HISTORIC CONCRETE ARCH BRIDGE - REHABILITATION

Amanda H. Porath, PE
Northwest Design Group, Inc.
MACKINAC TRAIL OVER CARP RIVER
Mackinac County Road Commission

11/18/2010
ARCH BRIDGE REHABILITATION

- Owner’s Needs
- Design Challenges
- Construction Solutions
- Rehabilitation
LOCATION
ORIGINAL CONDITION
REPLACEMENT BRIDGE CONSIDERED

- **Concrete Box Beam Structure**
- **100’ Span**
- **Width to meet AASHTO and MCRC requirements**
- **$1.4 Million Estimated Construction Cost**
- **Local Agency Bridge Program Funding**
- **Construction 2013+**
OWNER’S NEEDS

- General: Improve Condition of Crossing
- Widened Crossing
- Strength to Support Today’s Design Loads
- Within Allocated Funding Amount
- Timely Construction
IDEA TO REHABILITATE

- **Width**
  - Existing 22’ clear roadway
  - MCRC required 26’ clear

- **Strength**
  - Analyze for current design loads

- **$850,00 Estimated Construction Cost**

- **Construction 2011 due to Available Funding**

- **MCRC Quickly Decided to Rehabilitate**
DESIGN CHALLENGES

- **Width**
  - Arch is approximately 20’ wide

- **Environmental**
  - MDNRE Permit Easier to Obtain with Rehabilitation
  - USFS Section 7 Review, Wild & Scenic River
    - NDG wrote review for Forest Service Approval to accelerate process

- **Strength**
  - Original Design approximately 1920
  - Finite Element Analysis Performed
CONSTRUCTION SOLUTIONS

- Width
  - Approach Retaining Walls
  - Cantilevered Concrete Deck
Retaining Wall Construction
CONSTRUCTION SOLUTIONS

- Strength
  - Tied Back Spandrel Walls
  - Constructed Light Weight Fill over Arch
Light Weight (EPS) Fill & Tie Backs
REHABILITATION

- Construction August - November 2010
  - Hand Chipping & Shotcrete
  - Foundation Excavation for Drains and Waterproofing
  - Retaining Walls
  - Bridge Slab
  - Railings
  - Paving
- Final Construction Cost Approximately $850,000
THANK YOU

Amanda H. Porath, PE
Northwest Design Group, Inc.