Proposed Ohio River Bridge: Transitioning from Planning to NEPA and Navigation Modeling

September 17, 2013

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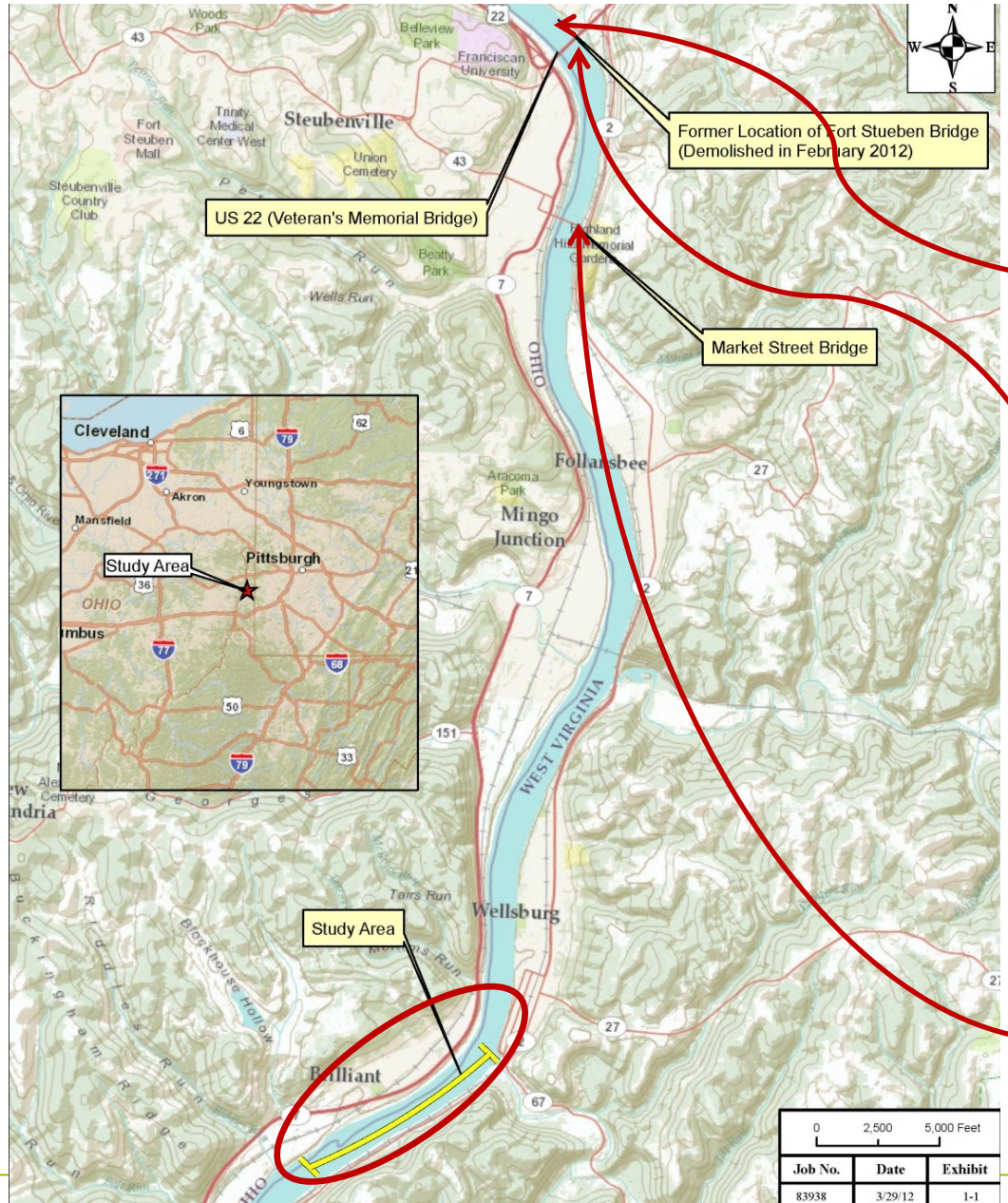
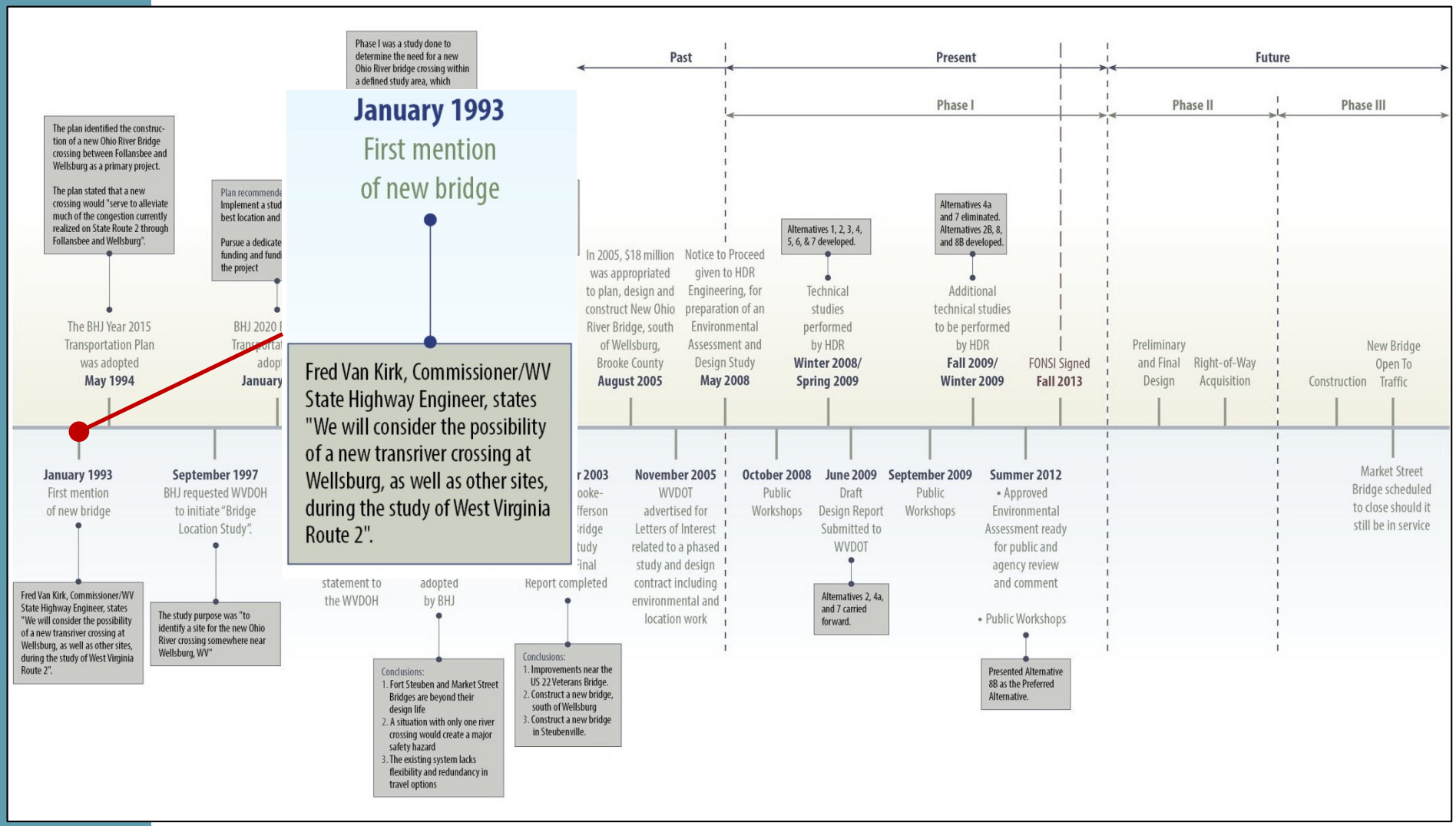
Upper Ohio Valley Bridge System



Planning a Bridge – A Brief History



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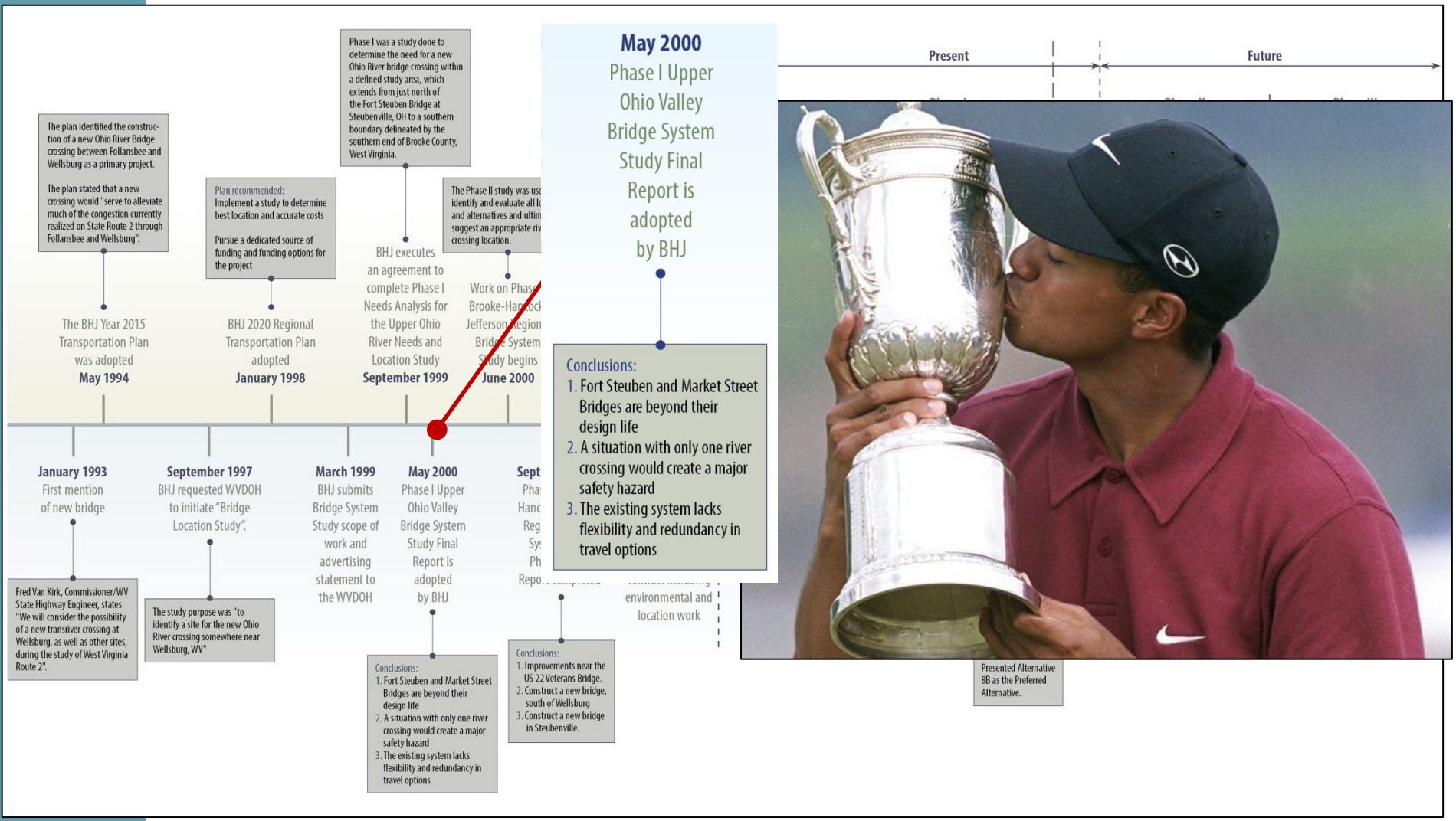

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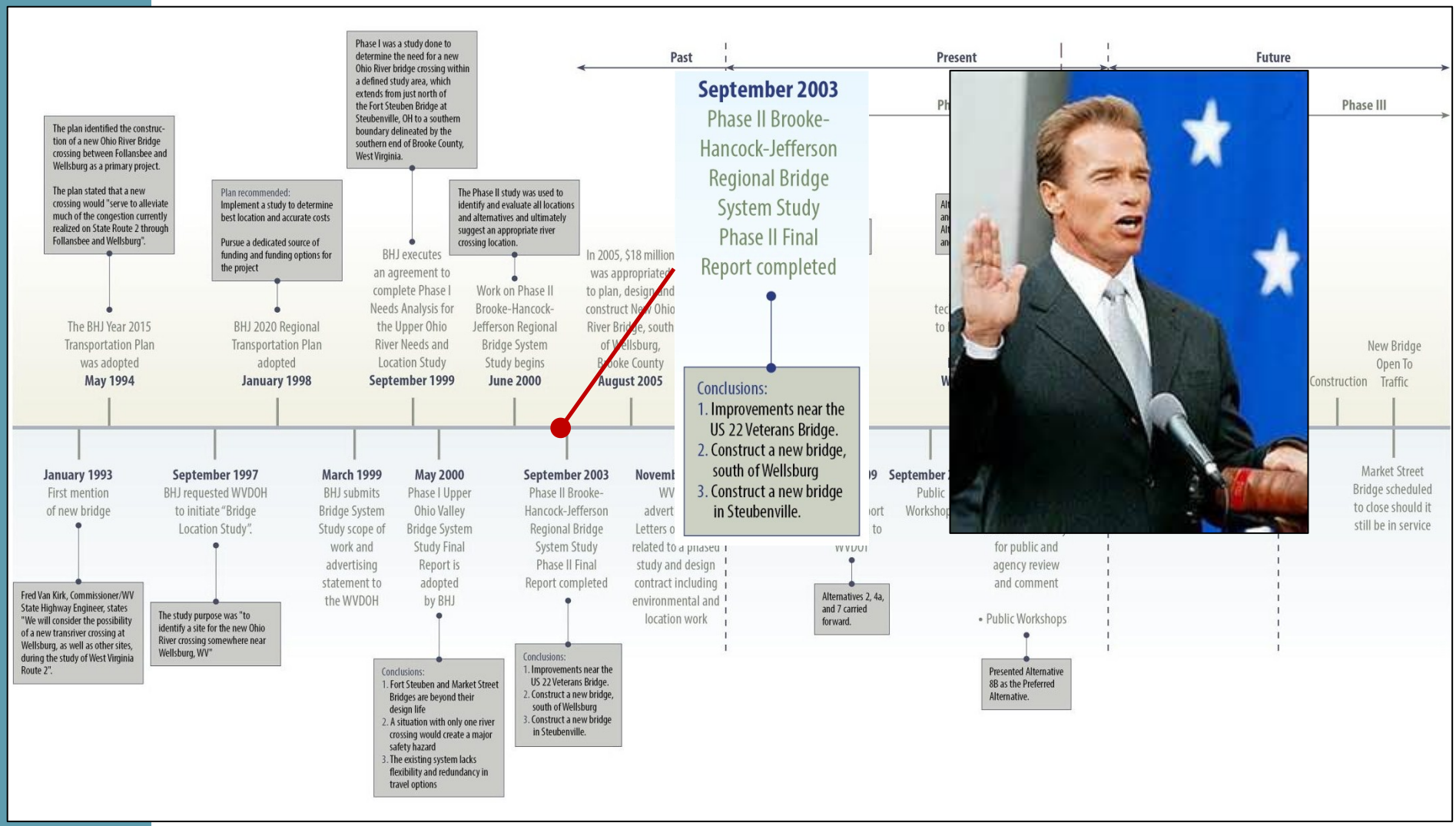

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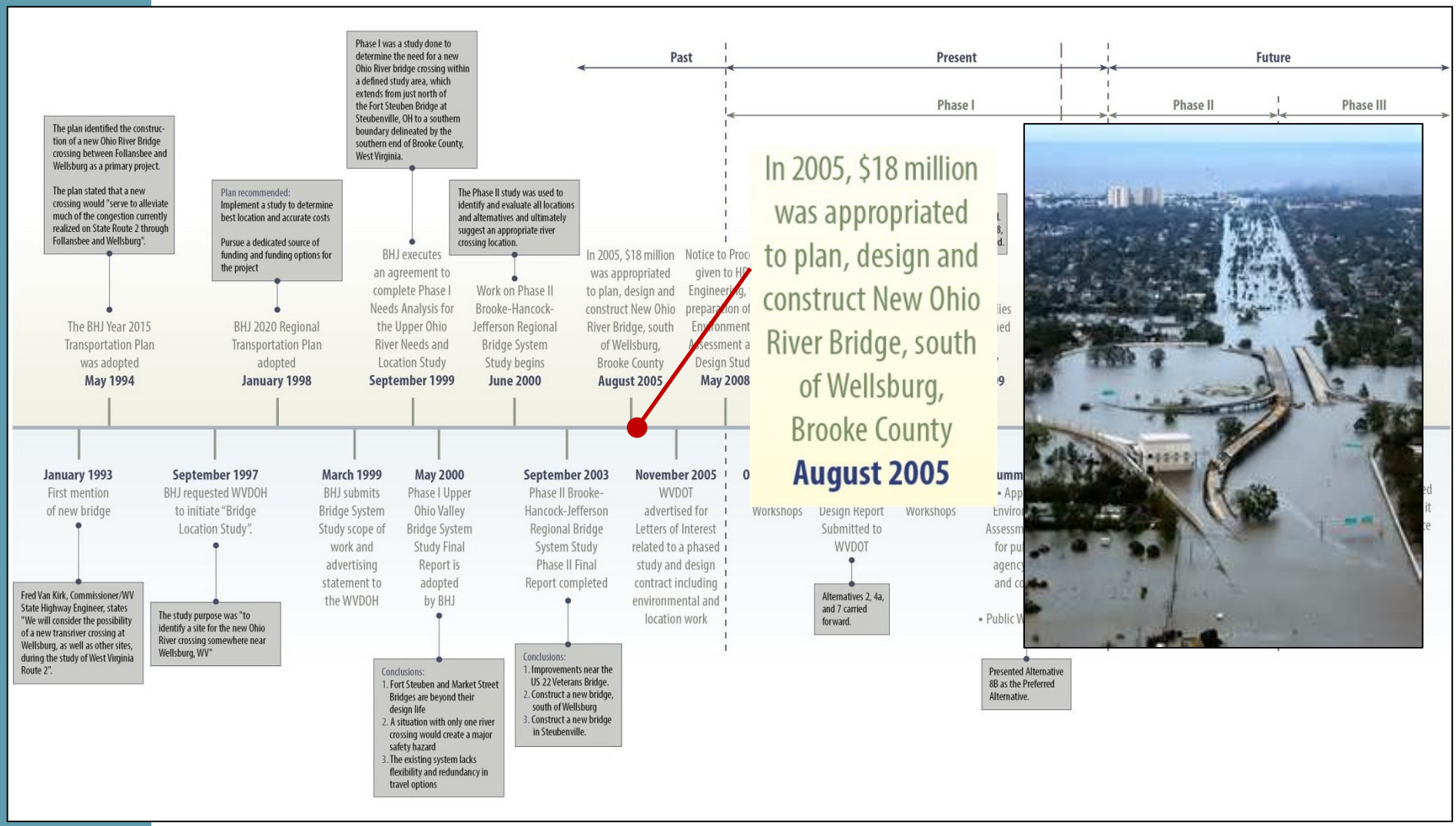
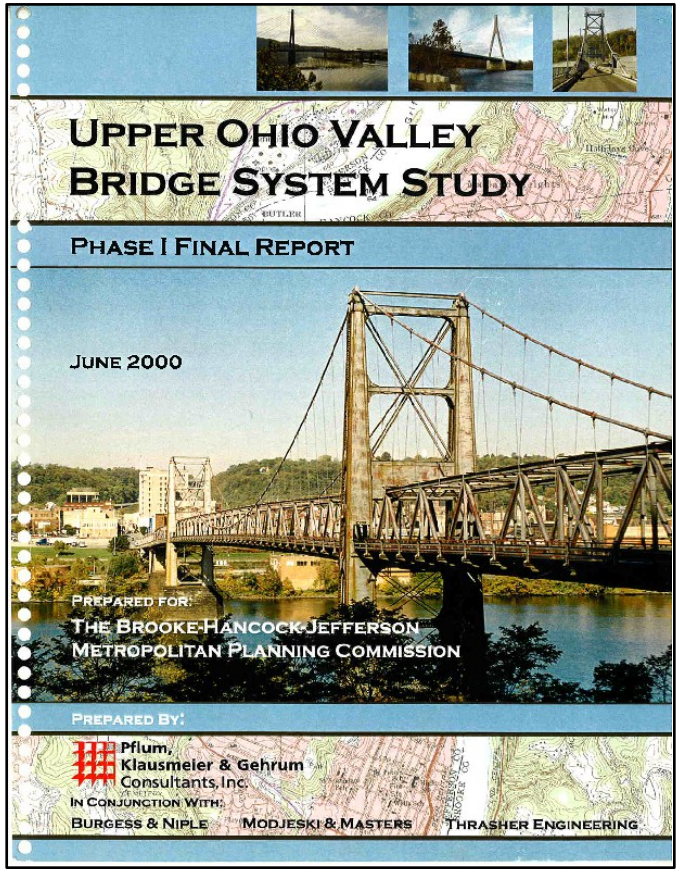


Phase I – Upper Ohio Valley Bridge System Study

Purpose

Analyze and Determine the need for a new Ohio River Bridge – Between just north of the Fort Steuben Bridge to southern end of Brooke County.



Phase I – Upper Ohio Valley Bridge System Study

The Study is an outgrowth of the *BHJ 2020 Regional Transportation Plan*

Their number one priority

Phase I – Upper Ohio Valley Bridge System Study

Conclusions and Determination of Need

1. The existing bridges can carry both current and projected traffic volumes.
2. Two of the three bridges (Market Street and Fort Steuben) are beyond their design life.
3. Both older bridges will require significant renovation to continue operating for any extended period of time.
4. Even with renovation abrupt closure of one or both older bridges is possible, if key structural components fail.

Phase I – Upper Ohio Valley Bridge System Study

Conclusions and Determination of Need

5. A situation with only one river crossing would create a major safety hazard.

6. The concentration of all river crossing capacity in a small geographic area limits flexibility within the system.

7. The adopted Goals and Objectives are not satisfied with any bridge out of service.

Phase I – Upper Ohio Valley Bridge System Study

Basis for Finding of Need

1. The impending closure of existing crossing capacity will cause failures in the system.

2. The existing system lacks flexibility and redundancy in travel options.

Phase I – Upper Ohio Valley Bridge System Study

Goals

1. Maintain and enhance transportation capacity, safety and reliability for existing businesses, their employees and all residents;

2. Provide enhanced access for expansion and retention of business, and attraction of new business to the region;

3. Draw more traffic and commerce into the Upper Ohio Valley;

Phase I – Upper Ohio Valley Bridge System Study

Goals

4. Develop linkages to high capacity inter-modal transportation by strengthening the connections to river ports and railroads;

5. Enhance emergency management options to provide alternative routes in case of flood, natural disaster or accident;

6. Improve travel times throughout the region; and

7. Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of vehicles.

Phase I – Upper Ohio Valley Bridge System Study

Conclusions – If both the Fort Steuben and Market Street Bridges were to be closed, there would be nearly double the amount of traffic on the Veterans Memorial Bridge.

- While the bridge can accommodate the increased volume, the ramp system cannot.
- If the Veterans Memorial Bridge is closed due to traffic accidents or inspections, the traffic on the other two bridges will exceed capacity.
- If only one of these bridges remains open to traffic, the impact of closures of the Veterans Memorial Bridge will be even more severe.

Phase I – Upper Ohio Valley Bridge System Study

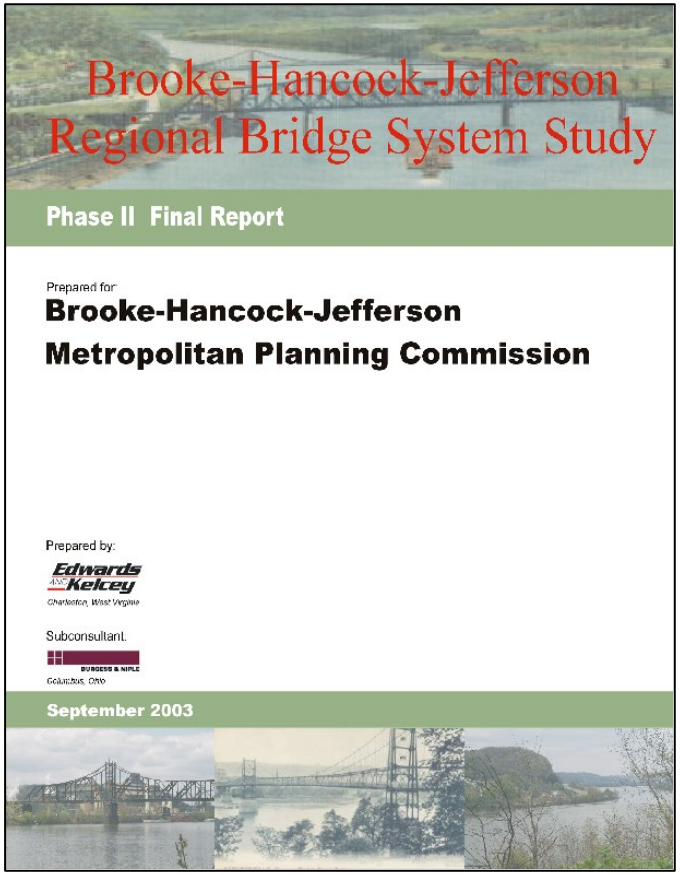
Conclusions – If both the Fort Steuben and Market Street Bridges were to be closed, there would be nearly double the amount of traffic on the Veterans Memorial Bridge.

- Also, at times when the Bridge is closed due to accidents or inspection, the nearest existing Ohio River crossing is at such a distance that the Weirton/Steubenville area that the impact on local traffic would be seriously impacted, essentially cutting the two cities off from one another.

Phase II – BHJ Regional Bridge System Study

Purpose

To determine the most suitable system of bridges in the study area considering the regional benefits from, and the cost of providing such a system.



Phase II – BHJ Regional Bridge System Study

Need Assessment

The proposed improvements will serve the Ohio River crossing travel desires for the BHJ region over the next 25 years. They prepare the community for the eventual end of the service life for both the Market Street Bridge (constructed 1904) and the Fort Steuben Bridge (constructed 1928).

Phase II – BHJ Regional Bridge System Study

Evaluation Criteria

1. Vehicle Hours of Travel (VHT)
2. Vehicle Miles of Travel (VMT)
3. Total Travel Time (Million Person Hours/yr)
4. Average Travel Times
5. Percent of System at each Level of Service (LOS)
6. Probability of Minimizing Potential Environmental Impacts
7. Estimated Vehicle Emissions (tons/yr)
8. Potential Annual Accidents

Phase II – BHJ Regional Bridge System Study

Evaluation Criteria

9. Potential for Improved Emergency Response
10. Potential for Alternative River Crossings
11. Capital Cost
12. Reduction in Total Users Cost
13. B/C Ratio
14. Technical Feasibility
15. Fiscal Likelihood
16. Potential Land Use Impacts

Phase II – BHJ Regional Bridge System Study

Evaluation Criteria

17. Ability to Maximize Accommodations of Heavy and Large Vehicles
18. Potential for Improved Access to Existing Industrial Sites
19. Potential for Improved Access to Future Industrial Sites

	MEASURES	Base Scenario	Southern Scenarios			
		Vets only	Vets, New South of Wellsburg	Vets, New Between Follansbee and Wellsburg	Vets, New Market in Exist. Location	V
		Baseline	#2	#3	#4	
	Mobility					
1	**Vehicle hours of travel (VHT)**	90,900	87,900	88,100	90,800	
2	**Vehicle miles of travel (VMT)**	2,799,000	2,774,000	2,782,000	2,781,000	
3	**Total Travel Time (Million Person Hours/Yr)**	36.05	35.18	35.37	35.90	
4	**Average Travel Time, Selected Gateways to Selected River and Rail Ports.**					
	WV Gateways to OH River and Rail Ports					
	WV27 to WP S Works River Port	36	17	16	32	
	US22 to WP S Works River Port	17	17	16	16	
	WV2 (south) to WP S Works River Port	41	17	18	38	
	WV27 to Warrenton River Term	51	25	29	47	
	US22 to Warrenton River Term	32	32	32	32	
	WV2 (south) to Warrenton River Term	56	24	31	53	
	WV27 to NS/W&LE RR Facility	37	16	14	33	
	US22 to NS/W&LE RR Facility	18	18	18	18	
	WV2 (south) to NS/W&LE RR Facility	42	15	16	39	
	OH Gateways to WV River and Rail Ports					
	US22 to Weirton I&C Water Port	25	25	25	25	
	SR 7 (south) to Weirton I&C Water Port	29	29	29	29	
	US22 to WP Coke Plant River Port	24	24	24	24	
	SR 7 (south) to WP Coke Plant River Port	28	22	23	23	
5	**Percent of System at each Level of Service.**					
	LOS "A"	83%	83%	83%	83%	
	LOS "B"	8%	9%	9%	9%	
	LOS "C"	3%	4%	4%	3%	
	LOS "D"	4%	3%	3%	3%	

Phase II – BHJ Regional Bridge System Study

First Priority

- Construct Roadway and Intersection Capacity Improvements
- Realign and improve Freedom Way/Birch Intersection
- Improve Alignment and Widen the intersection of Freedom Way/WV 2 and related WV approaches
- Improvement of Freedom Way including Upgrade and/or Widening of the Existing three lanes
- Improve and Widen University/SR 7 Intersection and Related Ohio Approaches
- Provide Safety Improvements on Veterans Memorial Bridge ramps in Ohio

Phase II – BHJ Regional Bridge System Study

Second Priority

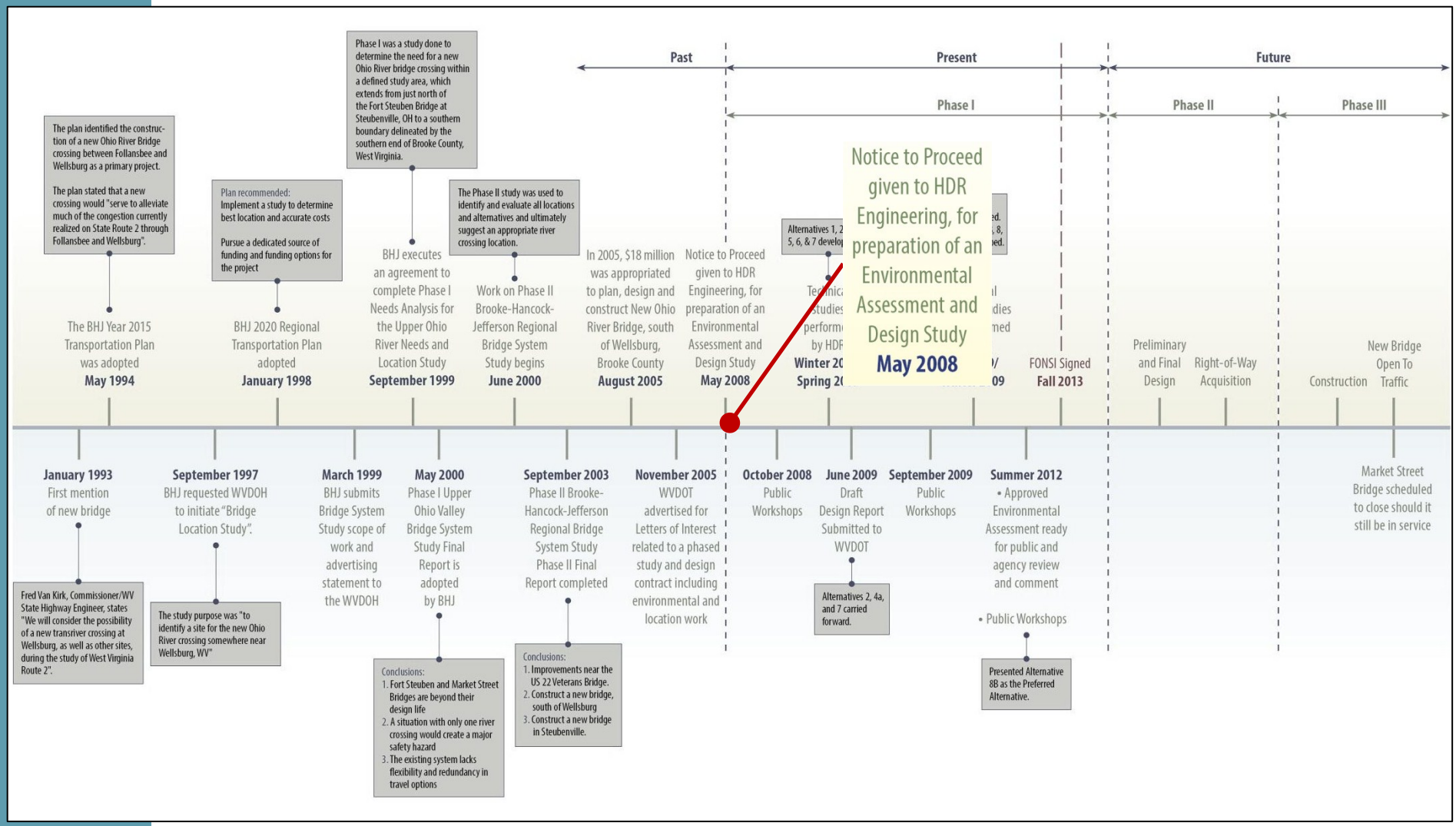
- Construct a New Ohio River Bridge, south of Wellsburg
- Prepare Engineering and Environmental Studies to Establish a Specific Location for the New Bridge and configuration of Roadway Connections to WV 2 and SR 7

Phase II – BHJ Regional Bridge System Study

Third Priority

- Construct a New Ohio River Bridge
- Prepare Engineering and Environmental Studies to Establish a Specific Alignment Location and Impact on WV 2, SR 7 and the Existing Street System in the Steubenville Central Business District.

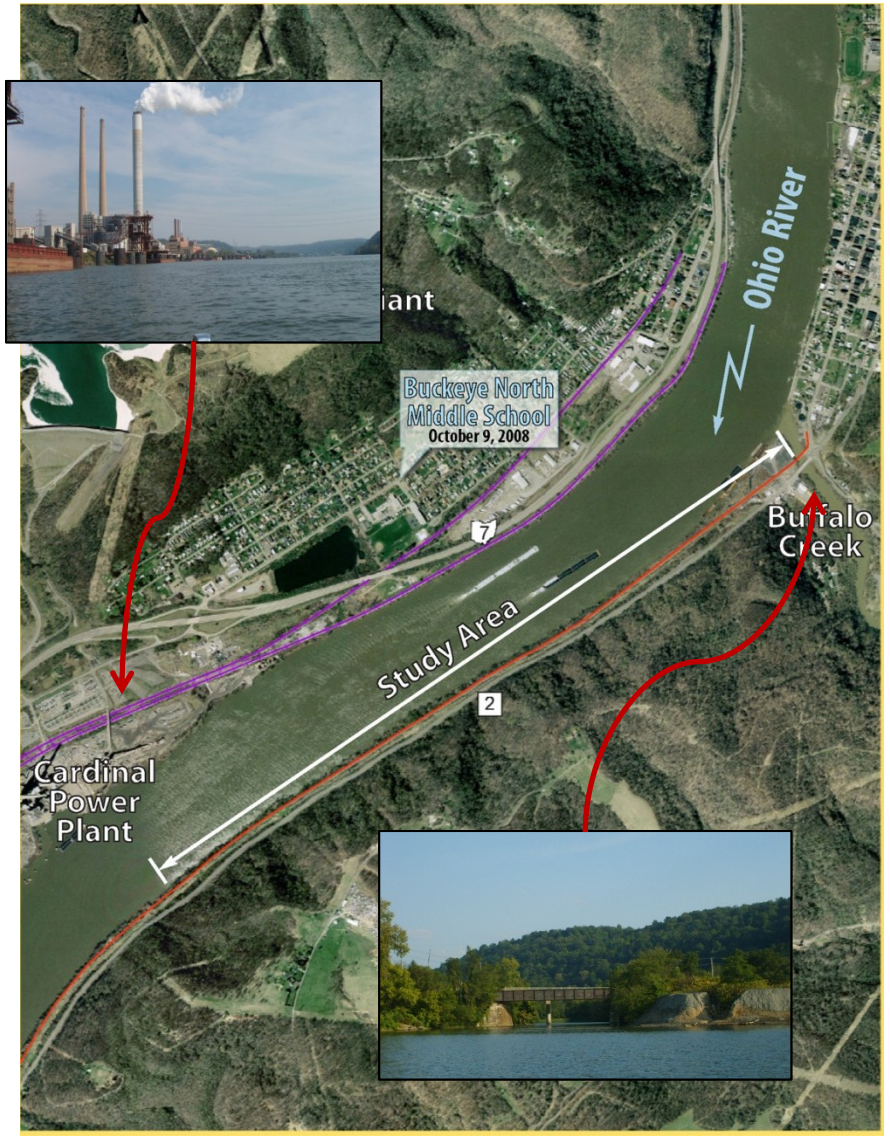
Planning a Bridge – A Brief History



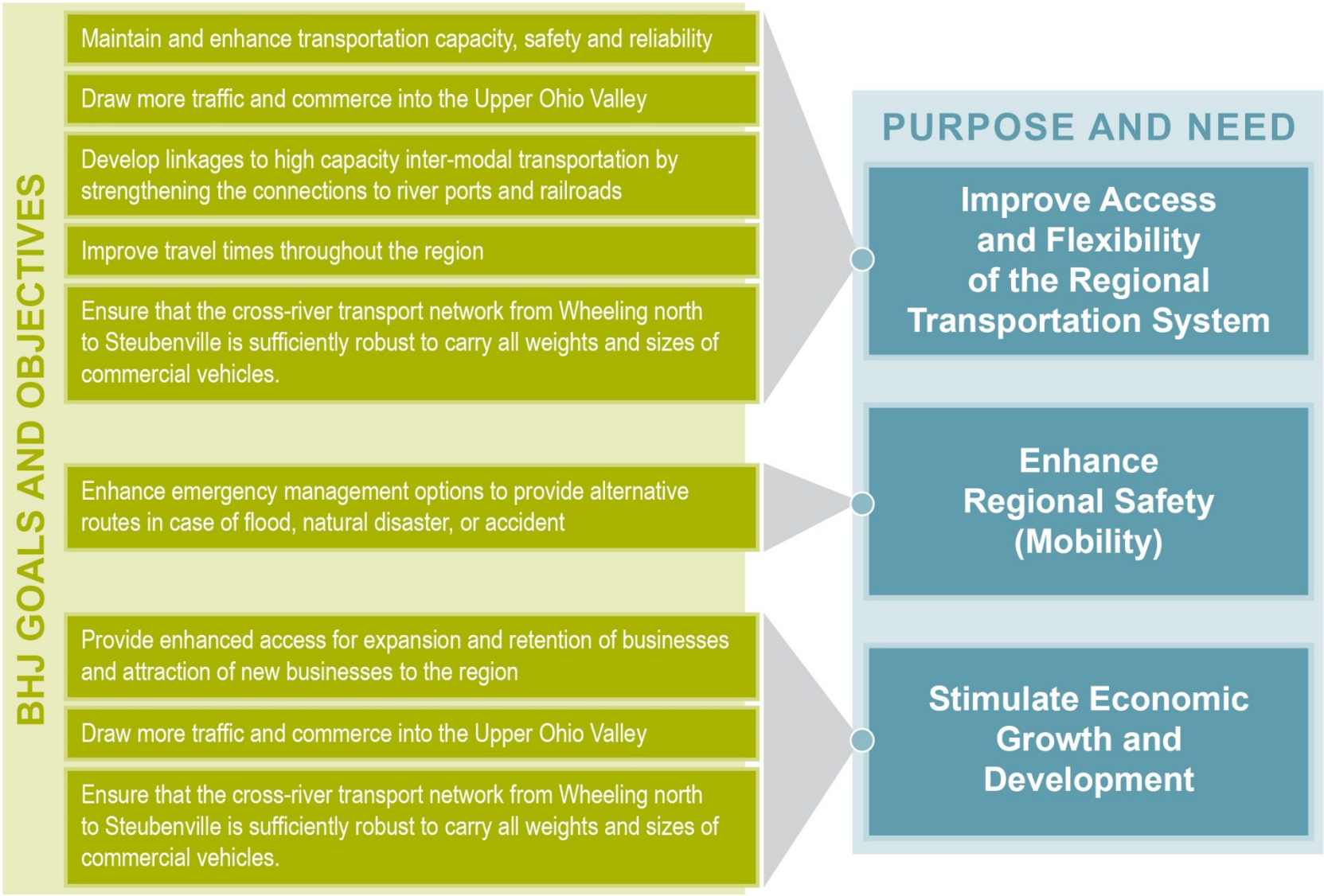
Transitioning to NEPA

Objectives and Goals

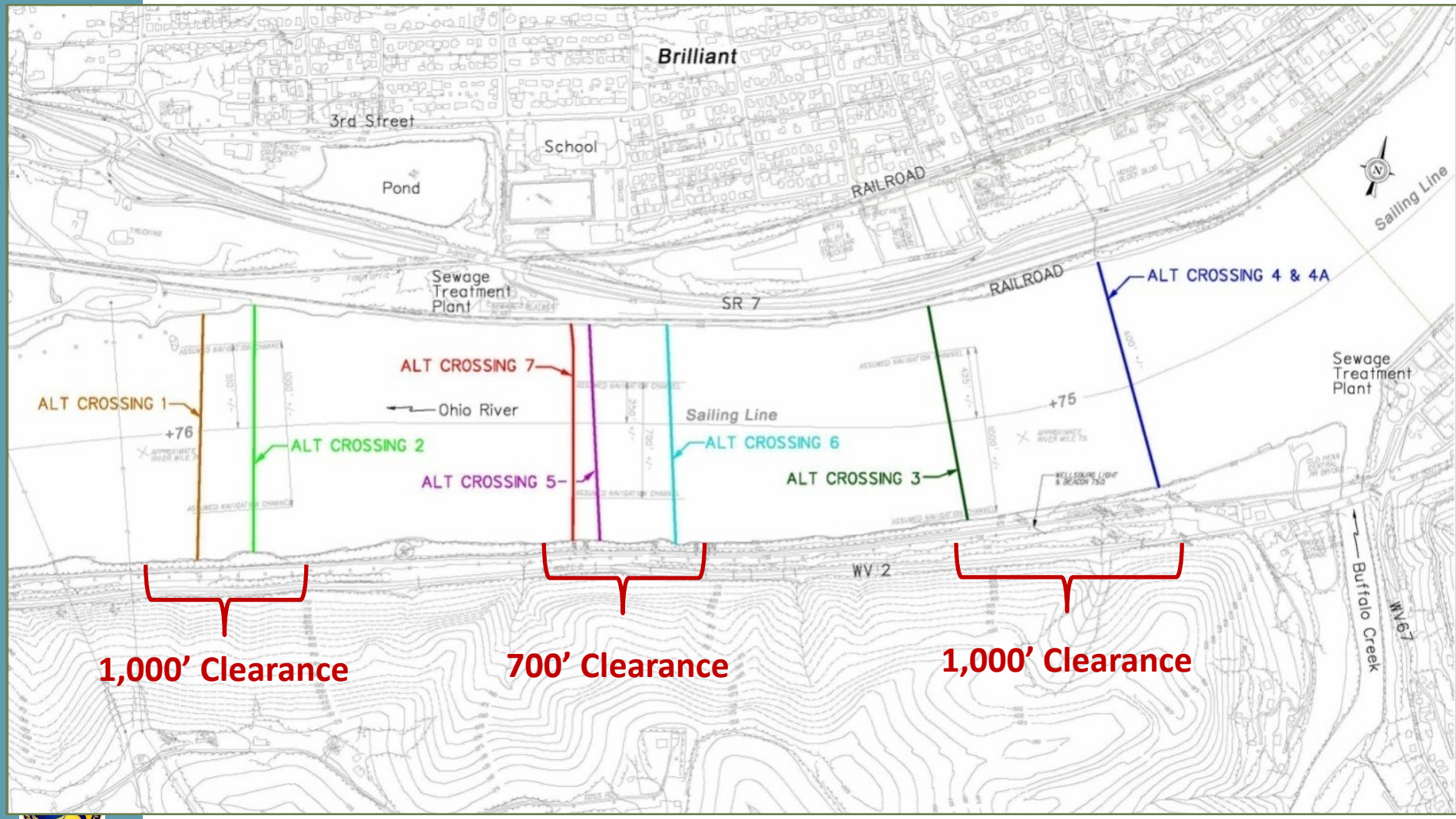
- **Maintain and enhance** transportation capacity, safety and reliability
- Provide **enhanced access** for expansion and retention of **businesses** and attraction of new businesses to the region
- Draw **more traffic and commerce** into the Upper Ohio Valley
- Develop **linkages to high capacity inter-modal transportation** by strengthening the connections to river ports and railroads
- **Enhance emergency management options** to provide alternative routes in case of flood, natural disaster, or accident
- **Improve travel times** throughout the region
- Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to **carry all weights and sizes** of commercial vehicles.



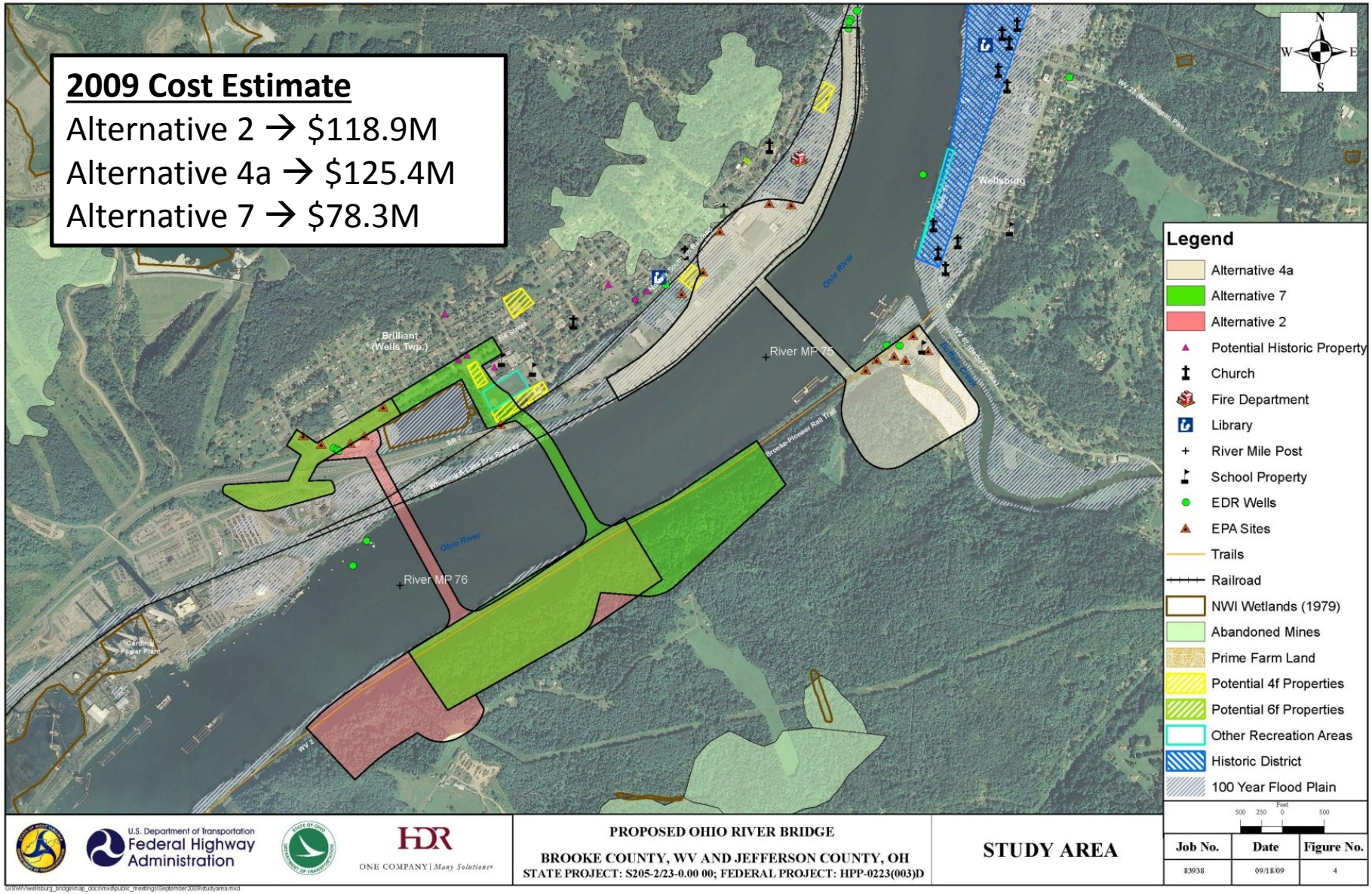
Transitioning to NEPA



Early Alternatives Development



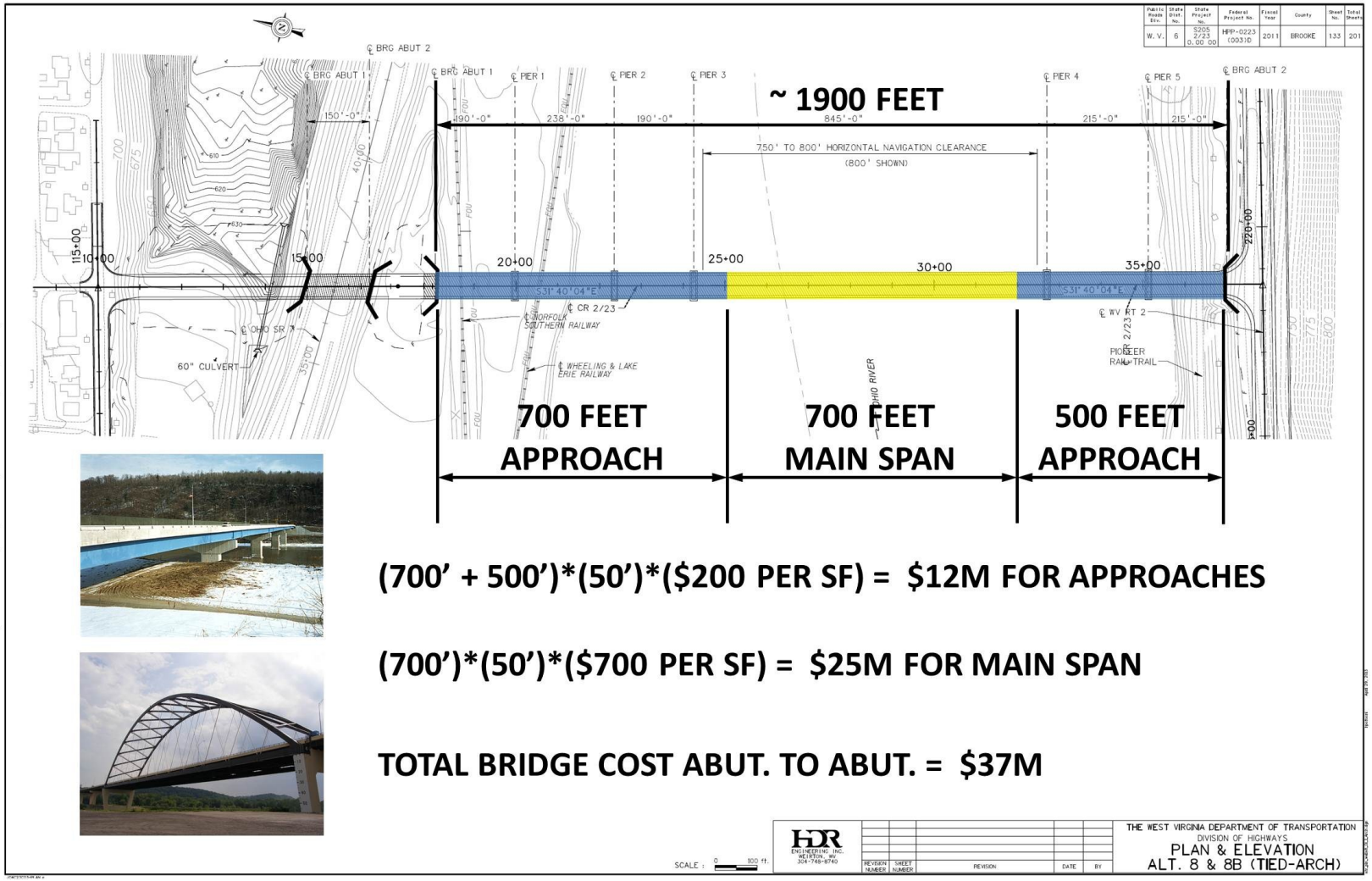
Alternatives Development – Summer 2009



Back to the Drawing Board

- Alternative with narrowest navigational clearance (and lowest cost) now in question
- Navigational clearance for Alternatives 2 & 4a both required 1,000 clearance
- ODOT suggested looking into Seamen's Church Institute's capabilities for river navigation simulation modeling

Why Does Navigational Clearance Matter During NEPA?



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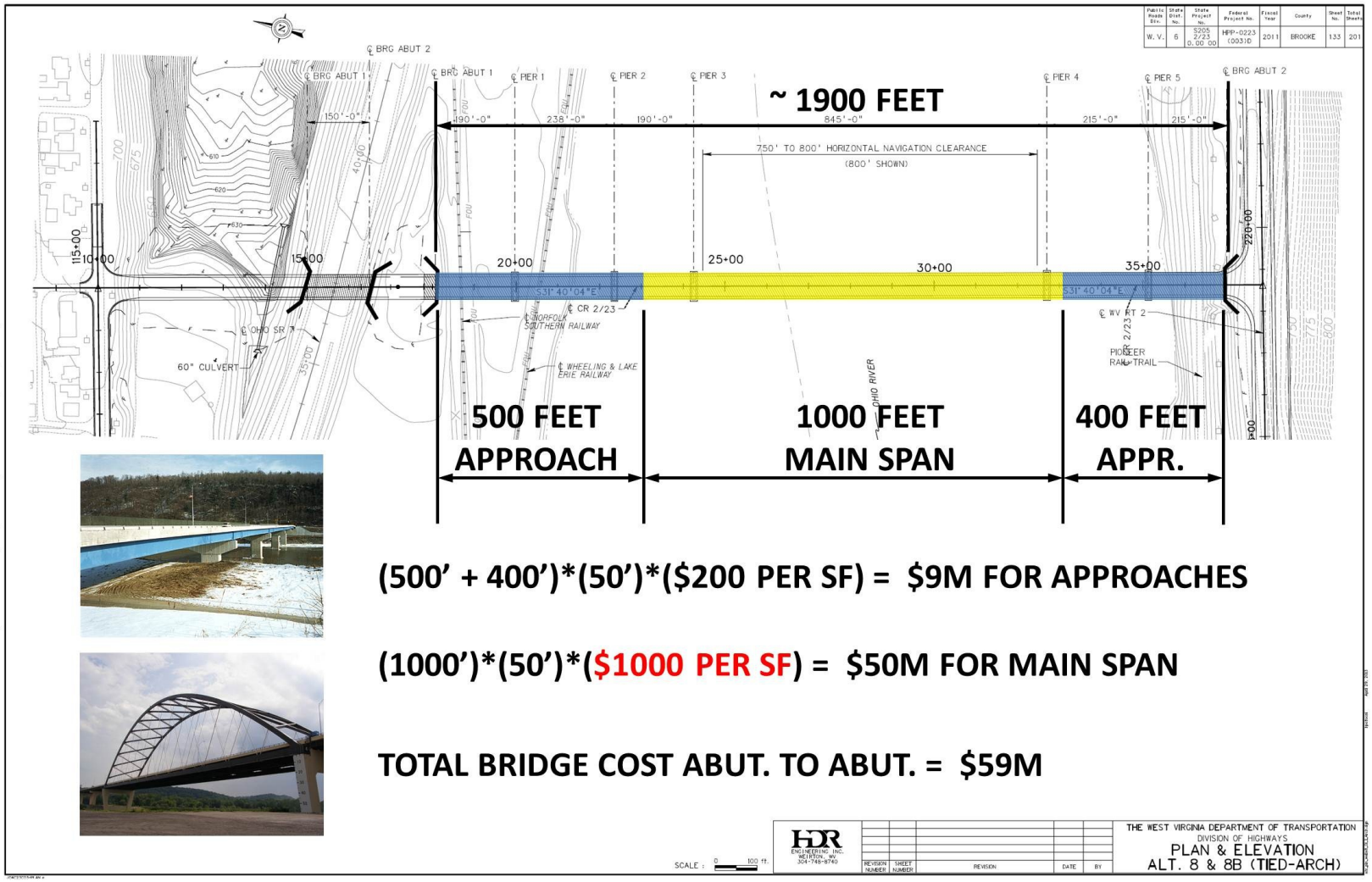
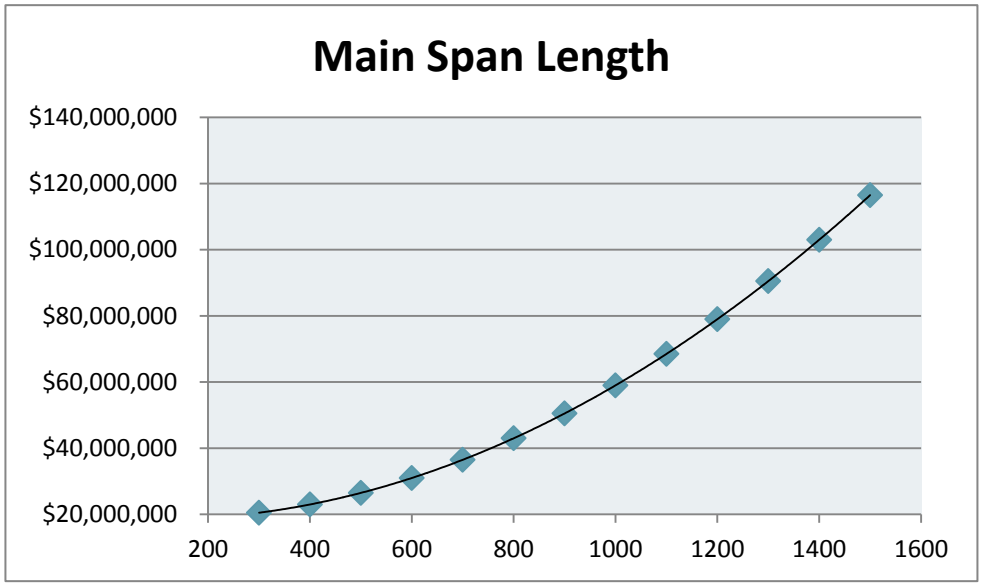


Comparing Costs

- 1900’ Total Bridge Length is Constant
- 700’ Main Span – $37M
- 1000’ Main Span - $59M
- Main Span Length Increase of 300’ (42%) Results in Bridge Cost Increase of 60%

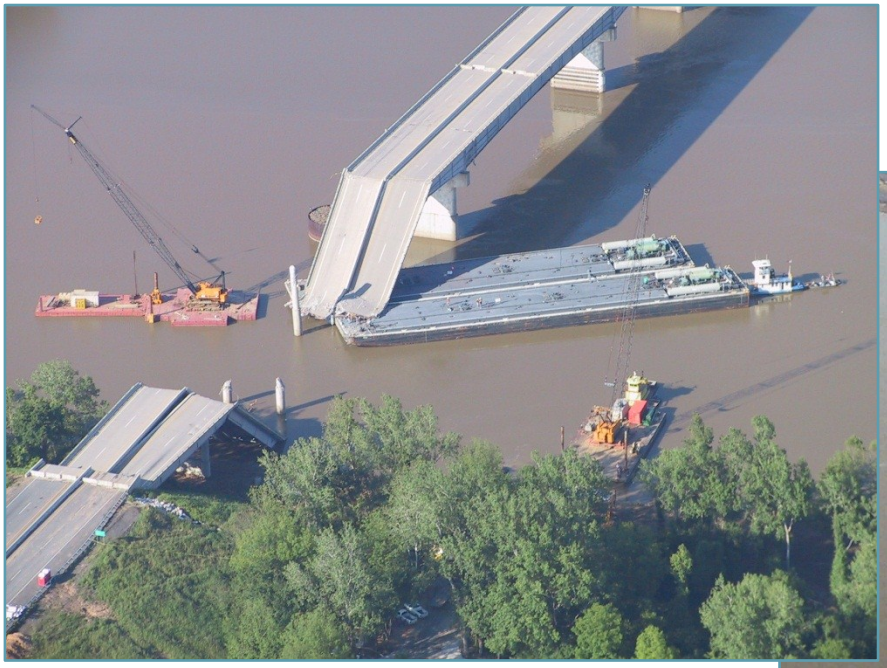
Bridge Cost vs. Main Span Length

- Exponential Relationship
- Determining Correct Main Span is Critical
- Main Span Length is Driven by Required Navigational Clearance



Navigational Clearance

- Bridge vs. Barge – Not Good for Bridge



Navigational Clearance

- What is Required for Safe Navigation
- USCG
  - Historically Based on a Synthesis of Best Available Information
  - Geometry of Site
  - Opinion of River Interests
- What is Better?
  - Actual Simulation of the River at the Project Site
  - Topography, Hydraulics, River Characteristics
  - Realistic Barge Configurations and Operators
  - Variable Bridge “Openings” and Pier Locations

Seamen's Church Institute

- Initial Mission – Ministering to River Mariners
- Later – Education and Training
- Finally – River Modeling and Simulations

Seamen's Church Institute

- Assembles a site-specific visual database of the study area.
- Creates a 3D visual representation of the site and proposed alternatives.
- Vessel models used in the simulation have realistic hydrodynamic properties and perform and maneuver like their real-world counterparts.

Seamen's Church Institute

- Ship pilots can perform various maneuvers within a virtual environment, navigating through proposed site alternatives.
- Pilots can test navigability through multiple situations, taking into account variables such as currents, day or night situations, fully-loaded or empty barges, etc.
- After each run, captains and pilots debrief, commenting on the ease or difficulty of the scenario and the safety margins that could be expected with new construction in the area.

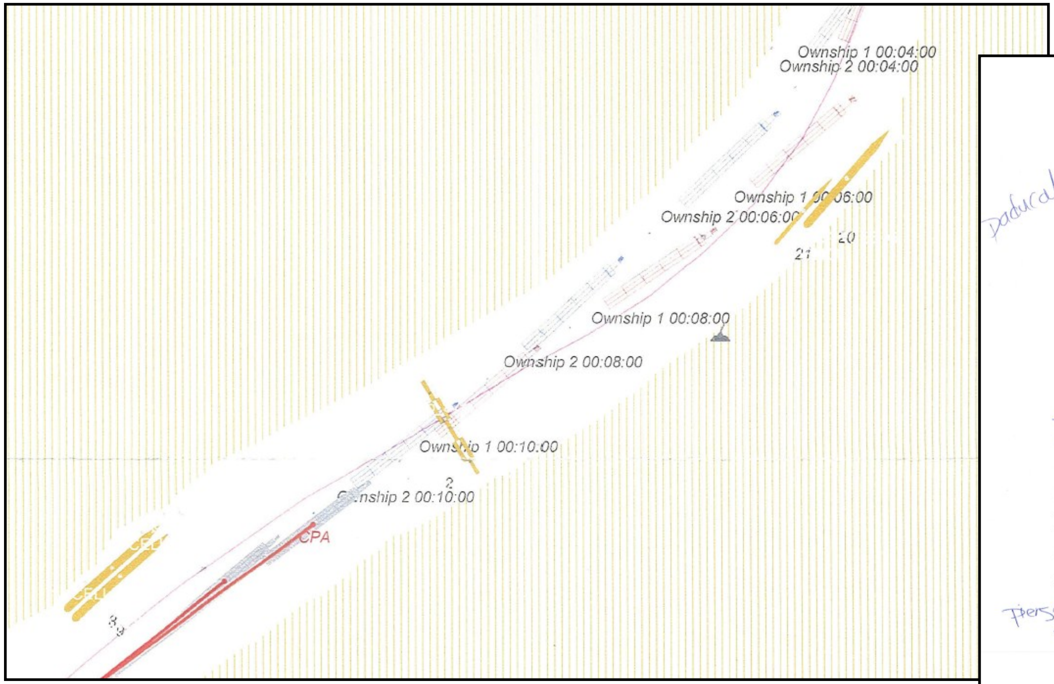
Seamen's Church Institute

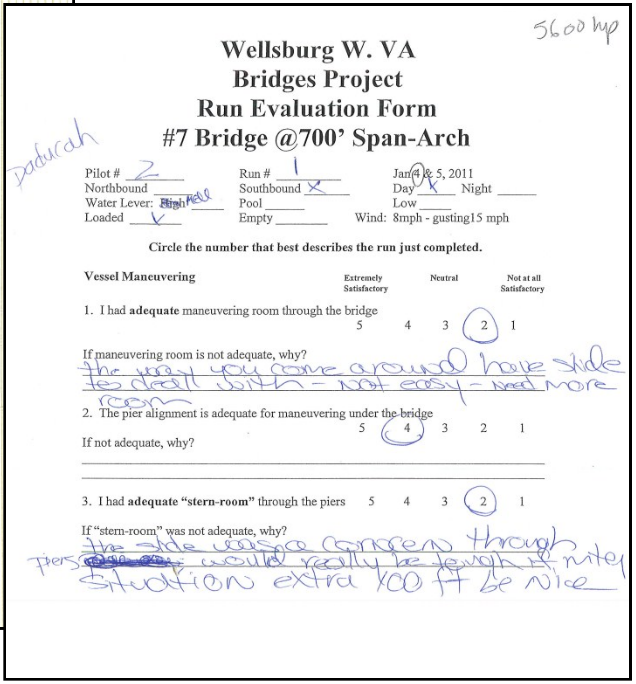
- Sample Video
  - Pilot Preparation
  - Simulation
  - Debrief

Video

Seamen's Church Institute

- Determine Reasonable and Safe clearances
- Get Buy-in from the USCG, Agencies and River Interests
- Then the USCG Sets Project Navigational Requirements Based on SCI results.





5600 hp

Wellsburg W. VA
Bridges Project
Run Evaluation Form
#7 Bridge @700' Span-Arch

Paducah

Pilot # 2   Run # 1   Jan 4 & 5, 2011
Northbound ____   Southbound X   Day X   Night ____
Water Lever: ~~High~~ Med ____   Pool ____   Low ____
Loaded ✓   Empty ____   Wind: 8mph - gusting15 mph

Circle the number that best describes the run just completed.

Vessel Maneuvering	Extremely Satisfactory		Neutral		Not at all Satisfactory
1. I had **adequate** maneuvering room through the bridge	5	4	3	(2)	1

If maneuvering room is not adequate, why?
the way you come around have slide tes deall with - not easy - need more room

2. The pier alignment is adequate for maneuvering under the bridge	5	(4)	3	2	1

If not adequate, why?

3. I had **adequate "stern-room"** through the piers	5	4	3	(2)	1

If "stern-room" was not adequate, why?
the slide was a concern through piers would really be tough if nitey situation extra 100 ft be nice

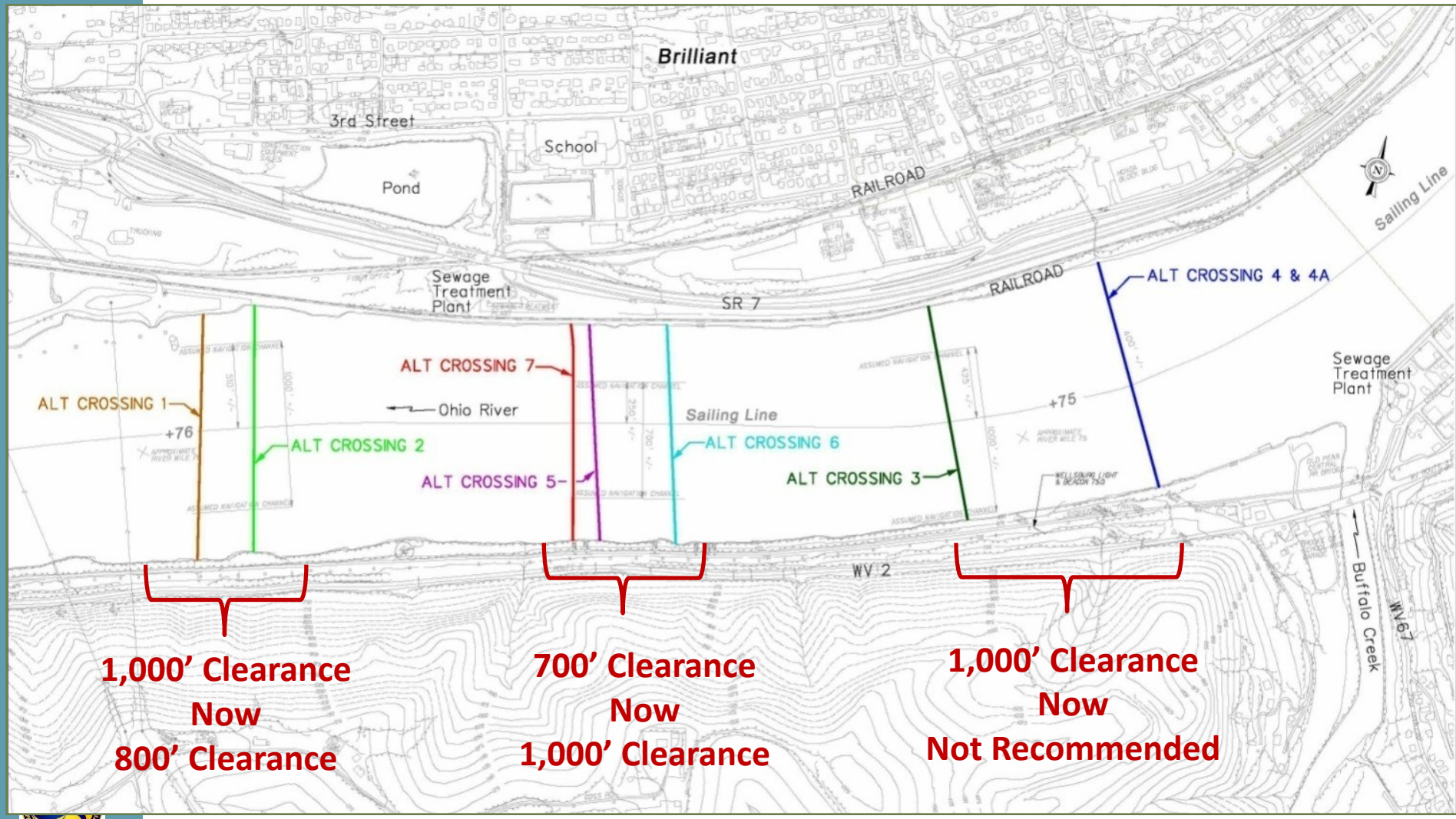
Modeling Cost / Benefit

- Prior to Modeling, an Option with Many Other Benefits had a Very High Relative Cost
- At this Location, Navigation Clearance was Reduced from 1000’ to 800’
- This Option Became the Preferred Alignment

- Modeling and Simulation Cost ~ $110,000
- Potential Project Savings of ~ $25M

> “The simulator answers every question and puts us in a good position to determine location. The simulator is so realistic, you can almost get seasick”
> – Greg Bailey, 2011

Alternatives Post-Modeling



Alternatives Post-Modeling