



*Woodrow
Wilson
Bridge
Project*

2018 Department of Energy
Project Management Workshop
"Managing Uncertainty"

Woodrow Wilson Bridge Project

a mega-project success story

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Vice President, WSP USA



Outline

- ◆ **Part 1: Project Overview**
- ◆ **Part 2: BR-3 Re-bidding Challenge & Lessons Learned**
- ◆ **Part 3: Proactive Construction Management**



Project Overview

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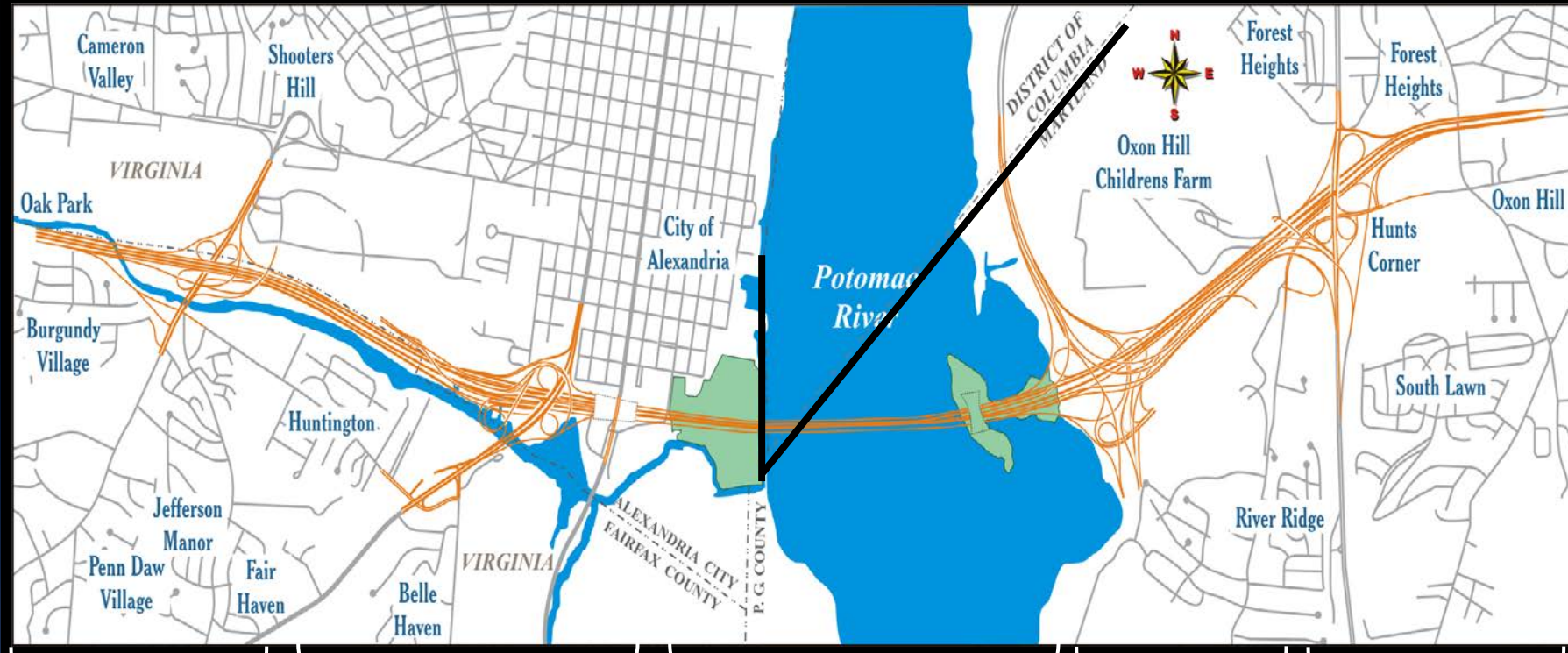


*The Woodrow Wilson Bridge Project is located in the
Washington DC Metropolitan Area.*



Project Overview

**7.5-mile corridor on I-95/Capital Beltway
from Telegraph Rd. in VA to MD 210**



**Telegraph
Road**

US Route 1

River Crossing

I-295

MD-210

Project Overview





Why This Project Was Important



Safety . . .

nearly twice the accident rate of similar highways in VA and MD

Traffic Volume. . .

seven hours of congestion daily and frequent several-mile backups

Service Life. . .

Wear and tear on the 40-year old bridge required its replacement in the near term

Commerce. . .

At least 1.3% (\$58 Billion) of trucked GDP crossed the Bridge in 1993.



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Project Overview

Four Project Sponsors





Project Overview: Governance

- **Joint Ownership Agreement**
 - Old bridge owned by FHWA, bascule operated by DC, and bridge maintained by MD and VA
 - New bridge jointly owned, operated and maintained by MD and VA
- **MD and VA each had a PM.**
- **Strong GEC was “trusted advisor” to both MD and VA**
- **Project Financial Plan - “nuclear option”**



Project Overview: Project Roles

- ◆ General Engineering Consultant (“GEC”)
JV of PB/URS/RK&K
Program and Construction Management
- ◆ Section Design Consultants (“SDC’s”)
5 Project Designers
- ◆ **Contractors – *Project Builders***
36 Prime Construction Contracts
 - 26 Prime Contractors + 260 Subcontractors



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Project Overview

Significant Milestones

2000 – Begin construction with river dredging

2001 – Begin bridge foundations, VA & MD soil improvement, Hunting Tower demo, and MD interchange work

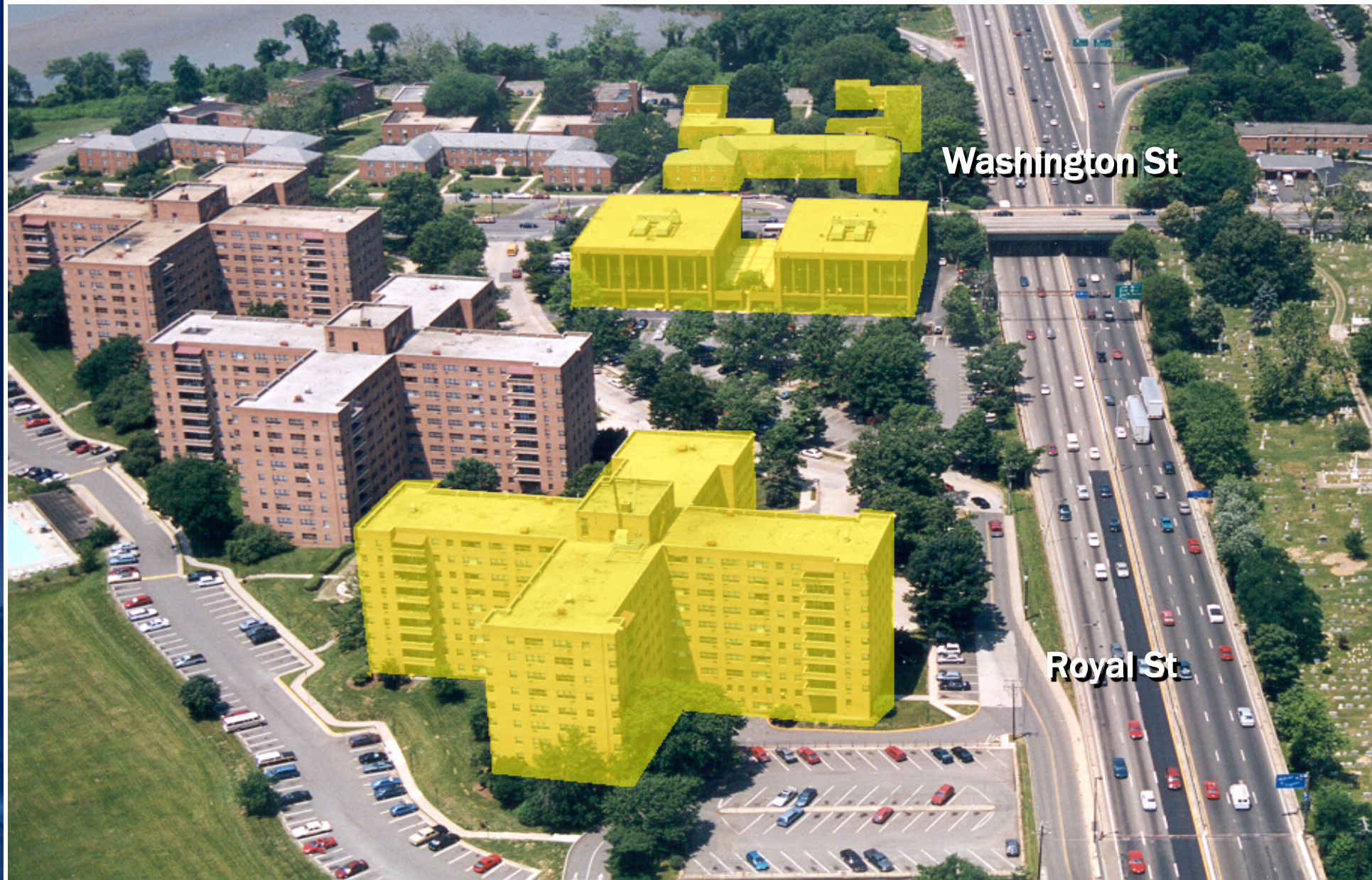
2003 – Begin bridge superstructure and VA & MD tie-in projects



Project Overview - VA Interchanges

Move 273 people in VA; Move 3 in MD

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Project Overview

Hunting Towers Demolition

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12

February 2003



March 2003



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Project Overview

Significant Milestones

Mid 2006 – Complete 1st new bridge, switch traffic, demolish old bridge

2008 – Complete 2nd new bridge and most of US Route 1, I-295 and MD 210 Interchanges

2013 – Complete Telegraph Road Interchange



Project Overview: Construction Sequence Phase 1

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**Traffic on
Old Bridge**

**2000-2006
Both Inner &
Outer Loop
Bridges
Under
Construction**



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Project Overview: Construction Sequence Phase 1





Project Overview: Construction Sequence Phase 2

**Old Bridge
Demolished**

**2006
Outer Loop Open
to Two-Way Traffic**

Project Overview – Construction Sequence Phase 2





Project Overview: Construction Sequence Phase 3

**Inner Loop
Bridge Under
Construction**

**2006-2008
Outer Loop Open to
Two-Way Traffic**



Project Overview: Construction Sequence = Final Configuration

**2008
Inner Loop Open
to SB Traffic**

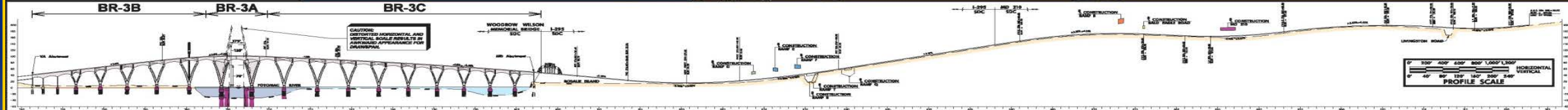
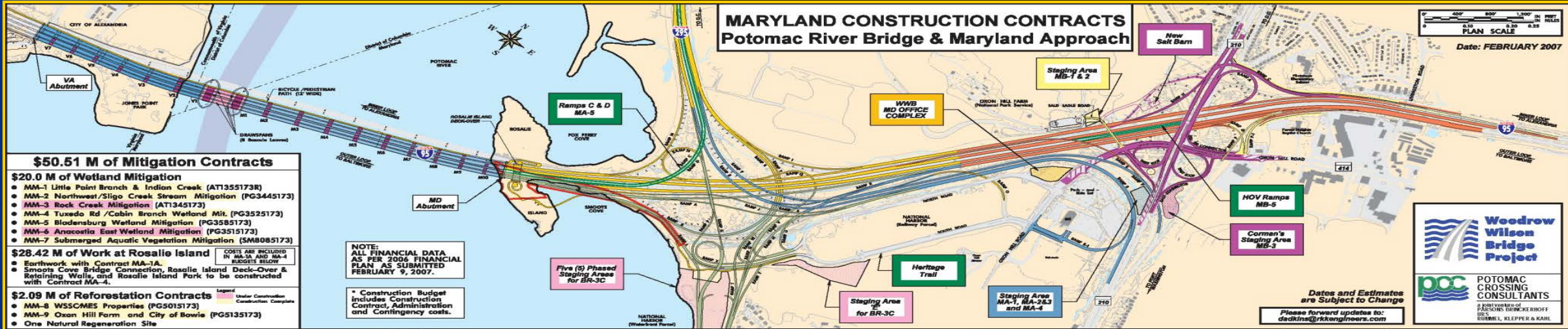
**2008
Outer Loop Open to
NB Traffic**



Project Overview

Maryland Interchanges

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Bridge SDC: P.T.G.		I-295 Interchange SDC: JMT / WRA Joint Venture			MD 210 Interchange SDC: KCI Technologies		
BR-1 Dredging	MA-1A Pre-Consolidation	MA-1 Ramps E, F, E-1	MA-2 and MA-3 Outer Loop N.H. Interchange	MA-4 Inner Loop & Rosalie Island Park	MB-1 and MB-2 Noise Walls, Bald Eagle Rd.	MB-3 MD 210 Interchange, Oxon Hill Road Int.	MB-4 Inner and Outer Loops Ramp B
BR-2 Foundations	PG 3555173 (MDE 01-SF-0165)	PG 3465173 (MDE 01-SF-0042)	PG 3475173 (MDE 02-SF-0057)	PG 5025173 (MDE 04-SF-0304)	PG 3605173 (MDE 02-SF-0059)	PG 5075173 (MDE 05-SF-0056)	PG 5095173 (MDE 06-SF-0011)
BR-3A, -3B, -3C Superstructure Contracts	ADVER. 4-24-01A OPEN BID 6-7-01A NTP 8-15-01A COMPLETE 9-7-06A CONSTR. BUDGET \$12.1M* CONTRACTOR: DRIGGS	ADVER. 8-6-01A OPEN BID 9-20-01A NTP 11-26-01A COMPLETE 3-3-06A CONSTR. BUDGET \$52.2M* CONTRACTOR: WAGMAN	ADVER. 9-27-04A OPEN BID 10-31-02A NTP 12-23-02A COMPLETE 7-17-06A CONSTR. BUDGET \$51.6M* CONTRACTOR: WAGMAN	ADVER. 9-27-04A OPEN BID 2-17-05A NTP 4-18-05A COMPLETE 5-15-09 CONSTR. BUDGET \$112.3M* CONTRACTOR: WAGMAN 49% COMPLETE	ADVER. 11-4-03A OPEN BID 12-18-03A NTP 2-4-04A COMPLETE 6-15-06A CONSTR. BUDGET \$21.5M* CONTRACTOR: WAGMAN COMPLETED	ADVER. 12-7-04A OPEN BID 3-31-05A NTP 5-11-05A COMPLETE 11-30-07 CONSTR. BUDGET \$52.3M* CONTRACTOR: CORMAN 67% COMPLETE	ADVER. 8-2-05A OPEN BID 11-10-05A NTP 12-23-05A COMPLETE 9-1-08 CONSTR. BUDGET \$71.7M* CONTRACTOR: WAGMAN 34% COMPLETE
SEE POTOMAC RIVER BRIDGE CONTRACTS FOR DETAILS	COMPLETED Soil pre-consolidation for Outer Loop between MD Abutment & Mainland, including Retaining Wall #1. Work includes installation of 781,300 LF of Wick Drains, Earth Surcharge and High Strength Geotextiles (93,100 SY) at MD Abutment (Earthwork: 306,700 cyds)	COMPLETED Replacement of Ramp E and Ramp F with new and longer bridges to permit future construction of Outer Loop Local and Express Lanes. New Ramp E and Ramp F Bridges. Work also includes Ramp E-3 connection to Oxon Hill Road and portions of Ramps F, O and R. Includes 6 bridges (25 spans) and 4 retaining walls (Earthwork: 343,000 cyds)	COMPLETED Outer Loop Local Lanes, National Harbor Interchange, Ramps A, G, J, P and portions of Ramps B, T, Q, R and H. Includes 11 bridges (32 spans) and 6 retaining walls and some landscaping (Earthwork: 221,000 cyds)	CRITICAL DATES Shift traffic to New Inner Loop Bridge by mid-2008 Outer Loop Express, Inner Loop Express and Inner Loop Local, I-295 to DC Line, Ramp I and remaining portions of Ramps B, J, M, N, O, Q, T and V and all work for Rosalie Island Park including deckover, north-south pedestrian path connections, bridge over Smoots Cove, pedestrian path and all final landscaping. Includes 10 bridges (22 spans) and 16 retaining walls (Earthwork: 446,000 cyds)	CRITICAL DATES Complete by mid-2007 Construction of noise barrier / retaining walls for Inner Loop and landscaping / mitigation at Flintstone Elementary School, noise barrier at Forest Heights Baptist Church, Bald Eagle Road, Ramp F bridge over Oxon Hill Road, Ramp F-1 connection to Outer Loop, Ramp G connection to Oxon Hill Road. Includes 3 bridges (4 spans) and 8 retaining walls. (Earthwork: 176,000 cyds)	CRITICAL DATES Complete by mid-2007 MD 210 bridge over Balfour, Ramps A, C and H, MD 210 roadways, HOV Ramps, Oxon Hill Road grade separation, connecting ramps, and relocation of Salt Barn to new quadrant. Includes 2 bridges (6 spans) and 5 retaining walls. (Earthwork: 273,000 cyds)	CRITICAL DATES Complete by mid-2008 Inner Loop Local, Inner Loop Express, Outer Loop, bridges over Livingston Road (3 phases), Ramp B Includes 2 bridges (11 spans) and 7 retaining walls. (Earthwork: 319,000 cyds)



Project Overview - Maryland Interchanges

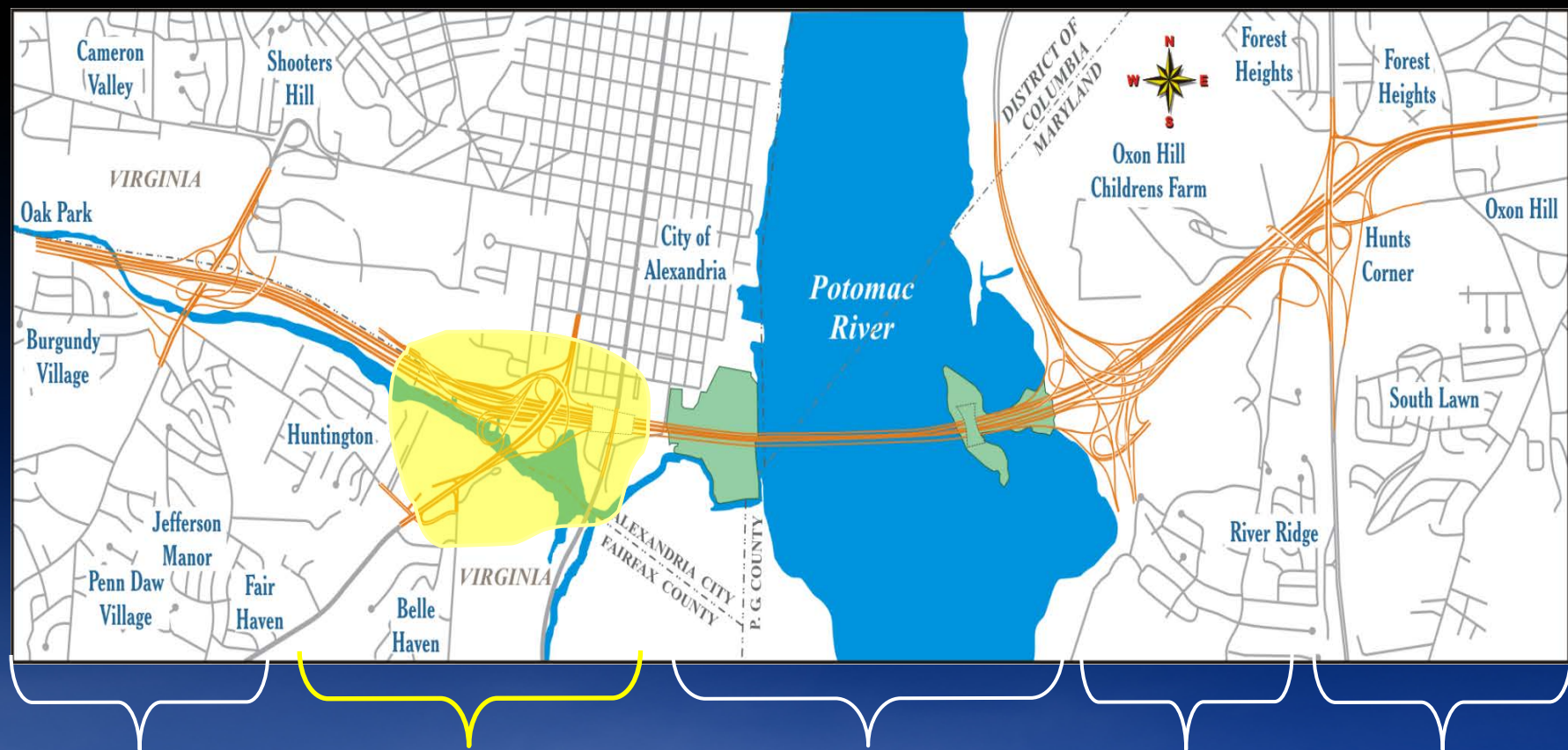
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Project Overview – VA Interchanges



Telegraph Road **US Route 1** River Crossing I-295 MD-210



Project Overview – VA Interchanges

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Project Overview: Dedication Ceremony-First New Span May 18, 2006

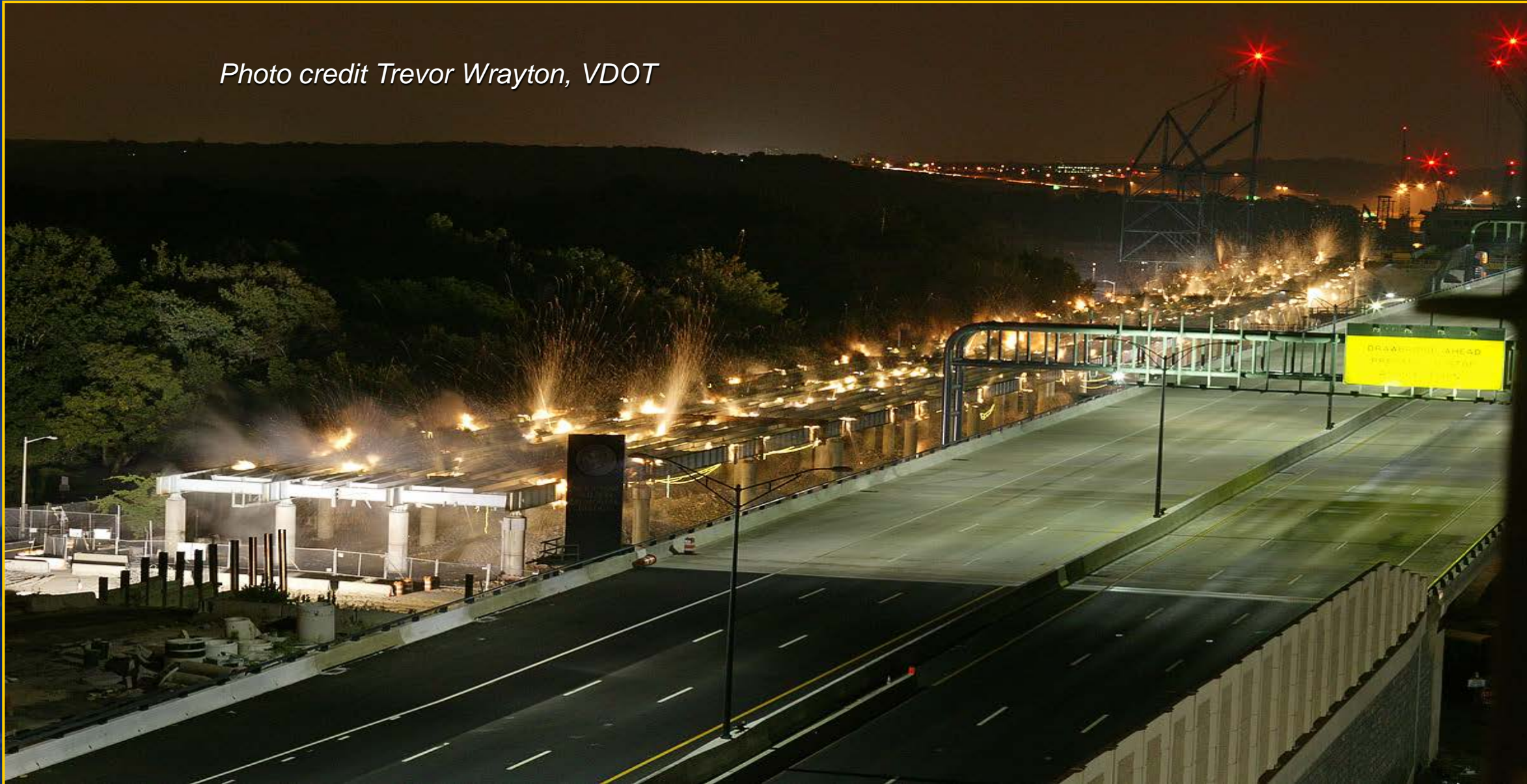




Project Overview: Old Bridge Demolition

August 28, 2006

Photo credit Trevor Wrayton, VDOT





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All Lanes Open

December 13, 2008





WWB Multi-use Trail Opens

June 6, 2009 all WWB facilities open

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Awards Won



- ◆ Over 70 regional, state and national awards
- ◆ ASCE's Opal and AASHTO's America's Transportation Award Grand Prize in 2008
- ◆ Four ARTBA Globe Awards for Environmental Excellence
- ◆ Gustav Lindenthal Medal



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Part 2: BR-3 Re-bid Challenge & Lessons Learned



Timeline : Bridge Contracts

- *October 2000 BR-1 Dredging \$14.5M*
- *May 2001 BR-2 Foundations \$125.4M*
- ***December 2001 - BR-3 Superstructure***



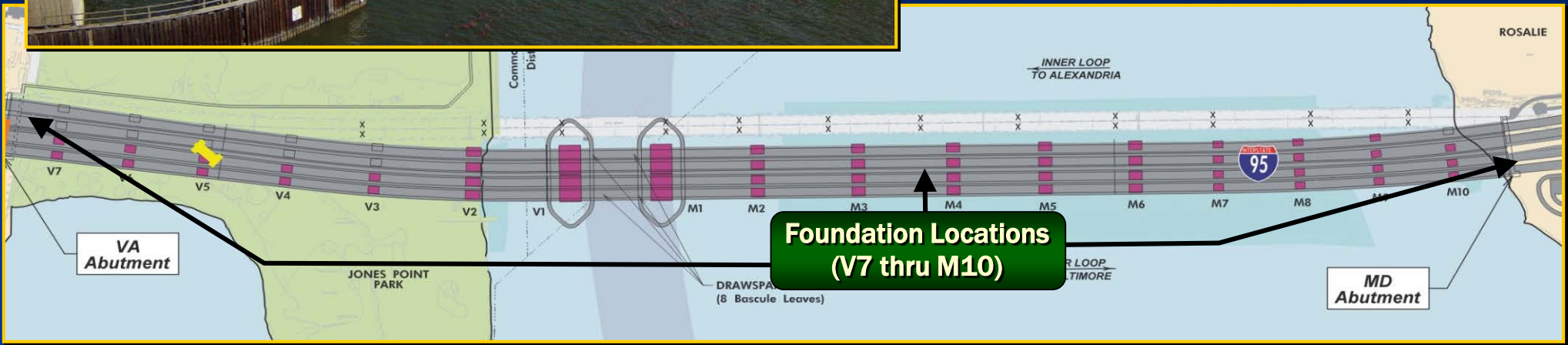
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Bridge Contract BR-2 Foundations



Designer:
PTG (Parsons)

Notice to Proceed
May 7, 2001



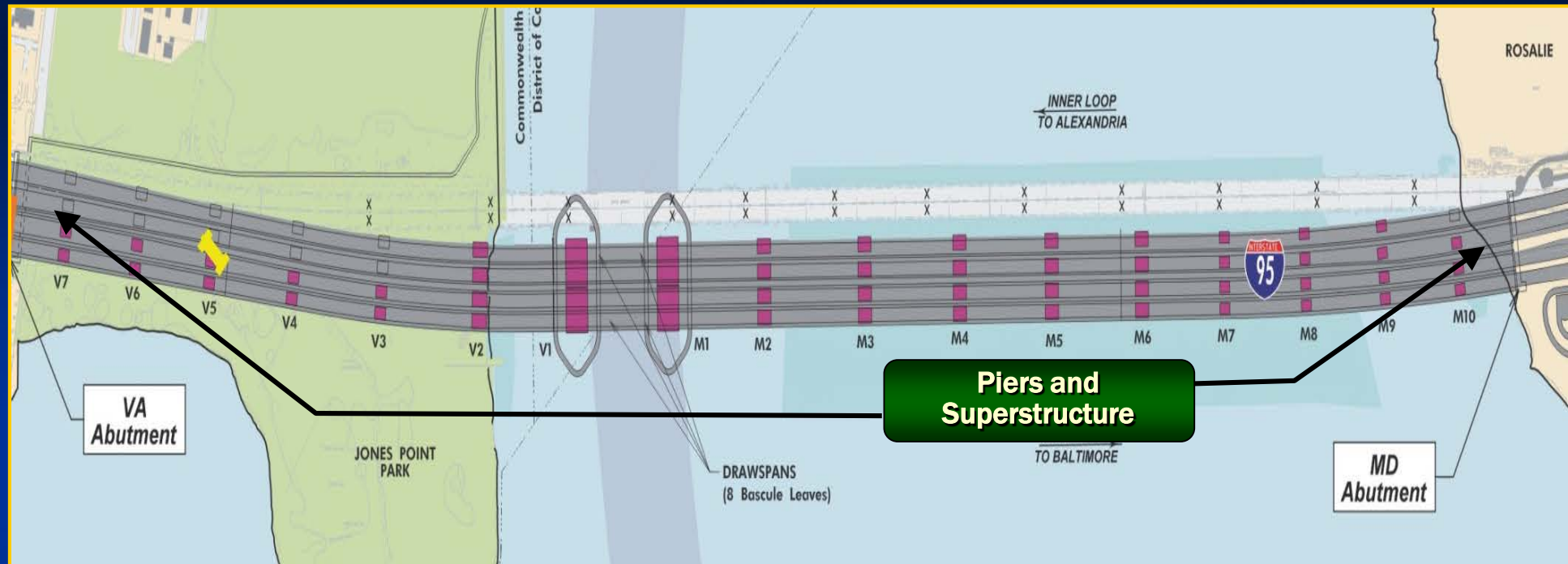


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Bridge Contract BR-3

Designer: PTG (Parsons)
Advertised: August 13, 2001

Pre-Bid Meeting: September 11, 2001
Bids Opened: December 13, 2001





Washington Post - December 14, 2001

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[The Washington Post]

MIETRO

FRIDAY, DECEMBER 14, 2001

B

Maryland & D.C.
Edition

1A4 3

Wilson Bridge Bid Called a 'Budget Buster'

Lone, \$860 Million Offer Exceeds Estimates by 75 Percent; Price Tag Could Delay Construction

By KATHERINE SHAVER
Washington Post Staff Writer

The only contractor to bid on building the two spans of the new Woodrow Wilson Bridge said yesterday that the job would cost almost \$860 million—75 percent more than the highest earlier estimates.

Maryland engineers in charge of the project said yesterday that they have no choice

but to either redesign the bridge or repeat their request for bids, hoping to attract competitors. But either step would throw bridge construction several months behind schedule. With foundation work already underway, the next building phase was set to begin in the spring.

State highway officials said they were stunned by the \$859.9 million bid by Kiewit, Tidewater & Clark to build the "su-

perstructure"—the parts of the two six-lane spans above water. Estimates ranged from \$450 million to \$500 million.

Maryland State Highway Administrator Parker F. Williams said state engineers could not remember a bid ever coming in so high above estimates.

"If this thing had come in under 5 percent over our engineers' estimate, I suspect we could figure out a way to do it," Wil-

liams said. "But, my word, \$859 million versus \$500 million is significant. . . . This bid just absolutely blew us away."

Any more delays in the 12-year saga to replace the 40-year-old span connecting Oxon Hill and Alexandria would prolong one of the region's biggest traffic headaches. About 200,000 vehicles per day—

See BRIDGE, B5, Col. 3



Bid Opening Day-December 13, 2001

BR-3 Contract

- ◆ One Bid - \$860 million - is \$373 million (75%) above the estimate
- ◆ Funding Responsibility – Maryland must cover Overruns
- ◆ Budget Implications – Non-Starter



Potential Issues that Limited Competition

- ◆ Uncertainty in the economy (especially after Sept. 11)
- ◆ Contract size / complexity
- ◆ Surety bonding issues



Potential Issues that Limited Competition

- ◆ Many mega-transportation projects bidding concurrently
- ◆ Many contract specifications were not seen as "contractor friendly"
- ◆ Uncertainty about the Project Labor Agreement (PLA)



Immediate Decisions

- ◆ Preserve the Approved Bridge Concept
- ◆ Continue Building the Bridge's Foundations
- ◆ Act Quickly, but Get it Right
- ◆ Collect the Best Advice Available



Increase Competition

- ◆ **Break Contract into Three Smaller Contracts with staggered Ad Dates**
- ◆ **Conduct Nationwide Marketing Campaign**
- ◆ **Make Contracts More Contractor Friendly**



Make Contracts more Contractor Friendly

- ◆ Reduced performance/payment bonds to 50%
- ◆ Reduced insurance requirements
- ◆ Lowered retainage to 2.5%
- ◆ Increased Mobilization Cap from 10% to 15%
- ◆ Allowed payment for stored materials
- ◆ Clarified PLA Requirement



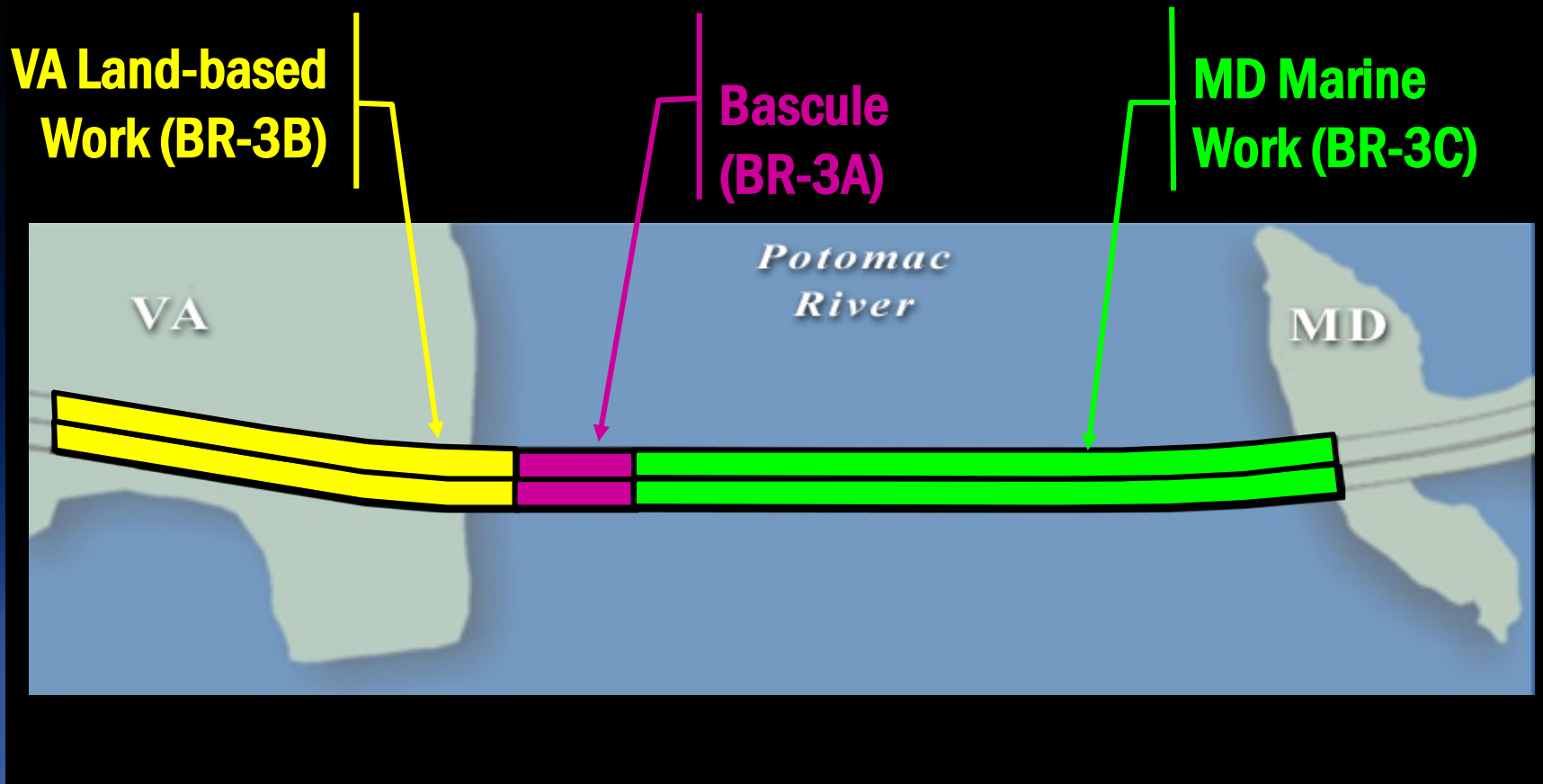
Decrease Cost of Structure

- ◆ Replaced steel box girders with steel plate girders
- ◆ Refined V-piers to simplify some elements
- ◆ Standardized more elements



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Re-Advertisement Strategy (Advertise 3 Contracts)





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Bid Results for 3 Bridge Contracts

- **Feb 2003** **BR-3A Bascule \$186 M**
- **April 2003** **BR-3B Virginia Approach \$115 M**
- **June 2003** **BR-3C Maryland Approach \$191 M**



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Bid Results

Combined Re-bid Total = \$492 million

**Within 2% of Original Engineer's
Estimate (\$487 million) !!**



Washington Post on the Re-bids

Wilson Bridge Engineers Relieved

Low Bid Brightens Outlook For Bridge

By KATHERINE SHAVER
and MATTHEW MOSK
Washington Post Staff Writers

The lowest bid to build the final piece of the new Woodrow Wilson Bridge came in so far below the Maryland engineers' estimate yesterday that state officials said they will consider lowering their predictions for the project's total cost.

The bid to build the eastern portions of the twin six-lane spans—from east of the drawbridges in the Potomac River to the Maryland shore—came in at \$191 million, or 25 percent below estimate. That helped put the entire program budget, dampening cost overruns on one of the highway projects in the

Low Bid Improves Outlook for Bridge Job

Low Bid on Major Bridge Piece Bodes Well for Budget

Unexpectedly Low Bid Keeps Wilson Bridge Under Budget

By KATHERINE SHAVER
Washington Post Staff Writer

Maryland highway officials were relieved yesterday when the lowest bid to build one of the costliest parts of the new Woodrow Wilson Bridge came in \$45 million under estimates, a sign that the massive project has not soared over budget.

State engineers had anxiously awaited the proposals to build the bridge's western section—from the draw spans to the Virginia-side abutment in Alexandria's Jones Point Park—as an indication of whether the \$2.56 billion project was headed for huge cost overruns. State officials requested new bids on smaller chunks of the project, hoping to elicit more competition after the lone bid to

build the entire bridge came in \$360 million over budget.

Yesterday's apparent low bid of \$115.5 million—well below the estimates of \$160 million—will keep the project's overall costs for work awarded so far to 8 percent below budget, bridge officials said. "We're pleased," said a beaming Bob Douglass, project director for Maryland's bridge-building contracts.

The first such contract—to build the draw spans—was awarded in January. It was \$18 million over estimates, a price that bridge officials said was close enough to stay under budget.

The Virginia-side contract will cover everything above water, including the

See BRIDGE, B6, Col. 1

Wilson Bids in Ballpark

\$18 Million Over Estimate Is a Relief to Engineers

By KATHERINE SHAVER
Washington Post Staff Writer

The lowest bid to build the draw spans of the new Woodrow Wilson Bridge came in \$18 million over engineers' estimates yesterday, but relieved Maryland officials declared that was close enough to assure they could continue the project.

Maryland highway officials were stunned last December, when the lone bid to build the entire bridge came in \$360 million—or 75 percent—over budget, threatening massive cost overruns on the largest transportation project in the region.

The state rejected that proposal and called for new bids on the twin six-lane spans, dividing the work into smaller

chunks in the hope of creating more competition and a lower price.

"This was a huge hurdle," said Parker Williams, head of the Maryland State Highway Administration. After the budget-buster bid last year, he said, "we had to ask the question, 'Is this project buildable?'"

Williams said yesterday's price of \$186 million for the draw spans proved it is. "I think we've got a workable bid here," he said. "I think we're in the financial parameters of affordability."

Maryland Transportation Secretary John D. Porcari said the bid showed "the market telling us this is as good as we're going to get with a project that's this com-

See BRIDGE, B6, Col. 1



Stacie Leavitt, center, confers with C headquarters in Pittsfield, Maine. The firm's bid was the second lowest.



Lessons Learned

- ◆ Avoid advertising at the same time as other mega-projects
- ◆ Reach out to the contracting community to generate interest
- ◆ Make the terms contractor friendly
- ◆ Set bond limits to enhance competition



Lessons Learned (Continued)

- ◆ Remove as much uncertainty as possible prior to advertising
- ◆ Emphasize the owner's active involvement

Techniques exist to mitigate contract interface risks, but there are no techniques to mitigate for a lack of competition



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Part 3: Proactive Construction Corridor Management



Failed Bid Changed the Project Mindset

“We all succeed together”

- ◆ Contractors are an indispensable part of the program
- ◆ It is in the owner's best interest to help contractors be productive
- ◆ The CM Team can facilitate contractors' productivity



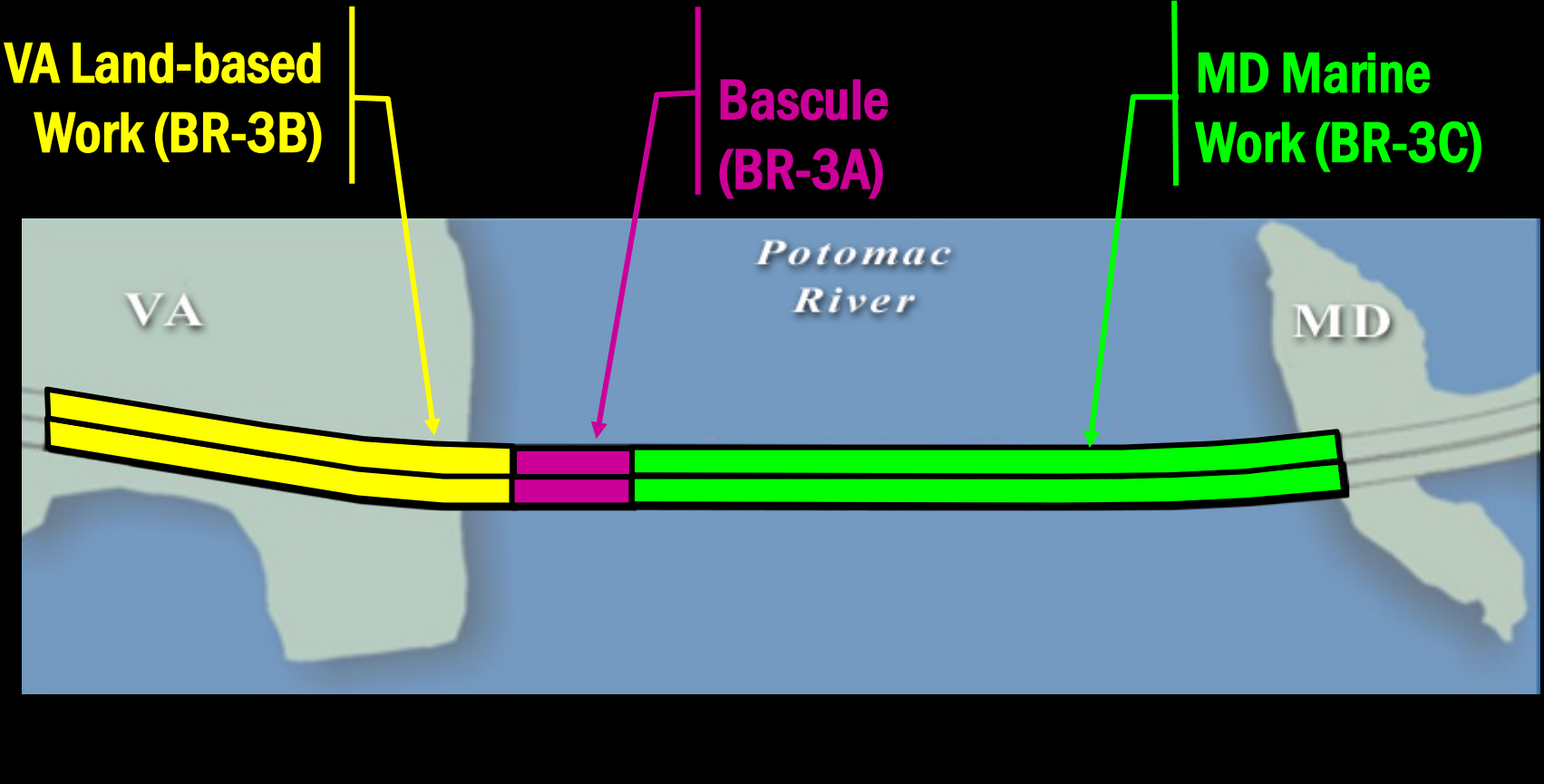
Construction Management Challenges

- ◆ Keep traffic moving during construction
- ◆ 6 contractors (vs. 4) must all meet a two week window, four years in the future.
- ◆ The critical path shifts among the 6 contractors
- ◆ How to manage the interfaces so that all contractors work together as if they were one?



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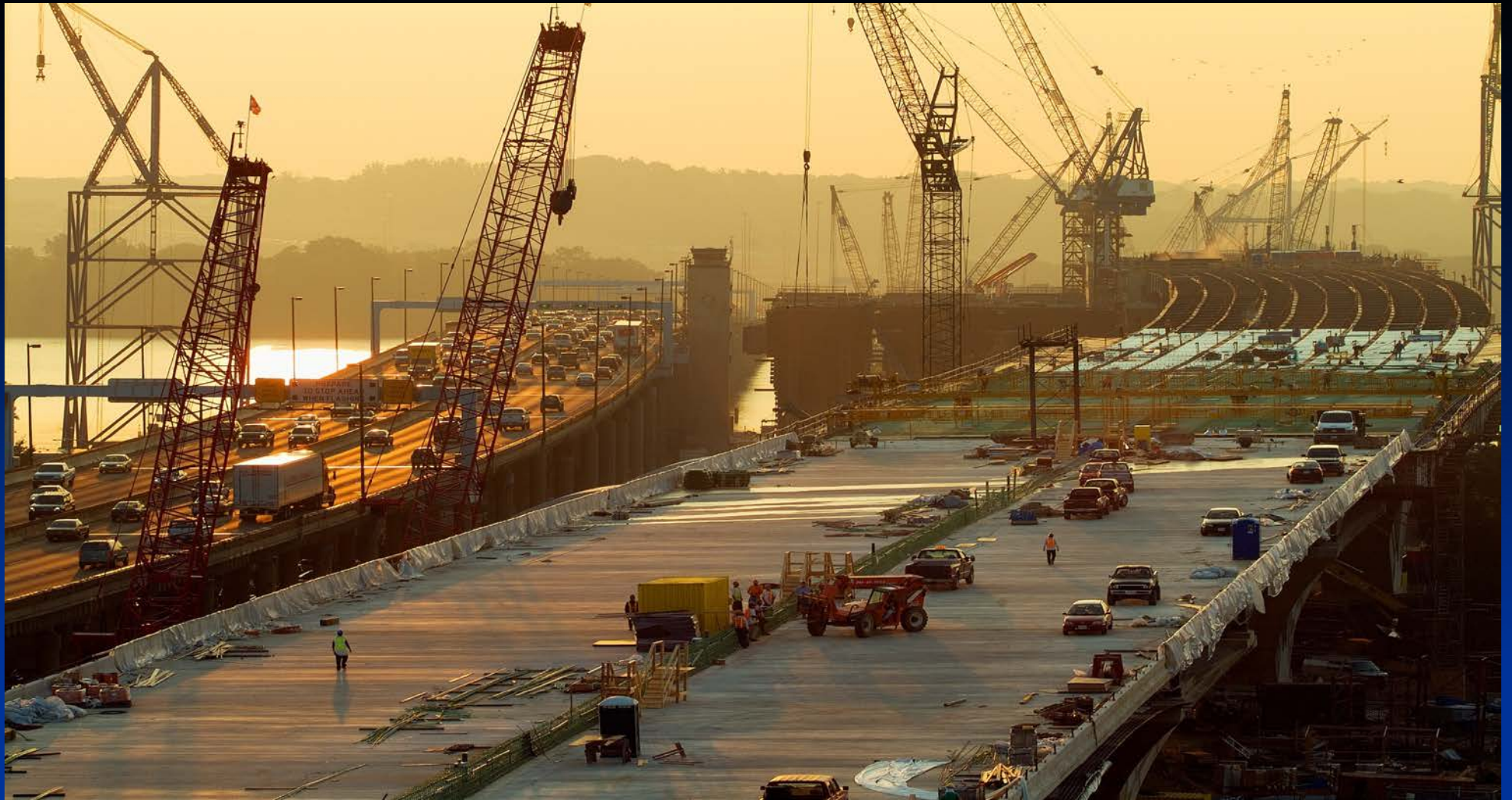
3 Contracts = 2 More Interfaces





BR-3B Viewpoint

- Build Outer Loop bridge as quickly as possible, so that traffic can be switched to it.
- Demo of the old bridge controls the critical path





BR-3A Viewpoint

- Build a complex machine to run smoothly for 75 years
- The more time the better to test and commission





BR-3A Viewpoint

- Old bridge not an issue
- Access via Floating bridge - boxed in by other contractors





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BR-3C Viewpoint

- Leave traffic on old Bridge as long as possible
- Old bridge is an asset after traffic shift
- Land access after traffic shift - boxed in by other contractors





Strategy: Seek Opportunities to Enhance Production

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*Temporary
haul road
on NPS
land*



Strategy: Program Planning and Scheduling

- ◆ Contracts were let by each state, key special provisions were Project-wide
- ◆ Corridor Coordination meetings kept contractors on the same page
- ◆ Integrated corridor schedule kept all contractors moving toward the same dates



Strategy: Proactive Public Relations

- ◆ Celebrate Successes - Manage publicity events
 - Bridge Bucks
 - Eagle Naming Contest
 - Worst commute contest
- ◆ Provide media access to Project site



Strategy: Partnering

Emphasize positive relationships

- ◆ Monthly Partnering meetings on all contracts
- ◆ Executive Partnering meetings as needed
- ◆ Web based rating and comments tool



Strategy: Keep Contractors Moving with Timely Responses



- ◆ Early issue identification the norm
- ◆ Quick decisions for ordinary issues
- ◆ “Show stopper” issues needed careful, yet timely, consideration



What was the final cost of three contracts?

- ◆ Total of base bids + changes = \$525M
(7% > than the combined low bids)
- ◆ Most of the cost increase was due to steel escalation
- ◆ Only \$4 million (< 1%) was due to contractor interface issues



Financial Plan History

- ◆ Initial Financial Plan (Approved Sept. 2001)
 - Total Project Budget = **\$2.443 Billion**
- ◆ 2014 Final Cost as Close Out
 - Total Project Cost = **\$2.357 Billion**

**\$86 million under budget
after 14 years**



WWB as Art



WWB as Art

WWB as Art





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The Completed Woodrow Wilson Bridge

On Schedule

On Budget



<http://wwblessonslearned.com/>



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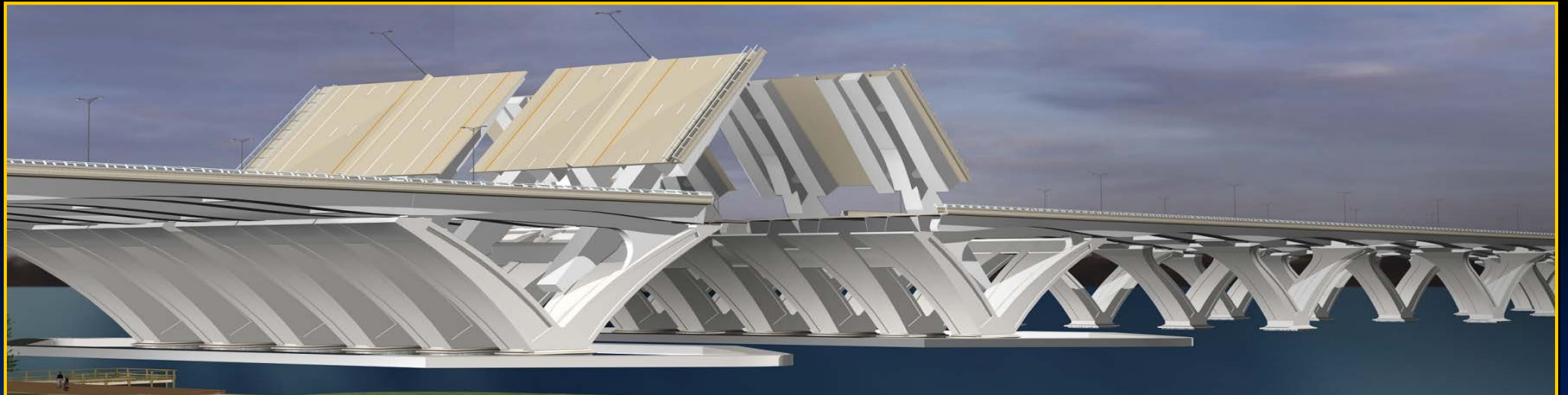
QUESTIONS ?



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Finished Bridge: Rendering & Reality

... the winning design, selected by a jury from 7 entries ...



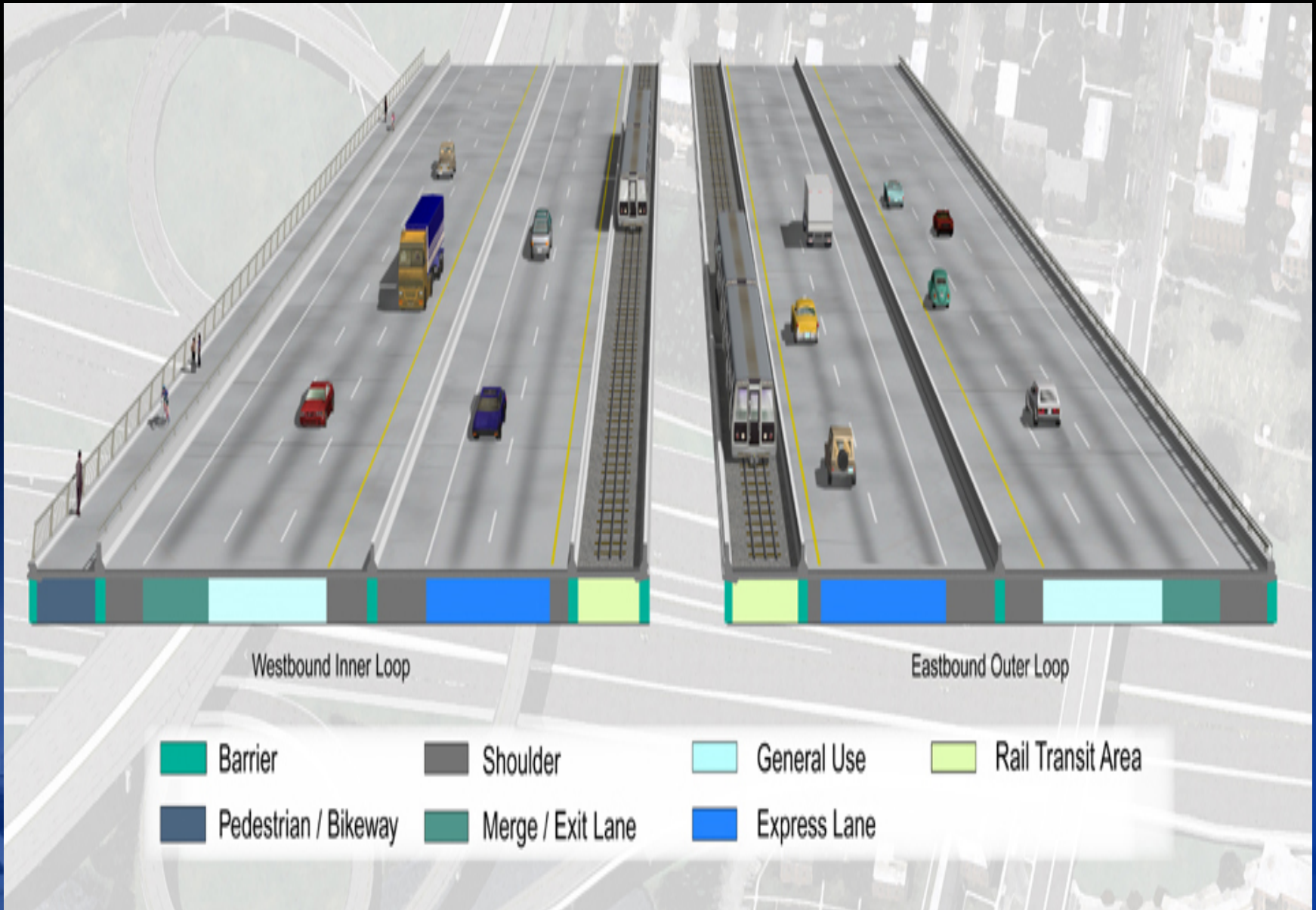


Bascule Span opens all eight leaves for first ship passage - July 2007



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New Bridge With Metro Rail





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Bridge Contract BR-2

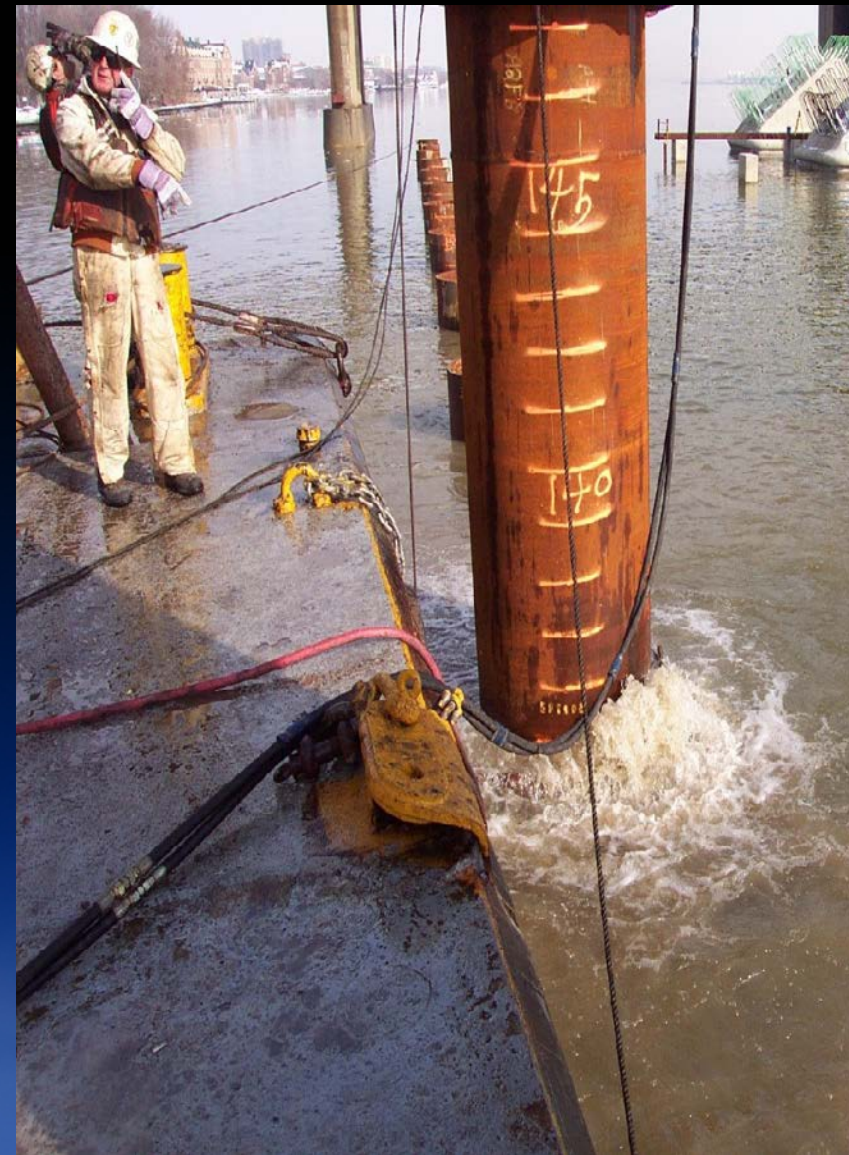
Hydraulic Pile Hammer





Bridge Contract BR-2

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Contained Air Bubble Curtain



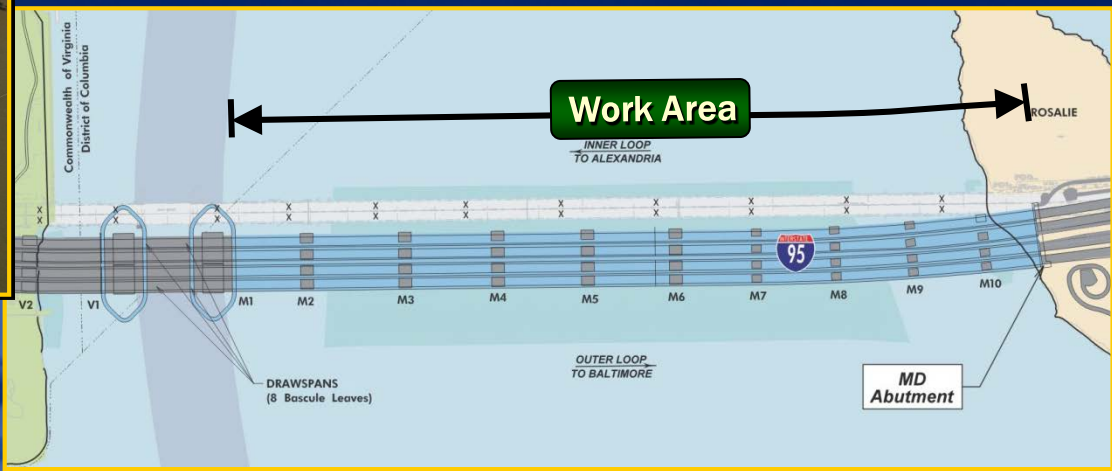
HOW COULD THIS HAVE HAPPENED?

- Value Engineering conducted in 1999.
- Engineer's Estimate prepared by bridge design consultant 1999 – 2001
- Detailed review and approval by FHWA
- Estimate Acceptance by the USDOT Office of the Inspector General



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Bridge Contract BR-3C





Bridge Contract BR-3C

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