Tied-Back Grade Beams for Stabilization of State Route 7 in Jefferson County, Ohio
Outline

- Project Background
- Exploration/Analysis/Design
- Construction
- Q & A
Location Map

Geohazards in Transportation in the Appalachian Region, August 4-6, 2009
Cross Section A-A’

Station 208+40.41

Geohazards in Transportation in the Appalachian Region, August 4-6, 2009
Slope Inclinometer Data (B1)
Slope Inclinometer Data (B4)
Contributing Factors to Slope Movement

- Fill over colluvial/alluvial deposits with soft zones
- Steeply sloping bedrock
- Ohio River fluctuations
- Possible increased shear stresses due to Brown’s Island
Alternative Stabilization Schemes

- Drilled Shafts ($3M)
- Drilled Shafts with Tiebacks ($3.4M)
- Soldier Pile w/ Lagging and Tiebacks ($3.5M)
- Tiedback Grade Beams ($2M)
Typical Section

Rock Anchor Installation

- Rock Anchors
- Bond Length To Achieve 195k Design Load (Typ.)
- 30° (Typ.)
- 3’6” (Typ.)
- Approximate Top of Rock
Cross Section A-A’

Station 208+40.41

Geohazards in Transportation in the Appalachian Region, August 4-6, 2009
## Anchor Information

<table>
<thead>
<tr>
<th>Section</th>
<th>Force to be Resisted “P” (kips/ft)</th>
<th>Horizontal Component “P_x” (kips/ft)</th>
<th>Horizontal Anchor Component “T_x” (kips)</th>
<th>Total Number of Anchors</th>
<th>Number of Rows</th>
<th>Estimated Anchor Spacing</th>
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<tbody>
<tr>
<td>206+50 – 207+30</td>
<td>72.4</td>
<td>69.9</td>
<td>168.9</td>
<td>33</td>
<td>3</td>
<td>7.0</td>
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<td>207+30 – 208+40</td>
<td>75.2</td>
<td>71.5</td>
<td>168.9</td>
<td>48</td>
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<td>6.75</td>
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<td>208+40 – 209+97</td>
<td>69.7</td>
<td>63.7</td>
<td>168.9</td>
<td>60</td>
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<td>209+97 – 212+00</td>
<td>46.9</td>
<td>43.3</td>
<td>168.9</td>
<td>54</td>
<td>3</td>
<td>11.5</td>
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<td>209+97 – 212+00</td>
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<td>43.3</td>
<td>168.9</td>
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<td>2</td>
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<td>Total</td>
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<td>195 (193)</td>
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Post Remediation Stability Analysis

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<tr>
<th>NO</th>
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<th>UNIT WEIGHT</th>
<th>SHEAR STRENGTH</th>
<th>PORE PRESSURE</th>
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<td>2</td>
<td>Failed Material</td>
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<td>Alluvial-Colluvial Material</td>
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<td>4</td>
<td>Bedrock</td>
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<td>Cohesion: 2000.0</td>
<td>Friction angle: 45</td>
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</tbody>
</table>

Factor of safety: 1.313
Side force Inclination: 0.8 degrees
Post Remediation Stability Analysis of Slope Below Anchors

Factor of safety: 1.817
Side force Inclination: -10.49 degrees
Construction

- September 2008 – May 2009
- Contractor – A. P. O’Horo
- Anchor Subcontractor – Schnabel Foundations
- Cost - $1.8M
Questions?

Thank You!