Ohio River Mainstem System Study (ORMSS)

Draft System Investment Plan (SIP)

Mark Hammond, Huntington District
USACE Planning Center of Expertise for Inland Navigation

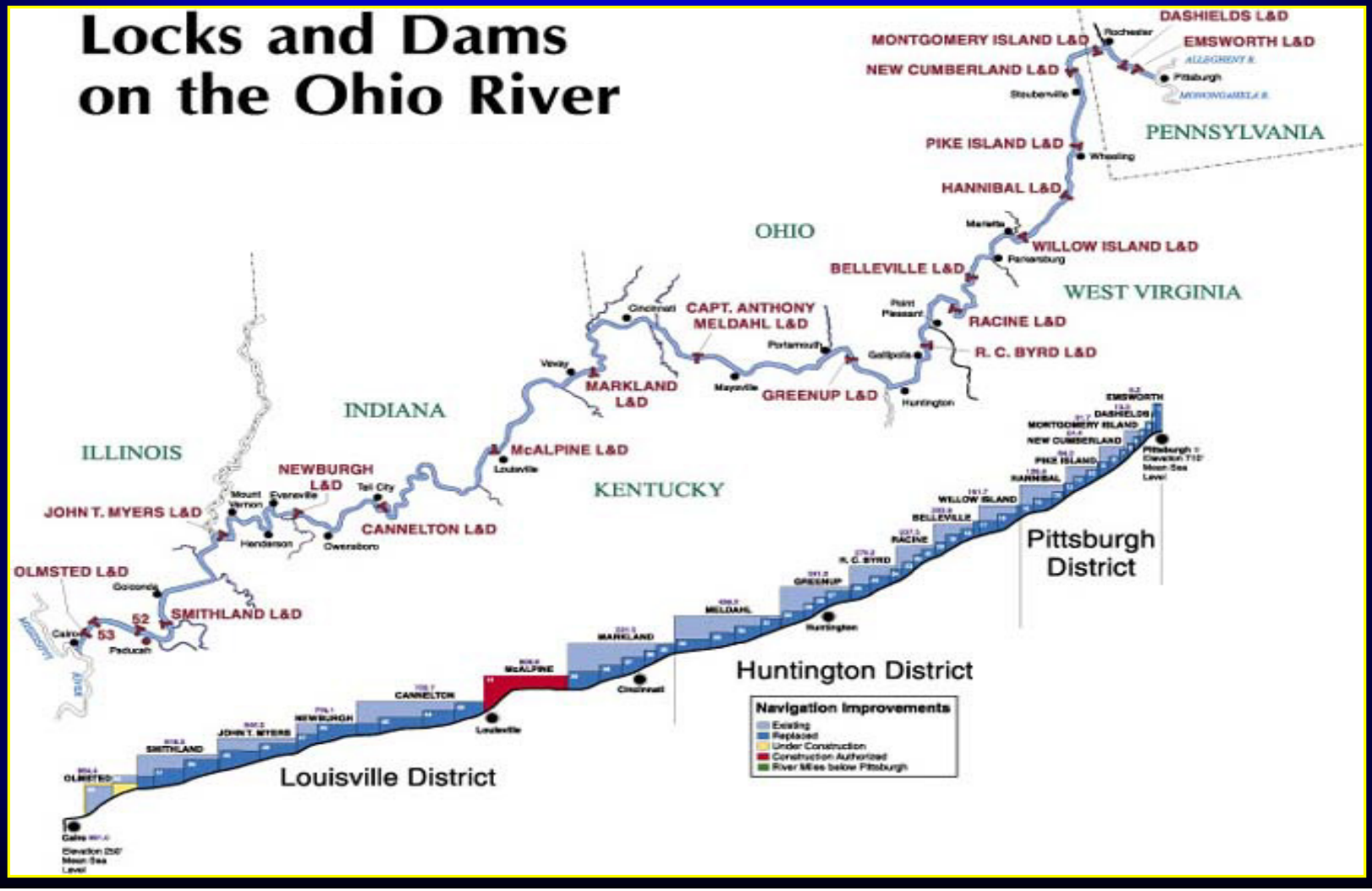
ORMSS – Draft SIP Briefing:

- ORMSS Purpose/Focus
- Describe Ohio River Navigation System (ORS)
- National Academy of Science Concerns
- Formulation & Evaluation
- Conclusions and Recommendations

ORMSS Purpose/Focus

- **The primary purpose of the ORMSS is to develop the best plan for maintaining a viable navigation system on the Ohio River**
- **The focus of the SIP is:**
  - **Navigation system reliability, not expansion**
  - **National Environmental Protection Act (NEPA) compliant Programmatic Environmental Impact Statement (PEIS) – system wide**
  - **Cumulative effects assessment – collective effects over time**

Ohio River Lock Profile



Ohio River Lock Configuration

Two Lock Chambers

Main Lock – 1200’ x 110’

Aux Lock – 600’ x 110’

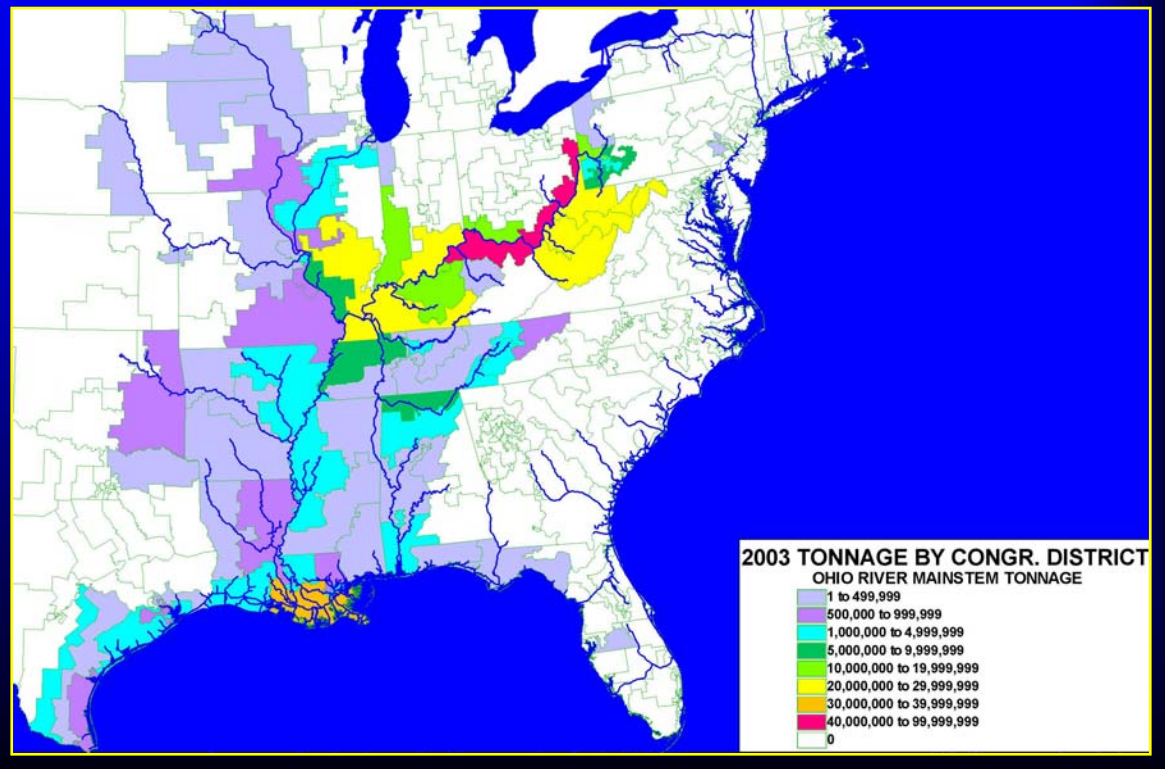
Upper Ohio Configuration

Main Lock – 600’ x 110’

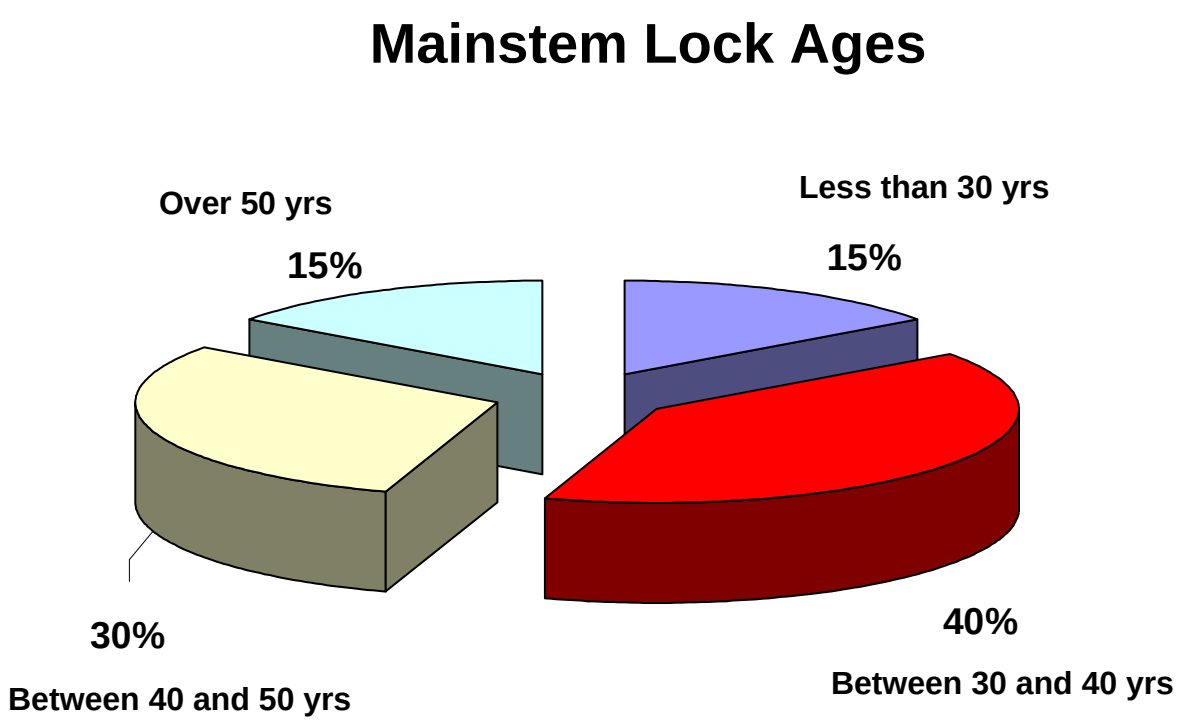
Aux Lock – 360’ x 56’

Why Ohio River Navigation?

- **Basin Traffic – 280.1 Million Tons in 2005**
  - **Coal Primary**
  - **Stone Secondary**
  - **Ores, Steel & Petrol**
- **Basin Coal Reserves**
  - **200 Billion tons**
- **Basin Electric Power Plants**
  - **Fuel cost savings**



Problem: Aging Infrastructure



Recent Ohio River Lock Closures

Lock	Closure Dates	Closure Duration	Delay (hrs)		Number of Tows Delayed	Delay Costs $
			Max	Avg		
Hannibal	Nov 1 - 15, 2005	15 days	140	58	125	$ 3,000,000
McAlpine	Aug 8 - 19, 2004	10 days 23.4 hrs	257	77	19	$ 695,000
Greenup	Sep 8 - Oct 31, 2003	52 days, 8 hrs	93	38	718	$ 13,200,000
Montgomery	Jun 18 - 28, 2002	10 days, 17 hrs	110	34	130	$ 1,200,000
Montgomery	Jul 15 - 31, 2002	16 days, 16 hrs	132	33	179	$ 1,700,000

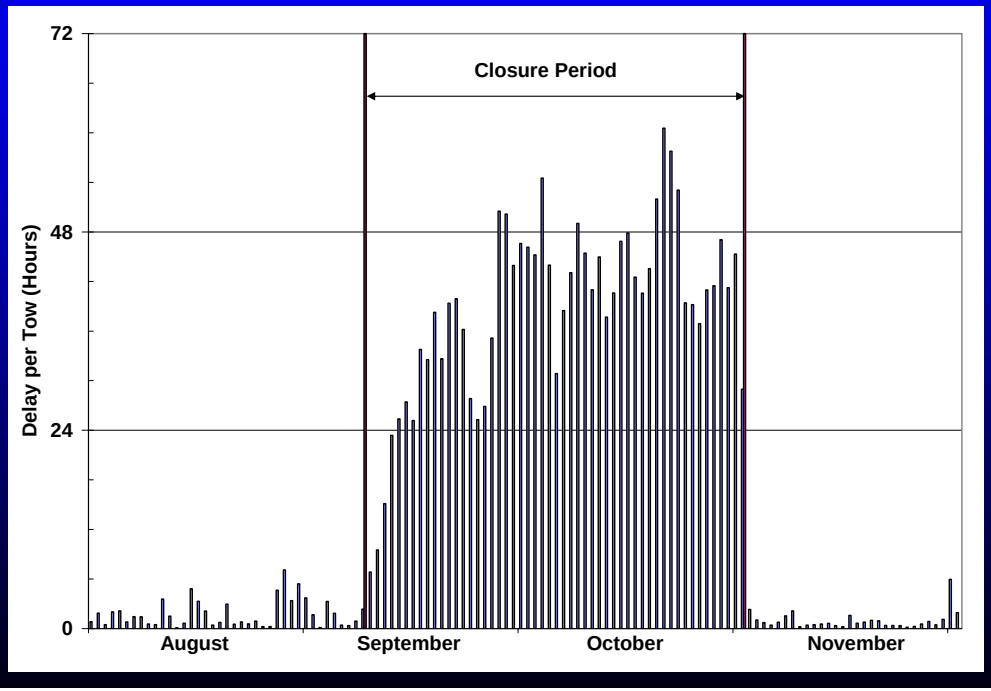
Source: Lock Performance Monitoring System (LPMS) and Institute for Water Resources (IWR) cost data.

Greenup Main Chamber Closure:

Sep 8 – Oct 31 2003

- 18 day scheduled → 52 day closure
- 718 tows delayed
- 27,000 hrs accumulated delay
- $13.2 million in delay costs
- Other industry costs estimated at over $30 million*

* unofficial study results



National Academies of Science (NAS) – Issues for ORMSS

- **Areas already consistent**
  - Systems Analysis
  - Transportation Rates
  - Modeling Lock Congestion
  - Structural Reliability
- **Areas where adjustments made to scope**
  - Forecasts and Uncertainty
  - Assessments of Nonstructural Alternatives
  - Better Integration of Engineering, Economics and Environmental inputs
  - Sensitivity of Barge Traffic to Rates
  - Ecosystem Sustainability Needs

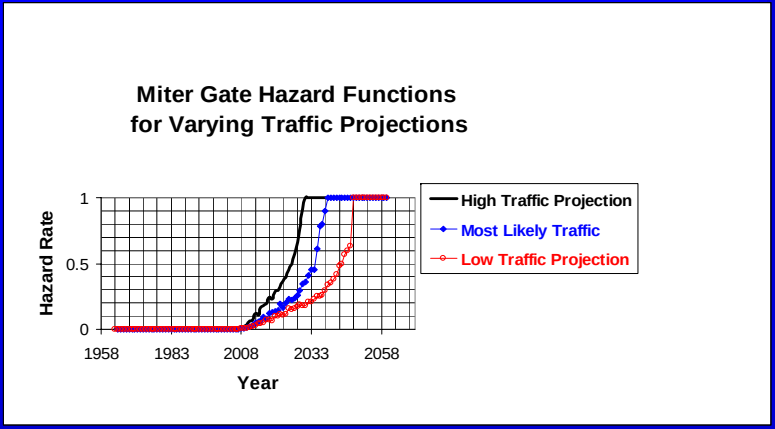
Ohio River Navigation Investment Model (ORNIM)

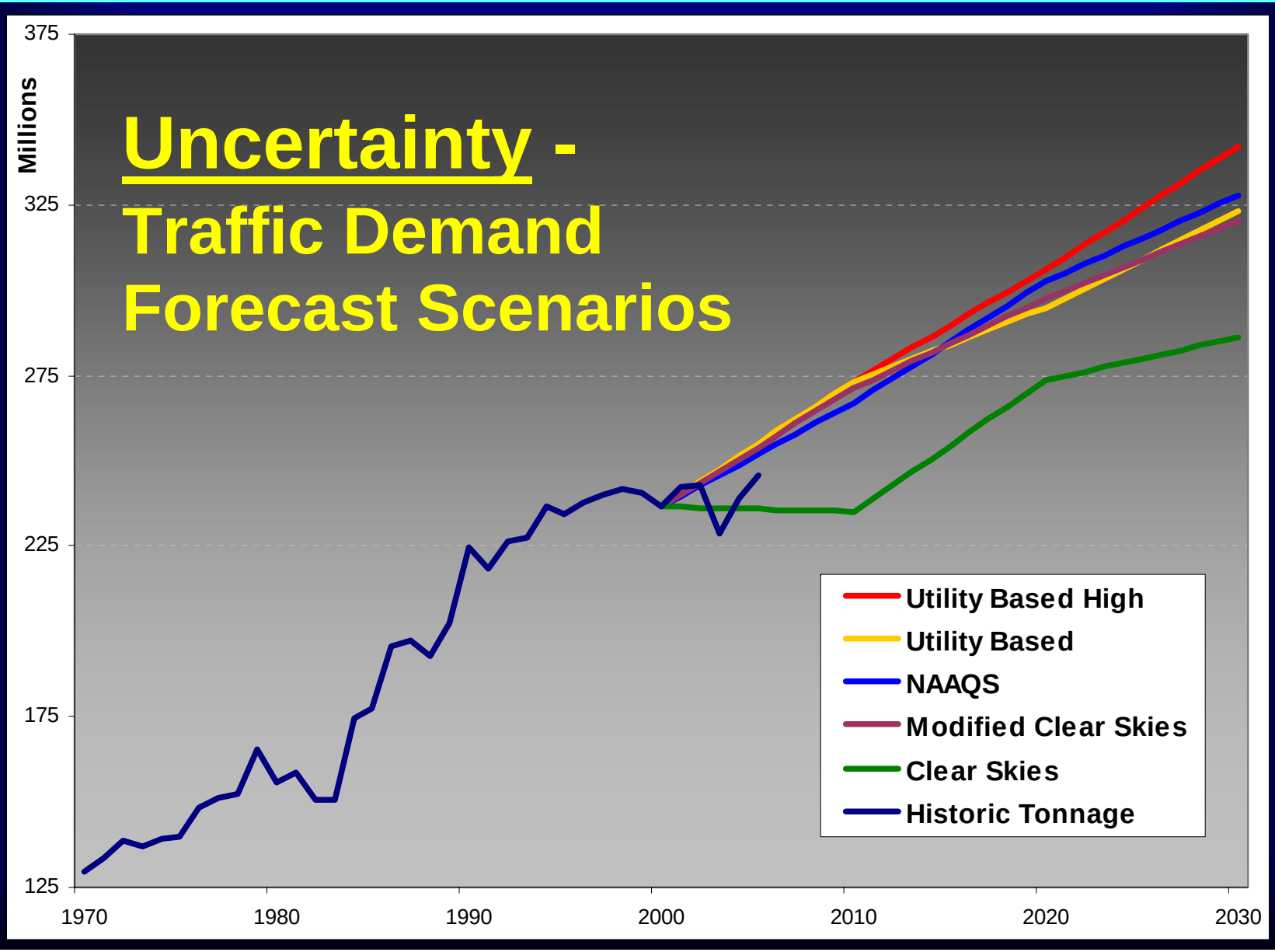
Lock Congestion & Rates

- **Lock Congestion Modeling (WAM)**
  - Use recommended technique - simulation
  - Remains state-of-the-art
  - Based behavior at locks as reflected in Lock Performance Monitoring System (LPMS)
- **Transportation Rates**
  - Use recommended technique
  - Rail Waybill Sample & Waterborne Commerce Data
  - Tennessee Valley Authority (TVA) rate experts

Risk - Engineering Reliability Analysis

- Time dependent analytical reliability models for all critical operating components.
  - Analysis endorsed by NAS review.
  - First successful use within the Corps of Engineers.
- Probabilities of failure integrated with economic analysis.
- Reliability analysis calibrated with field conditions.




Uncertainty -
Traffic Demand
Forecast Scenarios
Millions
375
325
275
225
175
125
1970
1980
1990
2000
2010
2020
2030
Utility Based High
Utility Based
NAAQS
Modified Clear Skies
Clear Skies
Historic Tonnage

Assessment of Nonstructurals

- **Evaluated**
  - **N-up, N-down operating policies**
  - **Mooring cells to reduce approach time**
  - **Helperboats**
  - **Industry re-scheduling**
- **Work to do – awaiting results of Navigation Economics Technologies (NETS) R&D**
  - **Congestion fees / Tradable lockage permits**
  - **Scheduling / Lock appointments**
  - **Shipper Response**

Shipper Response

- **TVA study for Transportation Research Board**
  - **Shippers depend on river and barge transport**
  - **Relatively unresponsive to price changes**
- **NETS study of Ohio River Basin (ORB) coal shippers**
  - **Relatively unresponsive**
  - **Surprising number of firms said they would go out of business if could not ship by water**

Independent Technical Review (ITR) of Economics Data and Models

- Anticipated the peer review process by assembling external review group
- ITR Team
  - Economics Appendix, Lead - John Burns
  - ORNIM - Karl Pavlovic, DOXA Inc
  - ORNIM - Mike Bronzini, George Mason U. (NAS)
  - Lock Congestion - Janet Skees, Skees, Inc.
  - Transportation Rates - James Corbett, U. of Delaware
  - Traffic Projections - Steve Fuller, Texas A&M (NAS)

Integrate Environmental Considerations

- **NEPA Compliance**
  - **Programmatic Environmental Impact Statement (PEIS)**
  - **Focus is Cumulative Effects Assessment (CEA) and other issues**
  - **Assess Environmental Sustainability**
- **Identify Long-Term Ecosystem Sustainability Needs**

Without Project Condition (WOPC)

"the WOPC was formulated to develop the least federal cost plan to provide viable navigation on the Ohio River mainstem"

- **Assumes minimum level of system reliability maintained**
- **Includes authorized improvements either under construction or pending appropriation (Olmsted, J.T. Myers, Greenup, Marmet, McAlpine, Kentucky, Chickamauga, Lower Mon)**
- **Includes implementation of the Ohio River Mainstem Ecosystem Restoration Program**
- **Focus is on the mainstem locks, not the dams**

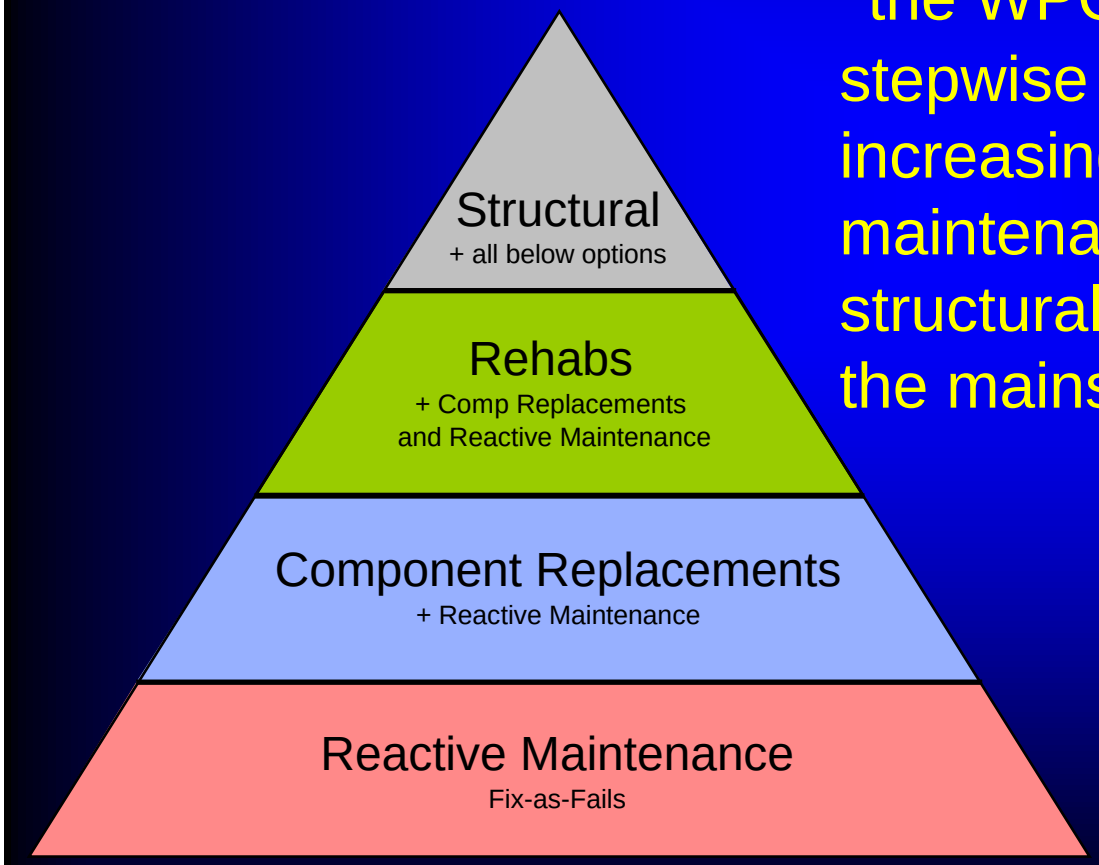
WOPC Average Annual Costs & Benefits

(2010-2070, 5.125%, Million FY 03 $)

Ohio Mainstem System	Forecast Scenario				
	Clear Skies	Modified Clear Skies	NAAQS Growth	Utility Based	Utility Based High
Reactive Maintenance Benefits					
Equilibrium Waterway Savings	$2,328.6	$2,493.5	$2,476.0	$2,536.4	$2,580.5
Reduced Savings from Unscheduled Repair	($75.8)	($119.8)	($124.1)	($107.7)	($120.3)
Total System Benefits	**$2,252.8**	**$2,373.7**	**$2,351.8**	**$2,428.7**	**$2,460.1**
Reactive Maintenance Costs					
Scheduled Lock Maintenance	$ 23.1	$ 23.1	$ 23.1	$ 23.1	$ 23.1
Scheduled Dam Maintenance	$ 6.9	$ 6.9	$ 6.9	$ 6.9	$ 6.9
Scheduled Lock Improvements*	$ 5.8	$ 5.8	$ 5.8	$ 5.8	$ 5.8
Unscheduled Lock Repair	$ 14.0	$ 15.1	$ 15.0	$ 14.7	$ 15.0
Normal O&M	$46.7	$46.7	$46.7	$46.7	$46.7
Random Minor	$2.4	$2.4	$2.4	$2.4	$2.4
Total System Costs	**$99.0**	**$100.1**	**$100.0**	**$99.8**	**$100.1**
Net Benefits	**$2,153.8**	**$2,273.6**	**$2,251.8**	**$2,328.9**	**$2,360.1**

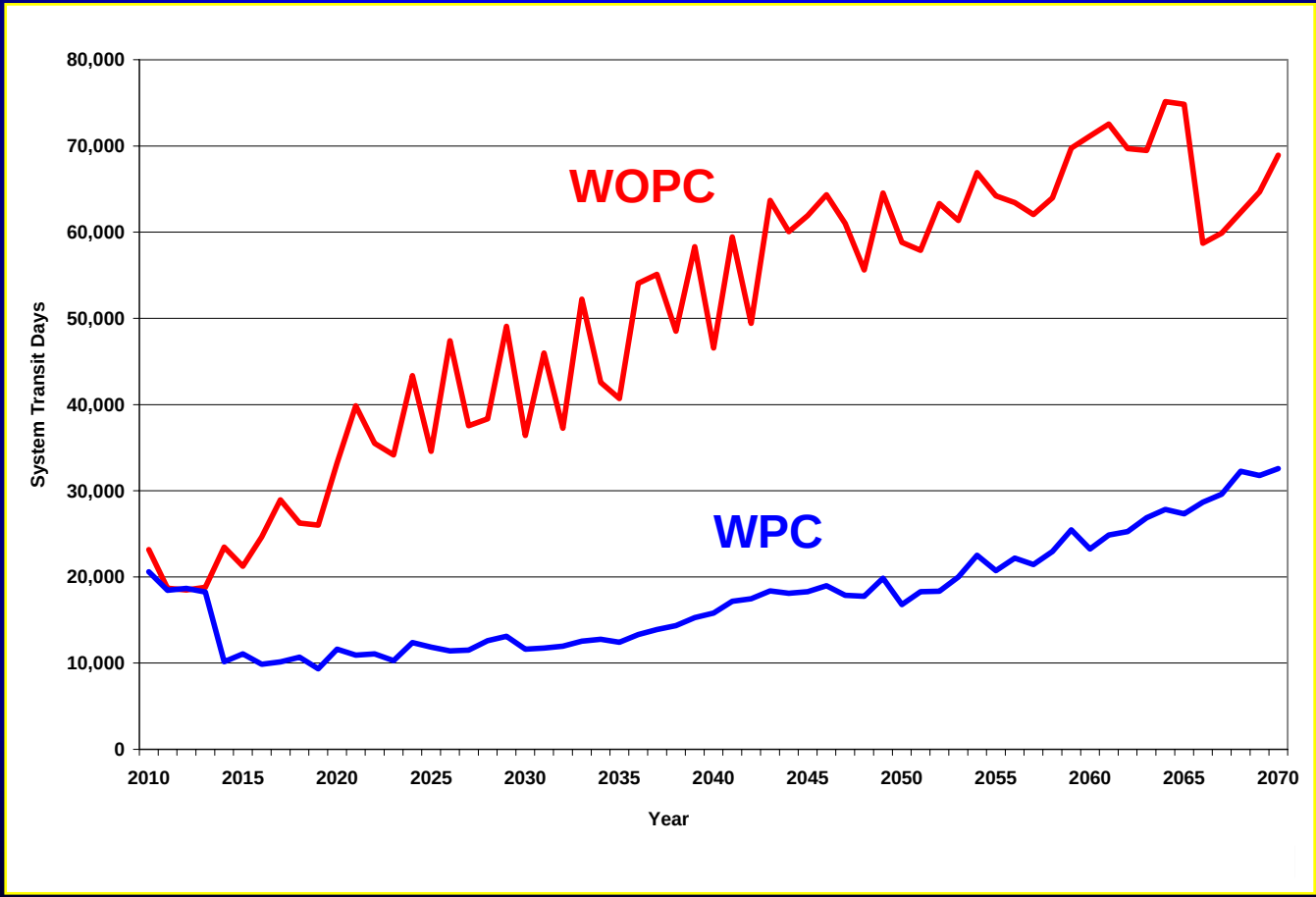
** Authorized 600' extension of the auxiliary chamber at Myers in 2010 and rehabilitation of the Greenup main chamber in 2010-11.*

With Project Condition (WPC)



"the WPC was formulated using a stepwise approach optimizing increasingly more aggressive maintenance alternatives, including structural modifications, at each of the mainstem projects"

Transit Days to Accommodate Equilibrium Traffic



WPC Average Annual Incremental Benefits and Costs

(2010-2070, 5 1/8%, Million FY03 $)

Ohio Mainstem System	Forecast Scenario				
	Clear Skies	Modified Clear Skies	NAAQS Growth	Utility Based	Utility Based High
Incremental Benefits over WOPC	$147.8	$237.0	$259.9	$207.0	$233.3
Incremental Costs over WOPC	$19.0	$18.6	$21.5	$18.9	$18.4
Incremental Net Benefit	**$128.8**	**$218.4**	**$238.4**	**$188.1**	**$214.9**
Benefit / Cost Ratio	**7.8**	**12.7**	**12.1**	**11.0**	**12.7**

- System investment opportunities exist to increase the efficiency of the current Ohio River mainstem
- Long term navigation needs on the Ohio include new lock chambers to replace the old and small upper Ohio chambers and the need to increase main chamber reliability at some of the lower Ohio projects

Draft SIP Findings

Investment	Year of Economic Justification*
Near-Term (2010-2015)	
Emsworth New 600' Lock	2010
Dashields New 600' Lock	2010
Montgomery New 600' Lock	2010
Montgomery New 1200' Lock	2010
Markland Main Rehab	2010
Meldahl Main Rehab	2010-2013
Hannibal Main Rehab	2011-2012
Myers Main Rehab	2011-2014
Pike Island Main Rehab	2015-2016
Med-Term (2016-2025)	
Newburgh Main Rehab	2016-2025
Cannelton Main Rehab	2016-2017
Belleville Main Rehab	2017-2028
Racine Main Rehab	2019-2020
Long-Term (2026-2052)	
Willow Island Main Rehab	2027-2028
Byrd Main Rehab	2030-2045
Markland Aux Rehab	2052
* to start investment alternative	

Environmental Effects and Opportunities

- **Site Specific**
  - **Will be evaluated (and mitigated if necessary) through future site-specific studies – *pertains to Upper Ohio***
  - **Implement some ecosystem sustainability improvements through environmental design features and mitigation plans**
- **System Level**
  - **Implementation of the WPC would benefit the Ohio River Ecosystem**
  - **Long term sustainability of freshwater mussels and riparian /floodplain ecosystem will remain marginal**
    - **Ongoing Section 7 Endangered Species Act Coordination**
    - **Ohio River Ecosystem Restoration Program**
    - **Ohio River Basin Comprehensive Study**

Conclusions

- All traffic scenarios indicate future growth
- Mainstem locks will degrade without proactive maintenance
- Proactive maintenance robustly justified
- Replacement of very old upper Ohio Locks are justified
- Need to complete the Upper Ohio River study
- Need to initiate studies for several major lock rehabilitations
- In general resources are sustainable with the exception of Mussels and Riparian/floodplain resources
- Opportunities exist to improve ecosystem sustainability for the Ohio River
- The SIP is not budget constrained - Need to develop a budget constrained and comprehensive Inland Navigation System SIP

Recommendations

- Increase O&M investments
- Complete all authorized navigation improvements
- Initiate main chamber rehabilitation studies for Meldahl, Hannibal, and Myers
- Initiate main chamber rehabilitation study for Pike Island
- Pursue planning and implementation of measures to improve environmental sustainability
- Initiate preparation of the Program Implementation Plan for the Ohio River Ecosystem Restoration Program.
- Establish a stand alone program to update the data and models used in preparing the System Investment Plan
- Provide optimal funding for the Upper Ohio River Study currently underway
- Complete work on the Markland gates as soon as possible