Can Traditional Highway Asset Management Strategies Be Adapted To Waterway Infrastructure Analysis?

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Presentation Objectives

- What is condition of the Waterway system?
- What are traditional Asset Management Strategies for Highways?
- What tools or data are relevant for waterway projects?
- Next Steps?
Why examine linkages across modes?

- More State DOT’s have a navigation role
- All states have other waterway resource considerations
- Will a national dialogue on all public investment in infrastructure emerge?
Previous Studies That Addressed Maritime Needs and Conditions

- AASHTO – “Freight Bottom Line”
- FHWA Condition and Needs – 1995
- TRB – “Global Intermodal Freight: State of Readiness for the 21st Century”
- Marad – Several studies on large ships at ports
- The Importance of the U.S. Port System – USACE - IWR 1997
- Inland Waterway Review, IWR, various editions.
- Maritime Trade and Transportation, USDOT, 2002
Corps Navigation Mission

Provide safe, reliable, efficient, effective and environmentally sustainable waterborne transportation systems for movement of commerce, national security needs, and recreation.
Maritime Infrastructure Conditions and Concerns

- 25,000 miles of waterway and harbor channels handle 2.4 billion tons of cargo vital to economy
- Half of locks exceed 50-year design life and lock maintenance downtime has doubled
- Maintenance backlog increased to nearly $700 million under FY 2005 Budget
- Harbor improvements are needed to handle new larger vessels
- Lock Construction Projects underway to meet these needs have been delayed by 5-10 years due to funding shortfall
USACE – Overview

- Projects are authorized by Congress
- Local cost share formulas exist for various project types for new construction
- Corps maintains projects into perpetuity once competed
- Competition from other business lines within Corps budget
- Shift from Construction to Operating and Maintenance (O&M) of navigation projects
Civil Works Appropriations Constant (FY 95) $ Billions

Year

$Billions

Total
Operations & Maint.
Construction
**Aging Lock Inventory**

- **Number of Lock Chambers**

<table>
<thead>
<tr>
<th>Age in 2004 (Years)</th>
<th>0-10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
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<td>36</td>
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*Includes all operational deep and shallow draft Corps and TVA navigation locks.*

*Dewatering and repairs of Inner Harbor Lock, GIWW, which opened in 1923 for steamboats.*
Can We Help People Make Better Decisions?
Highway Asset Management

Focus – strategic assessment of economic tradeoffs between alternative infrastructure investments

Recognizing:

- Increased demand on system
- “Mature” network of roads and bridges
- Increased competition for funding and support
- Non-traditional players in decision process
- More focus on maintenance and meeting user expectations
How Can One Look At A System?

- Inventory Functions – physical characteristics, numbers of facilities, labor, equipment
- Engineering – structural integrity, deterioration
- Operational Reliability – delay, closures
- Economical and Financial – Cost/Benefit Analysis, capital and financial resources
- Demand - Traffic volumes and flows
- Safety and Security
- Sharing resources across different users with conflicting goals
Evolution in Highway Asset Management

- Began with engineering criteria
  - Structures were gauged on risk of structural “failure” or condition
  - Decision makers were not financially constrained to make tough “economic” trade-off analysis
- In 60’s/70s, began linking economic concepts to “optimize” roadway investment
- Most Asset Management models developed from legacy systems
A Generic Asset Management System

- Goals
- Asset Inventory
- Condition Assessment and Performance Modeling
- Alternatives Evaluation and Program Optimization
- Short and Long Range Plans
- Project Implementation
- Performance Monitoring
- Budget
Data Elements in Highway Infrastructure

- Traffic patterns (truck, car, weight, etc.)
- Structural composition and condition
- Historical condition and maintenance logs
- Methodology to determine different alternatives – incremental analysis
- GIS with system attributes
- “Customer” responsive attributes
The Corps is Examining Performance Measures for O&M Budgeting

- Developing new measures use and economic measures to balance issues of scale, geography, and use
- Seeking comparability with other USACE business lines:
  - Flood Damage Reduction
  - Hydropower
  - Environmental Stewardship (Natural Resources)
  - Recreation
Current Asset Management Process at USACE

- Districts determine projects based on HQ criteria, mostly Remaining Benefit/Cost Ratios
- Information supplied to HQ and sorted into various groups based on B/C and other factors
- Determinations based on actual budgets for upcoming year

Strategic planning is a different function
Repair, Evaluation, Maintenance and Rehabilitation (REMR)

For lock components

- Developed Condition Index
  - 0  Extremely Poor
  - 90-100  Excellent Condition

- Was linked to FHWA research on concrete

Limitations:

- Did not satisfy all needs
- No economic cost benefit ratios
- No linkage to user expectations
Lock 101
Age of Lock as One Measure?

Figure 2-5: Summary Condition Index and Age of High Traffic Locks in 1994
Asset Management Models being used or reviewed by Corps

- Maximo – detailed
- Hydroamp – industry standard in hydropower
- NASA Deferred Model –
- Department of the Interior – Locks and Dams
- Ad Hoc analysis – “inventory” features
- Life Cycle Costs – PIANC, COPRI, AAPA, USACE
Potential Lessons on Applying HERS type methodology

- Accepted time horizons and scenarios in incremental analysis
- Elasticity concepts consistent with waterway studies
- Many of same elements – traffic, throughput, economic and engineering concepts
Limitations on Applying HERS type methodology

- Induced Demand in the original design, but no post plan review
- Background traffic concept different
- Stronger seasonality changing peak/off peak design considerations
- Waterway studies are justified on travel savings
- Network effects stronger
- No functional class structure in U.S. databases
- Waterways more prone to discrete changes
A Generic Asset Management System

Goals

Asset Inventory

Condition Assessment and Performance Modeling

Alternatives Evaluation and Program Optimization

Short and Long Range Plans

Project Implementation

Performance Monitoring

Budget
Research gaps related to adopting asset management models

- Lack of consistent performance measures
- Linguistic differences
- Lack of network effects (operational)
- No consistent long term view of waterways
- Emphasis – accounting, engineering, economical, reliable? Striking a balance?
- Engineering standards for different components
- Changing vessel sizes and configurations – operational characteristics
- Lack of portable models and tools
Recent USACE workshop on Asset Management:

Held end of August
50+ people
Third of series of meetings

Five Critical Problems

- Lack of standards and criteria
- Condition assessment
- Risk and uncertainty
- Business line process
- Inadequate models and tools
Implementation Challenges?

- Projects have multiple uses
- No framework to determine and track user expectations
- Competing commercial interests
- Determining guarantee or minimum standards
- Planning and defining current and future needs
- Data integration – GIS and data warehousing
- Can process transparency be developed?
- Education and commitment
Conclusion

- Some highway activities could be applied, such as process and data integration
- Waterway system is too diverse to simply rely upon highway tools
- Need to look at more collaboration, especially for non-traditional relationships