Marietta Aggregates
Site No. 23 Triangle Paving
Site No. 26 Martin Marietta Aggregates

Site No. 58 Carolina Sunrock Corp.
Site No. 58 Carolinian Sunrock Corp.
Site No. 29 REA Construction Corp.
Site No. 58 Carolina Sunrock Corp.
Site No. 23 Triangle Paving
Site No. 26 Martin Marietta Aggregates

Site No. 18 APAC – Tennessee, Inc.
Site No. 15 APAC – Tennessee, Inc.
Site No. 36 Vulcan Materials Co.
Site No. 49 Nantahala Talc & Limestone
Site No. 12 Boggs-Vaughn Construction Co.
Site No. 5  REA Construction Co.
Site No. 22 Asphalt Paving of Shelby
Site No. 34 J.E.J. Ltd. Partnership
Site No. 35 Jim L. Bost Construction
Site No. 41 Jim Young
Site No. 45 The PAPCO Group, Inc.

Site No. 19 Barnhill Construction Co.
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Site No. 60 Barnhill Construction Co.
Site No. 60 Barnhill Construction Co.
Site No. 27 S.T Wooten Construction Co.
Site No. 63 Ronnie Glenn and Grace D. Bailey
Site No. 52 Barrus Construction Co.
Site No. 51 David & Melvin Woodard
Site No. 69 Small’s Chapel Bible Church of G_d & Pascual, Amanda
Site No. 32 Johnson Brothers Asphalt

Site No. 67 Crowder Construction Co.
Site No. 64 New Hanover County
Site No. 7 Barnhill Contracting Co.
Site No. 47 Barnhill Contracting Co.
Site No. 53 Crowell Construction Co.
## Site History

### Memorandum of Agreement Summary – NCDOT and NCDENR

- **1989**: primary MOA to address sites
  - Sites not owned or controlled by NCDOT
- **1995**: Legislative Mandate to NCDENR and NCDOT
- **1996**: additional MOA
  - Testing methods, scope, and target list
  - CSA process
  - Target compound list established
- **1999**: CAP process

### Chronology

- **Work to Date**

<table>
<thead>
<tr>
<th>Investigation (1997-present)</th>
<th>Remediation (2002-present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100+ soil samples analyzed</td>
<td>P&amp;T started in 2002 and provide hydraulic control</td>
</tr>
<tr>
<td>25 groundwater monitoring wells installed</td>
<td>AS/VE System installed in 2003</td>
</tr>
<tr>
<td>29 groundwater monitoring events conducted</td>
<td>Treated six million+ gallons of groundwater</td>
</tr>
<tr>
<td>450 + groundwater samples analyzed</td>
<td>Removed ~13 lbs of TCE from groundwater</td>
</tr>
<tr>
<td>Thermal imaging to assess surface water</td>
<td>SVE pilot test conducted in April 2012</td>
</tr>
<tr>
<td>Fracture trace analysis and borehole geophysics</td>
<td>Electrical Resistance Heating (ERH) Bench test completed February 2013</td>
</tr>
</tbody>
</table>
Site History

- Chronology
- Work to Date
- Target Compounds

<table>
<thead>
<tr>
<th>NCDOT Target Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbon tetrachloride</td>
</tr>
<tr>
<td>chloroform methyl chloride</td>
</tr>
<tr>
<td>methylene chloride</td>
</tr>
<tr>
<td>trichloroethene</td>
</tr>
<tr>
<td>cis, trans, 1,1-dichloroethene</td>
</tr>
<tr>
<td>vinyl chloride</td>
</tr>
<tr>
<td>1,1,1-trichloroethane</td>
</tr>
<tr>
<td>1,1-dichloroethane</td>
</tr>
<tr>
<td>chloroethane</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solvent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee Paving</td>
</tr>
<tr>
<td>Private Testing Firms in Lab</td>
</tr>
<tr>
<td>Air Stack Testing</td>
</tr>
<tr>
<td>NCDOT Inspectors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-Target Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,2-Trichloroethane</td>
</tr>
<tr>
<td>Chlorobenzene</td>
</tr>
<tr>
<td>1,2,3-Trichloropropane</td>
</tr>
<tr>
<td>Chloroethane</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
</tr>
<tr>
<td>Isopropylbenzene</td>
</tr>
<tr>
<td>1,3,5-Trimethylbenzene</td>
</tr>
<tr>
<td>m,p-Xylene</td>
</tr>
<tr>
<td>Acetone</td>
</tr>
<tr>
<td>Methyl ether ketone</td>
</tr>
<tr>
<td>Benzene</td>
</tr>
<tr>
<td>Naphthalene</td>
</tr>
<tr>
<td>Bromobenzene</td>
</tr>
<tr>
<td>n-Butylbenzene</td>
</tr>
<tr>
<td>Bromochloromethane</td>
</tr>
<tr>
<td>o-Xylene</td>
</tr>
<tr>
<td>Bromodichloromethane</td>
</tr>
<tr>
<td>sec-Butylbenzene</td>
</tr>
<tr>
<td>Bromoform</td>
</tr>
<tr>
<td>tert-Butylbenzene</td>
</tr>
<tr>
<td>Bromomethane</td>
</tr>
<tr>
<td>Tetrachloroethene</td>
</tr>
<tr>
<td>Carbon disulfide</td>
</tr>
<tr>
<td>Toluene</td>
</tr>
<tr>
<td>1, 4-Dioxane</td>
</tr>
<tr>
<td>Trichlorofluoromethane</td>
</tr>
<tr>
<td>Potable Wells</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>1996 – first well survey completed</td>
</tr>
<tr>
<td>2012 – most recent update of well survey</td>
</tr>
<tr>
<td>52 wells w/in 1500 feet</td>
</tr>
<tr>
<td>97 wells w/in ½ mile</td>
</tr>
<tr>
<td>2 wells closest to site are sampled regularly</td>
</tr>
<tr>
<td>No compounds detected (Installing 2 POE Carbon Systems)</td>
</tr>
</tbody>
</table>
## Site Status

- **Receptors**
- **Soil**
- **Groundwater**
- **Surface Water**

<table>
<thead>
<tr>
<th>Target</th>
<th>1,1,1-trichloroethane</th>
<th>carbon tetrachloride</th>
<th>trichloroethene</th>
<th>vinyl chloride</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-DOT Compounds</td>
<td>1,1,2-Trichloroethane</td>
<td>Bromobenzene</td>
<td>Chlorobenzene</td>
<td>n-Butylbenzene</td>
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<tr>
<td></td>
<td>1,2,3-Trichloropropane</td>
<td>Bromochloromethane</td>
<td>Chloroethene</td>
<td>o-Xylene</td>
</tr>
<tr>
<td></td>
<td>1,2,4-Trimethylbenzene</td>
<td>Bromodichloromethane</td>
<td>Isopropylbenzene</td>
<td>sec-Butylbenzene</td>
</tr>
<tr>
<td></td>
<td>1,3,5-Trimethylbenzene</td>
<td>Bromoform</td>
<td>m,p-Xylene</td>
<td>tert-Butylbenzene</td>
</tr>
<tr>
<td>Acetone, Benzene</td>
<td></td>
<td>Bromomethane</td>
<td>Methyl ether ketone</td>
<td>Tetrachloroethene</td>
</tr>
<tr>
<td>1,4-Dioxane</td>
<td>Carbon disulfide</td>
<td>Naphthalene</td>
<td>Toluene</td>
<td></td>
</tr>
</tbody>
</table>

**Legend**
- Parcels
- Former Lab
- Soil TCE Isoconcentration
- Unnamed Tributary to Haw River
Site Status

• Receptors
• Soil
• Groundwater
• Surface Water

Saprolite Groundwater Results – October 2012

TCE Concentrations
- 0 – 100 µg/L
- 100 – 1,000 µg/L
- 1,000 – 10,000 µg/L
- >10,000 µg/L

Target Compounds
- TCE
- 1,1-DCE
- Cis-1,2-DCE
- 1,1,1-TCA
- 1,1-DCA

Non Target
- PCE
- 1,1,2-TCA
- 1,2-DCA
- Toluene
Site Status

Bedrock Groundwater Results – October 2012

Target Compounds
- TCE
- 1,1-DCE
- Cis-1,2-DCE
- 1,1,1-TCA
- 1,1-DCA

Non Target
- PCE
- 1,1,2-TCA
- 1,2-DCA
- Toluene

TCE Concentrations
- 0 – 100 µg/L
- 100 – 1,000 µg/L
Site Status

- Receptors
- Soil
- Groundwater
- Surface Water
Site Status

TCE Surface Water Results – November 2012

- Receptors
- Soil
- Groundwater
- Surface Water
Remediation

- Continue operation of pump and treat system

- Remediate source area soils
  - Electrical Resistance Heating (ERH)

- Evaluate groundwater and surface water trends
  - monitor sentinel wells
  - monitor potable wells

- Groundwater Feasibility Study
  - optimize pump and treat
  - supplemental in-situ (bioremediation)
  - monitored natural attenuation
Remediation

- Groundwater
- Soil
- Surface Water

- 7,000 CY requires treatment
  - 1,000 CY Hazardous
    - ~600 ft² area
    - near former lab
  - 6,000 CY Non-hazardous
    - ~4,800 ft² area
    - extends to water table

<table>
<thead>
<tr>
<th>Remedy</th>
<th>ERH</th>
<th>Excavate</th>
<th>SVE</th>
<th>Blend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Protection Human/Environment</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Long-Term Effectiveness</td>
<td></td>
<td></td>
<td>Y</td>
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<tr>
<td>Mass Reduction</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Implementability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td>Y</td>
<td></td>
<td></td>
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<tr>
<td>Community Acceptance</td>
<td></td>
<td></td>
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</tbody>
</table>
Remediation

**INTERIM MEASURE**
- evaluate remedies
- design remedy – phytoremediation
- intercept groundwater in riparian areas

**LONG TERM**
- Source area soil treatment
- evaluate need for source area groundwater treatment

Legend:
- Proposed Tree Locations
- Parcels
- Former Lab
- Suricial TCE isoconcentration
- Unnamed Tributary to Haw River
- Surface and Pore Water Sample Location
- Surface and Pore Water Locations above 2L and/or 2B Standards
- Sugar Lake Rd
- 0 150 300 Feet

Down gradient
Q
x
y
Remediation

- Groundwater
- Soil
- Surface Water

1st Growing Season
2nd Season
3rd Season
## Path Forward

<table>
<thead>
<tr>
<th>Task</th>
<th>Activity</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potable Wells</strong></td>
<td>Update Survey</td>
<td>Annually</td>
</tr>
<tr>
<td></td>
<td>Sample Select Wells</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>County coordination</td>
<td>Semi-annual report submittal</td>
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<tr>
<td><strong>Soil</strong></td>
<td>Bench Test ERH</td>
<td>Completed</td>
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<tr>
<td></td>
<td>Complete CAP</td>
<td>03/13 – 05/13</td>
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<tr>
<td></td>
<td>Implement ERH</td>
<td>07/13 – 07/14</td>
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<tr>
<td><strong>Groundwater</strong></td>
<td>~3 Proposed Shallow Wells</td>
<td>Spring 2013</td>
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<tr>
<td></td>
<td>~7 Proposed Deep Wells</td>
<td>Spring 2013</td>
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<tr>
<td></td>
<td>Monitoring Frequency</td>
<td>Semi-annual</td>
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<tr>
<td></td>
<td>Continue P&amp;T System</td>
<td>Weekly system checks</td>
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<td></td>
<td></td>
<td>Monthly effluent sampling</td>
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<tr>
<td><strong>Surface Water</strong></td>
<td>Remedy Evaluation</td>
<td>On-going</td>
</tr>
<tr>
<td></td>
<td>Remedy Design</td>
<td>12/12 – 02/13</td>
</tr>
<tr>
<td></td>
<td>Remedy Implementation - Phytoremediation</td>
<td>03/13 – 05/13</td>
</tr>
</tbody>
</table>
FACT SHEET
North Carolina Department of Transportation’s Commitment to the Environment & Public Health

Former Asphalt Testing Lab • 420 Sugar Lake Road, Pittsboro, North Carolina
NCDOT Contacts: Chris River, PG, Chatham, 919.707.2972 • Ethan Caldwell, LG, PE, 919.835.8481

Asphalt Testing Laboratories in N.C.
The North Carolina Department of Transportation (NC DOT) is charged with the responsibility of constructing and maintaining North Carolina’s roads. To accomplish this, NC DOT obtains asphaltic paving products from private companies. These companies operate plants on property where NC DOT neither owns nor controls.

By the mid-1990s, NC DOT implemented a Quality Assurance/Quality Control (QA/QC) program requiring certification of the privately owned asphalt plants. To accommodate the QA/QC program, asphalt suppliers built and maintained on-site asphalt testing laboratories. On-site laboratory testing was done in accordance with applicable American Society for Testing and Materials (ASTM) Standards using various chlorinated compounds to test the asphalt composition.

Because parties other than NC DOT purchased asphalt for non-NC DOT projects (e.g., city paving projects, private paving projects, projects for the federal government, etc.) the asphalt plant operators and private testing firms also performed asphalt testing independent of NC DOT. The Independent users tested the same chlorinated compounds and ASTM methods.

The solvent properties of chlorinated compounds had great utility in other asphalt plant applications including use as an asphalt release compound for truck beds and for miscellaneous equipment cleaning. Chlorinated solvents were also used for ASTM stack testing requirements for air permit compliance. NC DOT ceased the use of solvents in asphalt testing in 1995.

Pittsboro History and Highlights
Site History
- 1968 – present; site operation for asphalt production
- 1968 – 2000; Lee Paving – site owner and operator

- 2000 – present; ST Woolen – site owner and operator

- 1968 – 1995: solvents used in asphalt testing by NC DOT

- Solvent usage may have continued after 1995 by other parties

- 1995 – present; environmental assessment and remediation by NC DOT

Solvent Users
- Lee Paving
- Private Testing Firms
- SBME
- Lee Engineering (now AMEC)
- F&K
- Army Corp of Engineers
- NC DOT Inspectors

Protection of Receptors
- Completed first well survey in 1996
- Most recent update was completed in 2012

Regulatory Status of Asphalt Testing Laboratories
Under the Instruction of the North Carolina General Assembly, NC DOT and NCDENR entered into a Memorandums of Agreement (MOA) beginning in 2009 to conduct site assessments at former asphalt testing laboratories. Additional MOAs were agreed to in 1996 and 1999 to establish a target list of compounds and prepare Corrective Action Plans (CAP) at a select number of sites, including the testing laboratory in Pittsboro. Initially, oversight of site investigation and remediation activities were completed by NCDENR Division of Water Quality, Aquifer Protection Section. NCDENR recognized in 2007 and NC DOT is currently coordinating with NCDENR regarding their regulatory responsibility with respect to future site investigation and remediation. Notwithstanding, NC DOT has continued site investigation and remediation activities in accordance with the NCDENR approved CAP and MOAs.

Path Forward
Supplemental Investigation and Delineation
- 10 additional wells planned (Winter-Spring 2013)
- Continue semi-annual groundwater sampling
- Evaluation of groundwater and surface water interaction (On-going)
- Sample potable wells quarterly and update well survey annually
- Evaluation of Alternative Remedies
- Source area soils
- Pilot test ERH (Winter 2012-2013)
- Continue operation of pump and treat system
- Evaluate groundwater remediation in downgradient area
- Design of Phytoremediation (Spring 2013)

Target Compounds Detected On-Site
- 1,1,1-TCA (trichloroethene)
- 1,2-DCE (dichloroethene)
- 1,1-DCB (dibromoethene)
- carbon tetrachloride
- vinyl chloride

Non-Target Compounds -
Compounds found on-site not associated with NC DOT use:
- 1,1,2-Trichlorotropane
- 1,1,2-Trichloroethane
- 1,2,3-Trichlorobenzene
- 1,4-Chloro-
- acetone
- benzene
- bromobenzene
- Bromochloromethane
- Bromodichloromethane
- Bromanil
- Bromomethane
- Carbon tetrachloride
- Chlorobenzene
- Chloroethene
- Isopropylbenzene
- m,p-Dioxane
- Methyl ethyl ketone
- Naphthalene
- n-Butylbenzene
- o-Xylene
- sec-Butylbenzene
- tert-Butylbenzene
- Toluene

TARGET COMPOUNDS -
Solvants Used by NC DOT for Asphalt Testing
Trichloroethane (TCE)
1,1,1-Trichloroethane
1,1-Dichloroethene
Carbon Tetrachloride
Contacts

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