Anchored Reaction Blocks Stabilize Double Mainline Tracks above the Scioto River

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Presentation Outline

1. Site Information
2. Problem Area
3. Site Investigation
4. Subsurface Conditions
5. Problem Assessment
6. Design repair
7. Construction of designed repair
8. Construction Recap
9. Questions
Project Vicinity
Site Information

- Northeast of Piketon, OH city limits along Scioto River
- Side-hill cut/fill
- Two railroads – double mainlines
- Heavy traffic – 20 to 40 trains per day
Problem Area

- Affected area ~1000 feet
- Track Distresses
  - Cross-level
  - Profile loss
  - Alignment
- Track Maintenance
  - 1 to 2 times every 2 months
  - More frequent in Spring
Track Conditions
Site Investigation

► Investigation over two-week period
► 12 borings across both railroad ROWs
  ► On- and off-track borings
  ► Up to 30 feet depth and minimum of 10 feet into rock
  ► 6 holes with inclinometers
► Survey
  ► Topography
  ► Track centerlines for both railroads
  ► Existing features
Subsurface Conditions

Mapped geology
► Waverly and Maxville Formation (shale, sandstone, limestone)
► Ohio Shale – black to greenish gray

Surficial Deposits
► Alluvium and colluvium over residuum

Borings match mapped formations
► 5 to 30 feet of overburden
► Soft to hard gray clay over gray and black bedrock
Boring Locations - Inclinometers
Boring Locations - Inclinometers

B-12

B-13

$\pm \frac{1}{4}\text{-inch/month}$
Problem Assessment

Wedge type failure along top of rock
► Water within slope
► Highly weathered shale

Slip planes triggered by scour of toe

Rapid drawdown – high water
High Water?
Geotechnical Cross-Section
Design

8’x8’x2’ reaction blocks
► 75 blocks
► 75, 150-kip anchors

600 feet of riprap armor
► 5’ thick
► 3’ maximum diameter
## Required Permits

<table>
<thead>
<tr>
<th>Permit</th>
<th>Agency</th>
<th>Estimated Review Period</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPDES Construction General Permit</td>
<td>Ohio EPA</td>
<td>Permit likely required</td>
<td>SWPPP and NOI required if soil disturbance &gt;1 acre</td>
</tr>
<tr>
<td>USACE Section 404/401 WQC</td>
<td>USACE/OEPA</td>
<td>(45-60 days from submittal, assuming waiver(s) approved and NWP conditions can be met)</td>
<td>PCN required. Fill in river is 1000 feet long, need waiver from USACE and OEPA approval for over 500 feet. Also need waiver if greater than 1 cubic yard per running foot. No in-stream work 3/15-6/30. Other NWP conditions must be met.</td>
</tr>
<tr>
<td>Cultural Resources/Section 106 Review</td>
<td>OH SHPO</td>
<td>Likely not required.</td>
<td>Area is previously disturbed. Cultural resource review will be conducted with PCN review.</td>
</tr>
<tr>
<td>T&amp;E Species</td>
<td>USFWS</td>
<td>(30 days from submittal)</td>
<td>Early coordination may be conducted if it will expedite PCN review.</td>
</tr>
<tr>
<td>Floodplain</td>
<td>Pike County</td>
<td>(30 days from submittal)</td>
<td>H&amp;H and plan sheet review required for fill in floodway</td>
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</tbody>
</table>
Fish and Wildlife

Waivers contingent on US Fish and Wildlife Service
USFWS required mussel survey
- One living mussel safely relocated!

Tree clearing before seasonal impacts to Indiana Bat
Construction Commences
Riprap Placement
Anchor Testing

Post-Tensioning Institute
► Performance – 6 tests
► Proof – 70 tests
Anchor Load Cells

Long-term monitoring
► Permanent load cells
► At quarter lengths along site
► Geokon vibrating wire sensors
Final Grading and Vegetation
Construction Recap

Construction Schedule (80 days)

► 50% ahead of project schedule
► 75 anchor blocks with ground anchors
► 15,000 tons of riprap along Scioto
Let’s Review

► Scour of toe triggered slope movement
► Estimated slip plane along weathered shale interface
► Repair
  • 75 anchor blocks
  • 150-kip anchors
  • 600 feet of riprap
Q&A