St. Croix River Crossing Project
Industry Update

October 25, 2009
Bridge Update Topics

• **Project Background**
  – Concept Development
  – Concept Criteria
  – Visual Quality
  – Preliminary Engineering

• **Visual Quality Update**

• **Structures Update**
  – Bridge Description
  – Bridge Details
  – Bridge Construction

• **Foundation Options**
Project Background
Concept Development

• Supplemental Final Environmental Impact Statement (SFEIS) - 2006
  – Stakeholder Process
• Visual Quality Planning Process
• Visual Quality Manual (VQM) - 2007
  – Visual Quality Review Committee
• Lower St. Croix National Scenic Riverway
  – National Park Service
Concept Criteria

• Minimize Environmental Impacts
  – Bluff Impacts
  – Mussel Beds
  – High Quality Wooded Wetlands

• Minimize Visual Impacts
  – Low Visual Dominance
  – A Local Asset and Amenity
  – Quietly Elegant
  – Interesting and Expressive
Visual Quality

• Visual Quality Manual (VQM)
  – Selected Concept is called “Organic”
    • The parts look as if they were found in nature, or shaped by natural forces.
    • The vertical pier forms are reed-like; the girders are rounded and tapered like bones or tree branches; and walls barriers and railings are curved and blended into the larger form.
    • Transitions are gradual and smooth; edges are soft and curved; and colors are unified and natural expressions of their materials.
Preliminary Engineering

• Concept Refinement
  – Structural Analysis
  – Visual Quality
  – Bridge Lighting & Signing
  – Construction
  – Maintenance & Inspection
• Design Criteria
• Foundation Options
Visual Quality Update
Study Elements

Two column configuration

Three column configuration

One box girder

Two box girders
Exposed cable connections
View of overlook from trail
View from Sunnyside Marina

St. Croix River Crossing Bridge Lighting
View from Existing Stillwater Bridge

St. Croix River Crossing

Bridge Lighting
River View Looking North

St. Croix River Crossing

Bridge Lighting
River View Looking South

St. Croix River Crossing

Bridge Lighting
Structures Update
Bridge Description

- SFEIS and Visual Quality Manual (VQM)
  - River Spans
    - Extradosed Bridge - 4 to 6 Piers in the River
    - Maximum Pier Height of 60 Ft. Above Roadway
    - Superstructure Integral Connection with Piers
    - Constant Depth Box Girder
  - Approach Spans and Ramps
    - Superstructure Integral Connection with Piers
    - Constant Depth Box Girder
    - Linear Depth Transitions
Bridge Details

• 3 Bridges
  – Br No 82045 – TH 36 Eastbound & Westbound
    • River Spans
    • Approach Spans
  – Br No 82047 – TH 36 Westbound to TH 95
  – Br No 82048 – TH 95 to TH 36 Eastbound

• Crossing the St. Croix River
  – River Width: 2,850 Feet
  – Water Depth: 25 to 30 Feet
Bridge Details

- Br No 82045 – TH 36 Eastbound & Westbound
  - River Spans
    - Extradosed Bridge
    - Segmental Concrete Box Girder(s)
    - 3,460 Ft Long Continuous
    - 370,000 SF
  - Approach Spans
    - Segmental Concrete Box Girders
    - 1,630 Ft Long Continuous
    - 149,000 SF
Bridge Details

• Br No 82047 – TH 36 Westbound to TH 95
  • Segmental Concrete Box Girder
  • 986 Ft Long Continuous
  • 48,000 SF

• Br No 82048 – TH 95 to TH 36 Eastbound
  • Segmental Concrete Box Girder
  • 1,293 Ft Long Continuous
  • 36,000 SF
Tower Elevation and Sections

Elevation

Outside View

Inside View

St. Croix River Crossing

Tower Elevation and Sections
Two Box Girder Cross-section
One Box Girder Cross-section
Bridge Construction

- Permitting Agencies
  - Corp of Engineers
  - Minnesota DNR

- Potential Construction Staging Areas
  - Stillwater Municipal Barge Terminal
  - Xcel Barge Unloading Facility
Foundation Options
Subsurface Investigations
<table>
<thead>
<tr>
<th>Phase/Date</th>
<th>Borings</th>
<th>Testing</th>
</tr>
</thead>
</table>
| 1: Nov 91 – Aug 96 | 86 borings               | • w%, PI, grain size, organic %, UU  
                       | • 55 onshore MN          | • UC on rock                                      |
|                 | • 21 river               |                                                   |
|                 | • 10 onshore WI          |                                                   |
| 2: Oct 95       |                          | 2 drilled shaft O-cell (1 axial, 1 lateral)  
                 |                          | 1 driven pile (axial & uplift)                   |
| 3: Nov 98 – Oct 99 | 17 borings in river  
                      | • w%, PI, grain size, organic %, UU  
                       | (upstream)                        | • UC on rock                                      |
|                 |                          |                                                   |
| 4: Aug – Nov 2005 | 11 borings in river  
                      | • w%, organic %, UU       
                       | 2 CPTs in river             | • UC on rock                                      |
| 5: Jun – July 2009 | 6 borings               | • organic %                                         
                       | • 4 onshore MN            | • UC on rock                                      |
|                 | • 2 onshore WI           |                                                   |
Subsurface Profile: Approach Spans
Subsurface Profile: Extradosed Spans
# Subsurface Conditions

<table>
<thead>
<tr>
<th>Strata</th>
<th>SPT / RQD</th>
<th>Testing Results</th>
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<tbody>
<tr>
<td>Soft River Silts</td>
<td>N/A</td>
<td>organic % avg = 13 s_u = 30 to 270 psf</td>
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<tr>
<td>MN Overburden</td>
<td>N = 2 to 50+</td>
<td>N/A</td>
</tr>
<tr>
<td>WI Overburden</td>
<td>N = 0 to 50+</td>
<td>N/A</td>
</tr>
<tr>
<td>Bedrock</td>
<td>RQD = 0 to 99</td>
<td>q_u = 200 to 10,000 psi (1,400psi avg)</td>
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<tr>
<td></td>
<td>(40 avg)</td>
<td>• 0.5 to 5.5 ksi (2 ksi)</td>
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<tr>
<td></td>
<td></td>
<td>• 2 to 10 ksi (6 ksi)</td>
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<tr>
<td></td>
<td></td>
<td>• 0.2 to 9 ksi (1.8 ksi)</td>
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<tr>
<td></td>
<td></td>
<td>• 0 to 85 (40 avg)</td>
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<tr>
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<td>• 0 to 80 (55 avg)</td>
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<tr>
<td></td>
<td></td>
<td>• 0 to 95 (35 avg)</td>
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</tr>
</tbody>
</table>

- **MN Overburden**
  - N = 2 to 50+
  - N/A

- **WI Overburden**
  - N = 0 to 50+
  - N/A

- **Bedrock**
  - RQD = 0 to 99
    - 40 avg
  - 0 to 85 (40 avg)
  - 0 to 80 (55 avg)
  - 0 to 95 (35 avg)
  - q_u = 200 to 10,000 psi
    - 1,400psi avg
  - 0.5 to 5.5 ksi (2 ksi)
  - 2 to 10 ksi (6 ksi)
  - 0.2 to 9 ksi (1.8 ksi)