HANOVER STREET CORRIDOR STUDY

includes the Vietnam Veterans Memorial Bridge

Public Information Meeting

Monday, February 5, 2018

CITY OF BALTIMORE
CATHERINE E. PUGH
MAYOR

dot
DEPARTMENT OF TRANSPORTATION
BALTIMORE CITY

HANOVER STREET CORRIDOR STUDY
includes the Vietnam Veterans Memorial Bridge

Tonight's Presentation

- Study Overview
- Project Goals
- Process & Schedule
- Work Completed to Date
- Previous Input
- Guiding Principles
- Design Opportunities
- Next Steps

Study Overview

- **Purpose**: Identify improvements to the Vietnam Veterans Memorial Bridge and Hanover Street corridor to address accessibility, connectivity, and safety for multiple modes:
  - Bicycle
  - Pedestrian
  - Transit
  - Automobiles
  - Freight
- **Funding**: USDOT $1.1 MM TIGER Grant and a $700,000 match from Baltimore City
- **Study Limits**: Wells Street to Reedbird Avenue (a distance of 1.4 miles)

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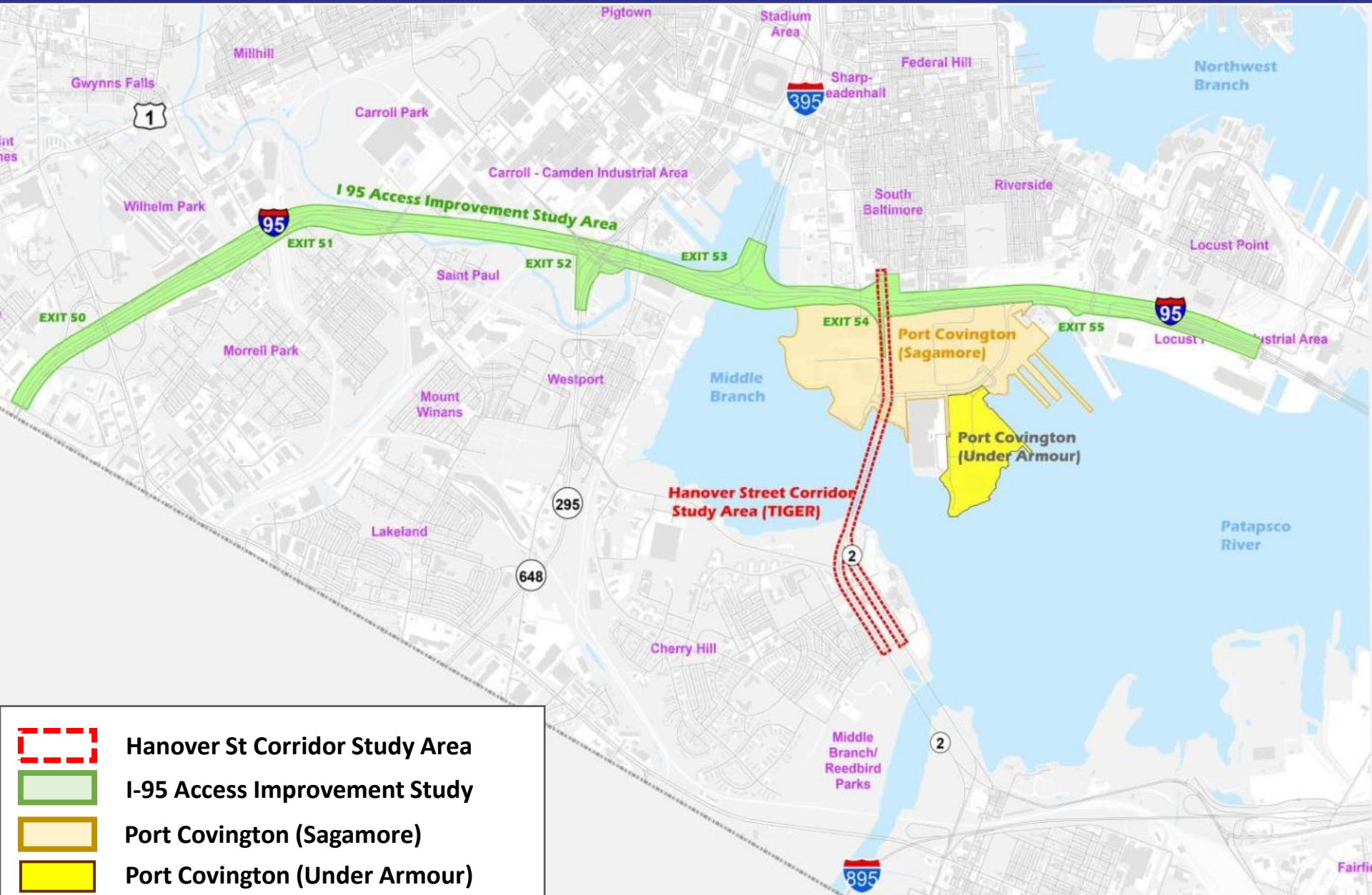
Adjacent Projects



Project Goals

At the end of this process, the team will produce a PLAN to upgrade and enhance the Hanover Street corridor and Vietnam Veterans Memorial bridge by:

- Providing the surrounding communities with safe and reliable access to key quality of life resources
- Maintaining a critical link between existing and planned bicycle and pedestrian trails
- Improving access for local and regional motorists and freight to and from the Port of Baltimore
- Promoting better connectivity between local bus and light rail services

Process & Schedule

Summer 2016	Winter 2017	Winter 2018	Spring 2018

Assess Existing Conditions & Collect Data	Conduct Economic Market Analysis	Study Existing Transportation Network	Identify Design Opportunities and Constraints	Develop Corridor Plan and Guiding Principles
• Review area master plans • Collect regional and community demographic data • Assess existing and proposed land uses • Review current traffic data • Review bridge inspection reports	• Assess current economic climate • Identify future potential development opportunities and challenges	• Identify potential barriers to multi-modalism • Review existing pedestrian and bicycle facilities • Identify transit facilities and assess operations • Conduct safety assessment	• Identify growth opportunities • Identify design opportunities and constraints • Compare concepts to study area needs • Evaluate constructability challenges	• Develop corridor plan • Create guiding principles • Outline recommendations in Project Plan • Determine costs • Identify key factors needed to advance project

Solicit Public and Agency Feedback

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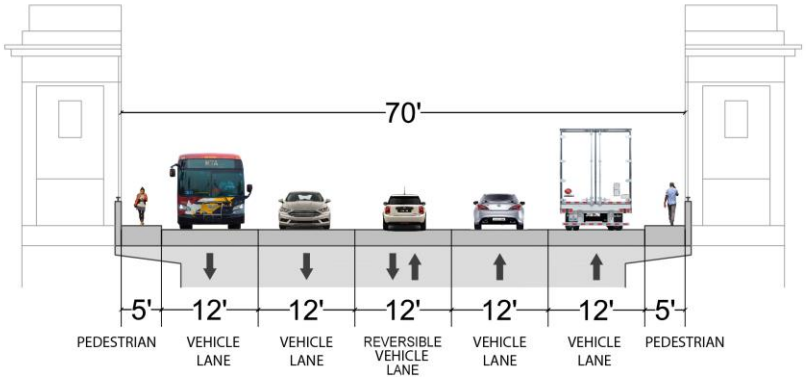
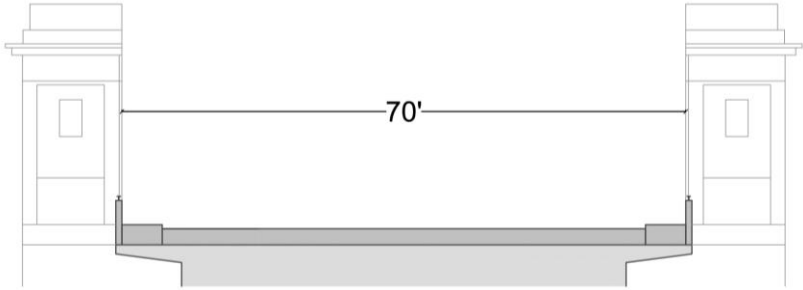
Work Completed to Date

- Conducted Public Outreach
  - Interagency Advisory Group (IAG)
  - Community Advisory Panel (CAP)
  - Public Meetings – September 2016, January 2017, and May 2017
- Collected Existing Conditions Data
  - Review of available data and previous plans, studies, and inspection reports
  - Field visits to verify existing conditions
- Conducted Economic Market Analysis
  - Review of previous economic and master plans
  - Analysis of demographic, economic, and real estate data
  - Stakeholder interviews
  - Documentation of economic strengths and weaknesses
- Analyzed Existing Transportation Network
  - Investigation of existing demand
  - Review of safety and capacity of existing facilities
- Identified Design Opportunities and Constraints
  - Preliminary bridge options and cost estimates
  - Future (2040) traffic analysis
- Developing Corridor Plan and Guiding Principles
  - Urban design concepts
  - Guiding principles

Previous Bridge Typical Section Activity



Existing Bridge



Proposed Bridge

- What we heard:
  - Additional space needed for pedestrians and bicycles to increase comfort and enhance recreation
  - Add barrier separation between pedestrians / bicycles and vehicles for safety
  - Add barrier separation between opposing vehicle travel directions for safety
  - Overall support for removing center reversible lane due to safety concerns
  - Stronger support for pedestrian / bicycle accommodations rather than a dedicated transit lane

Guiding Principles

Guiding Principles

The Guiding Principles for the Hanover Street Corridor Study will:

- Inform the selection of corridor options
- Serve to guide the design-related elements along the Hanover Street corridor
- Establish a framework and serve as a guide for the City of Baltimore to take a proactive approach for future phases of design and construction

Guiding Principles

- Historic and cultural context of the Vietnam Veterans Memorial Bridge
  - Aesthetics
  - Architectural importance
  - Cultural and natural resource preservation
  - Bringing back the original purpose of the bridge – connectivity for all travelers; since rehabilitation in 1970, the purpose of the bridge has been almost exclusively to move vehicles
- Community Revitalization
  - Gateway to current and future development
  - Economic and social growth
- Safety
  - Increased space in the corridor for pedestrians and bicycles
  - Using design opportunities to calm traffic (reduce speeds) improves safety for pedestrians and bicyclists

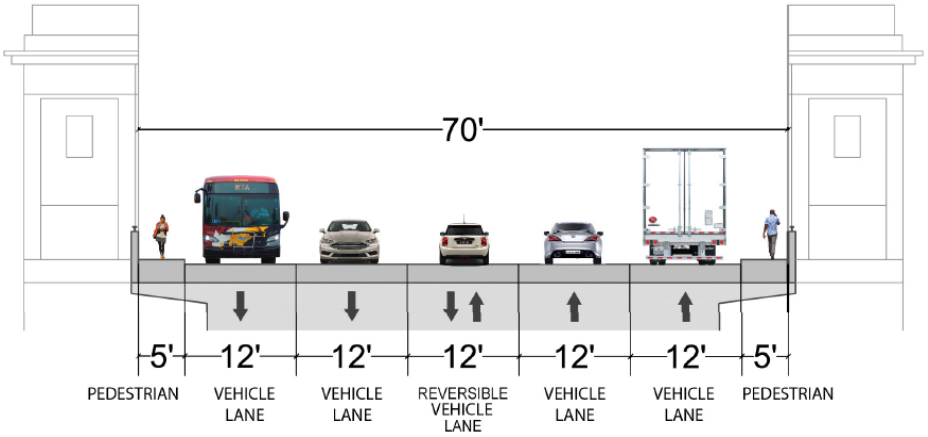
Guiding Principles

- Connectivity
  - Improved and enhanced multimodal connectivity between pedestrians, bicyclists, transit riders, motor vehicles, and freight operators
  - Remove barriers that block desired movements and gaps that separate people from their desired destinations
  - Make connections within and between neighborhoods, as well as between local and regional origins and destinations (residential, retail, employment, and recreation)
- Accessibility
  - Provide the surrounding communities with safe and reliable access to key quality of life resources (retail, employment, and recreation)

Preliminary Bridge Options

Short-Term Maintenance Option

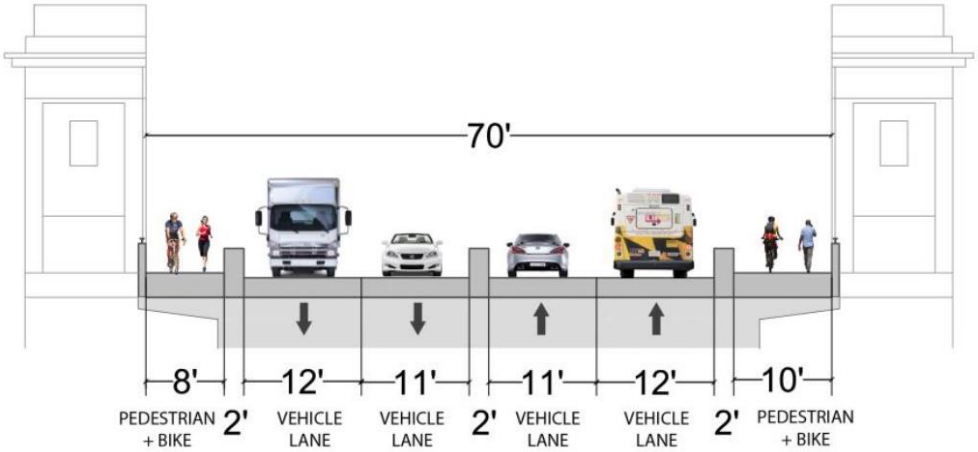
Option 1 / 2: Full Deck Replacement (Roadway Only)



- Replacement of "Top Slab" of Deck above Precast Planks
  - Does not include movable span steel grid deck replacement
  - Does not include sidewalk replacement
- Methodology
  - Used existing plan sets to derive quantities
  - Cost estimate based upon primary work items
- Cost Estimate
  - Used recent construction costs for similar work
  - Identified contingencies and project soft costs
  - **Total cost (2018 $): $8.0 million to $10.0 million**

Preliminary Bridge Options

Option 3: Four-Lane Section

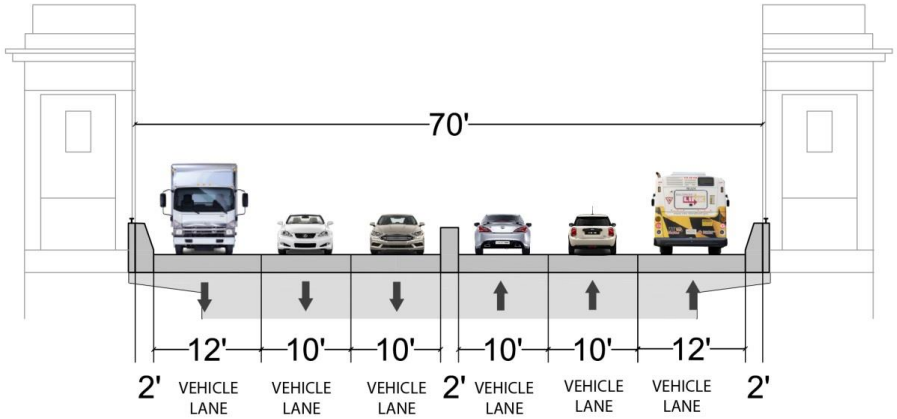


- Replacement of Bridge Deck – Full Depth including Precast Planks
  - Includes replacement of movable span steel grid deck
  - Includes bicycle and pedestrian paths, replacing outside barriers, installing new barriers between vehicular traffic and pedestrians and bicyclists, and installing new lighting
- Methodology
  - Used existing plan sets to derive quantities
  - Cost estimate based upon primary work items
- Cost Estimate
  - Used recent construction costs for similar work
  - Identified contingencies and project soft costs
  - **Total cost (2018 $): $30.0 million (no rehabilitation of the moveable span)**
  - **Total cost (2018 $): $50.0 million (fix the moveable span in the closed position)**
  - **Total cost (2018 $): $70.0 million (full rehabilitation of the moveable span)**

Preliminary Bridge Options

Option 4: Separate Pedestrian / Bicycle Bridge and General Rehabilitation of the Existing Bridge to Accommodate Six Travel Lanes

New Bridge



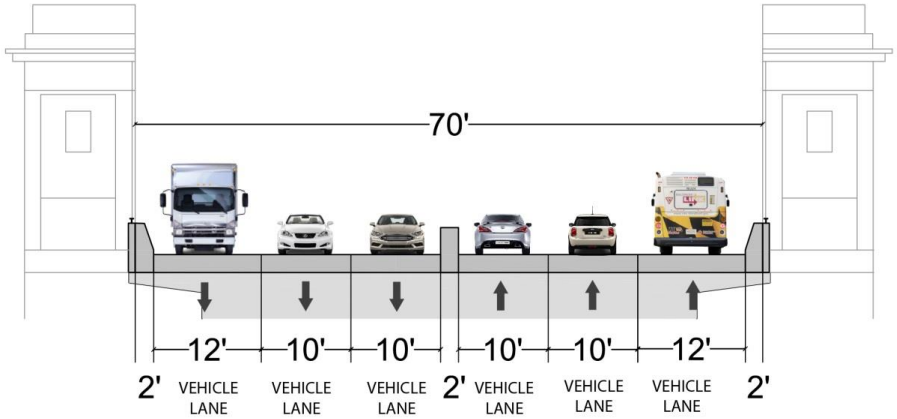
Existing Bridge

- Requires United States Coast Guard Approval to Fix Movable Span of Existing Bridge
- Replacement of Bridge Deck – Full Depth including Precast Planks
  - Includes structural modifications to fix existing movable span
  - Includes concrete filled steel grating of existing movable span
  - Includes six travel lanes, replacing outside barriers, installing new barriers between opposing vehicular traffic, and installing new lighting
- Construction of New Parallel Pedestrian / Bicycle Bridge
  - Connecting Middle Branch Park to West Covington Park, west of the existing bridge
  - Assumes a fixed channel span
  - Serves bicyclists and pedestrians only

Preliminary Bridge Options

Option 4: Separate Pedestrian / Bicycle Bridge and General Rehabilitation of the Existing Bridge to Accommodate Six Travel Lanes

New Bridge

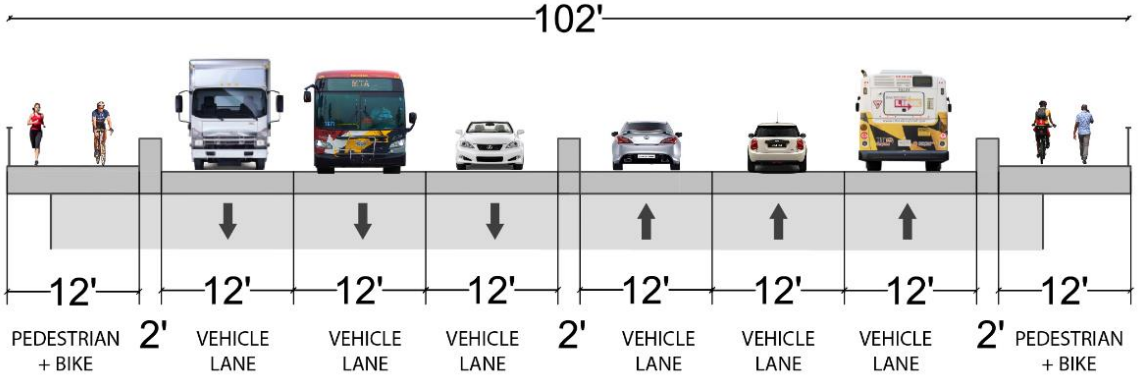


Existing Bridge

- Methodology
  - Used existing site information to derive bridge length
  - Cost estimate based upon industry recognized “square foot” costs for similar work
- Cost Estimate
  - Identified contingencies and project soft costs
  - **Pedestrian / bicycle bridge cost (2018 $): $20.0 million**
  - **Existing bridge rehabilitation cost (2018 $): $50.0 million**
  - **Total cost (2018 $): $70.0 million**

Preliminary Bridge Options

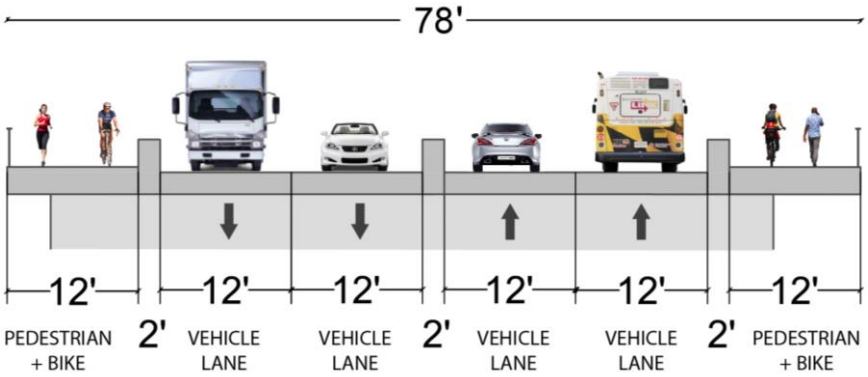
Option 5: New Six-Lane Bridge and Demolition of Existing Bridge



- Construction of a New "Signature Crossing"
  - Assumes a movable channel span
  - Includes demolition of the existing bridge
- Methodology
  - Used existing site information to derive bridge length
  - Cost estimate based upon industry recognized "square foot" costs for similar work
  - Used relatively high unit costs for "signature" portion of bridge
- Cost Estimate
  - Used standard contingencies
  - Identified project soft costs
  - **New bridge cost (2018 $): $230.0 million**
  - **Demolition of existing bridge cost (2018 $): $15.0 million**
  - **Total cost (2018 $): $245.0 million**

Preliminary Bridge Options

Option 6: New Four-Lane Bridge and Demolition of Existing Bridge



- Construction of a New “Signature Crossing”
  - Assumes a movable channel span
  - Includes demolition of the existing bridge
- Methodology
  - Used existing site information to derive bridge length
  - Cost estimate based upon industry recognized “square foot” costs for similar work
  - Used relatively high unit costs for “signature” portion of bridge
- Cost Estimate
  - Used standard contingencies
  - Identified project soft costs
  - **New bridge cost (2018 $): $180.0 million**
  - **Demolition of existing bridge cost (2018 $): $15.0 million**
  - **Total cost (2018 $): $195.0 million**

Preliminary Bridge Options Summary

Preliminary Bridge Options			
Option	**Description**	**Rehabilitation or Replacement**	**Total Cost (2018 $)**
1 / 2	Full Deck Replacement (Roadway Only)	Short-Term Maintenance	$8.0 M to $10.0 M
3	Four-Lane Section with 8 to 10 Foot Barrier Separated Pedestrian / Bicycle Paths	Rehabilitation	$30.0 M to $70.0 M
4	Separate Pedestrian / Bicycle Bridge and General Rehabilitation of the Existing Bridge to Accommodate Six Travel Lanes with No Pedestrian or Bicycle Accommodations	Rehabilitation	$70.0 M
5	New Six-Lane Bridge with 12 Foot Barrier Separated Pedestrian / Bicycle Paths and Demolition of Existing Bridge	Replacement	$245.0 M
6	New Four-Lane Bridge with 12 Foot Barrier Separated Pedestrian / Bicycle Paths and Demolition of Existing Bridge	Replacement	$195.0 M

Urban Design Concepts

Potee Street looking north

- Enhanced pedestrian space – bus shelter and bench
- Dedicated bicycle facility

Hanover Street looking north

- Dedicated bicycle facility
- Enhanced landscaping

Peninsula below northern bridge arcade

- Enhanced public recreation space (previously unused)
- Public art displays

Arcade peninsula

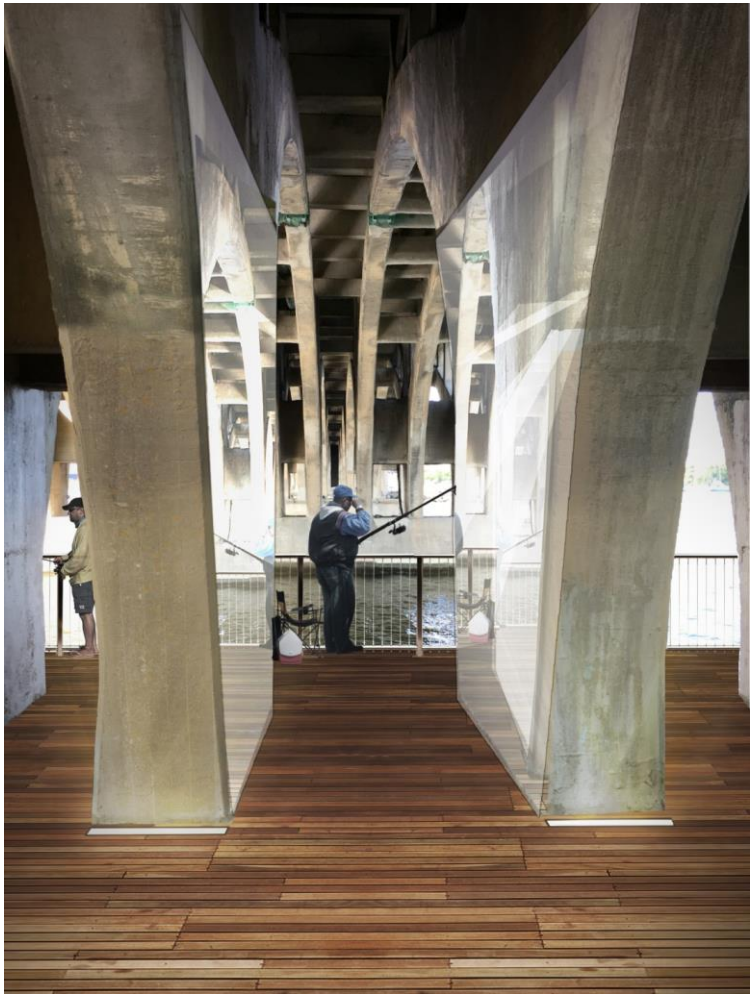
- Enhanced public recreation space (previously unused)
- Pedestrian lighting
- Pedestrian stairway connection to/from bridge

Arcade peninsula sculptural stairway to / from bridge

Space below southern bridge vault

- Enhanced public recreation space
- Pedestrian lighting for enhanced safety
- Cleared vegetation to enhance safety

Space under southern end of bridge



View from bridge (looking northwest)

- Barrier between pedestrians and vehicular traffic for enhanced safety
- Pedestrian lighting
- Pedestrian stairway connection to/from bridge

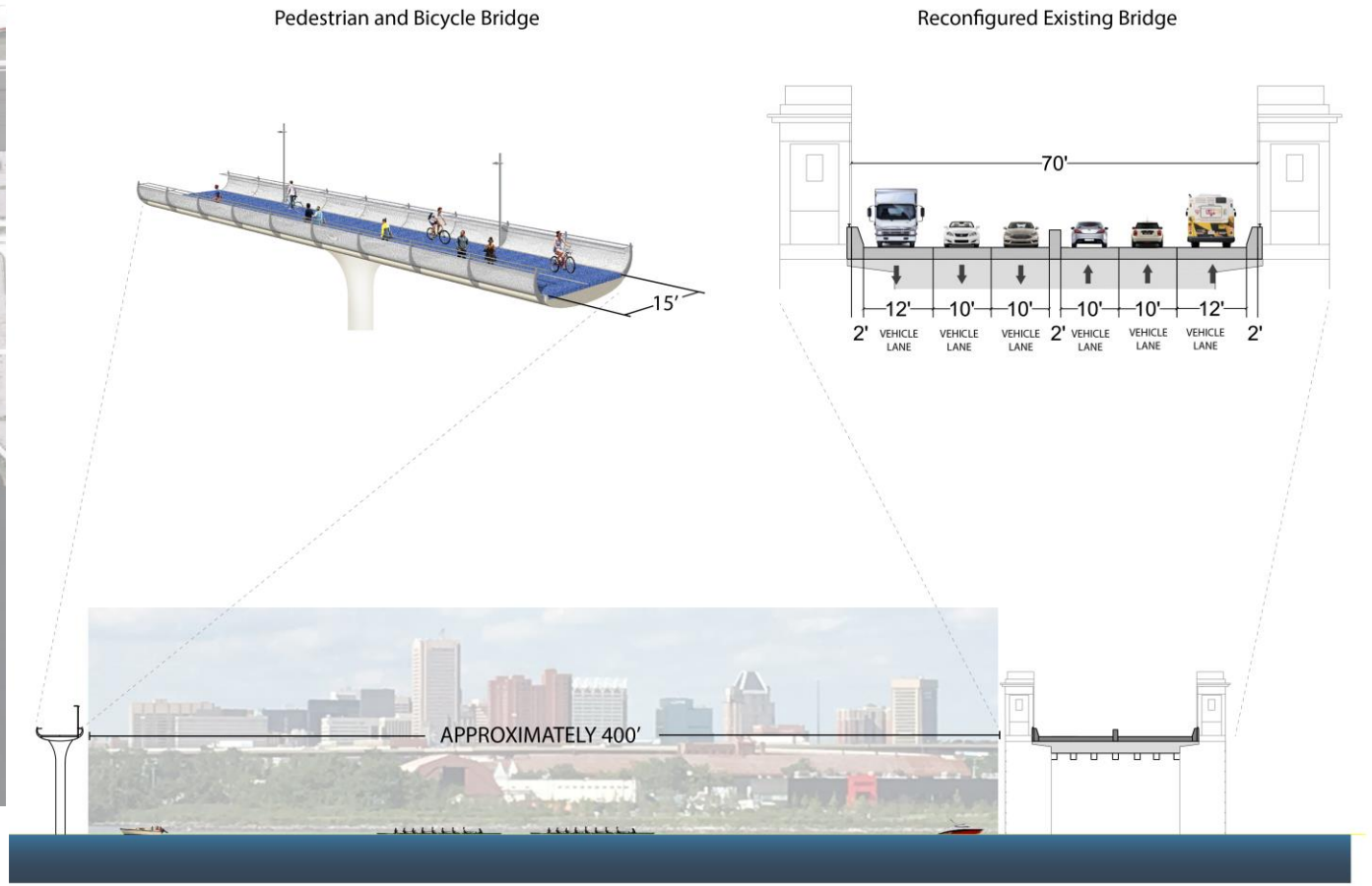
Hanover Street at Cromwell Street (looking south)

- Enhanced pedestrian crosswalks
- Removed channelized right-turn movements to improve pedestrian safety

Potee Street at Waterview Avenue (looking southeast)

- Enhanced pedestrian crosswalks

Separate pedestrian and bicycle bridge with reconfigured existing bridge



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Traffic Analysis

Types of Analysis

Vehicles

- Intersection Level
  - Intersection Performance Measures
    - Level of Service (LOS)
    - Volume-to-Capacity (V/C) Ratio
    - Vehicle Delay
- Network Level
  - Micro-Simulation (SimTraffic)
  - Network Performance Measures
    - Travel Time
    - Queue Lengths
    - Travel Speeds

Other Modes

- Bicycle Level of Comfort

Intersection LOS Delay Ranges

Signalized Intersections	
Level of service	**Control Delay range (sec/veh)**
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

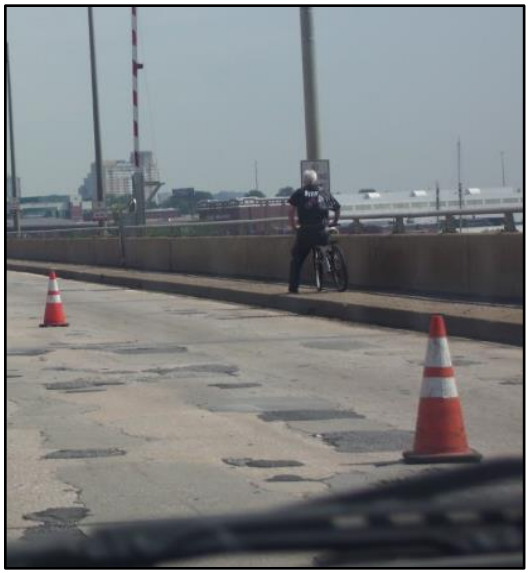
Bicycle Level of Comfort

Inputs to Analysis

- # of through lanes
- Divided/Undivided Roadway
- Average Daily Traffic
- Heavy Vehicle Percentage
- Posted Speed Limit
- Width of Outside Lane (and shoulder)
- Pavement Condition

Output

- Level of service (A through F) based on score



Recap of Existing Conditions

- All intersections within the project study area limits operate with a LOS D or better during the AM and PM peak hours.

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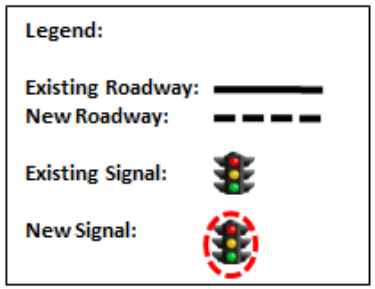
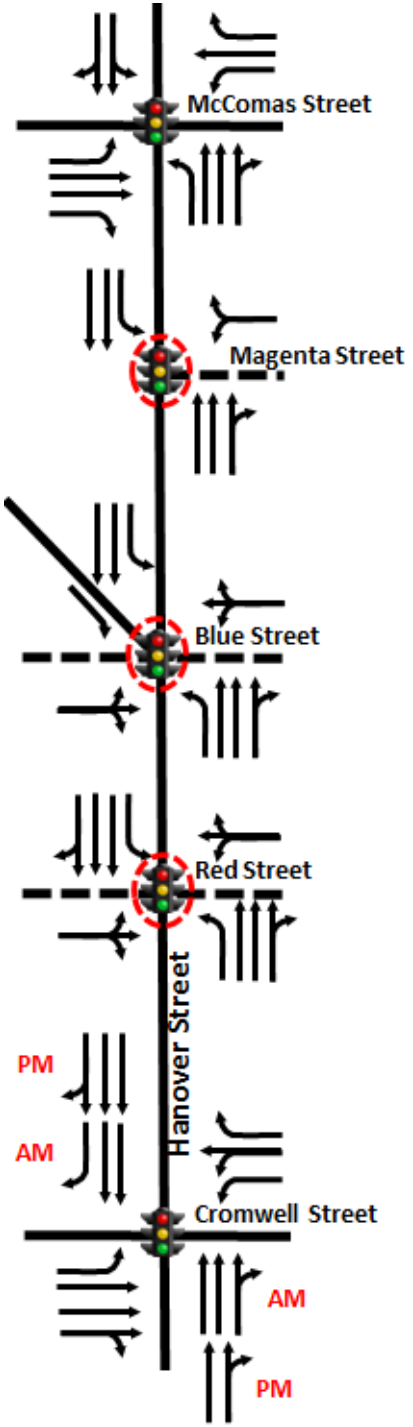
Existing Average Corridor Travel Times

Existing Travel Times – Vehicle (Bicycle) [Pedestrian]				
	AM – Northbound	**AM – Southbound**	**PM – Northbound**	**PM – Southbound**
Northern Segment Wells Street to Cromwell Street (0.4 miles)	1.3 minutes (2 minutes) [9 minutes]	1.5 minutes (2 minutes) [9 minutes]	1.4 minutes (2 minutes) [9 minutes]	1.3 minutes (2 minutes) [9 minutes]
Southern Segment Cromwell Street to Reedbird Avenue (0.9 miles)	1.8 minutes (5 minutes) [19 minutes]	2.0 minutes (5 minutes) [19 minutes]	2.3 minutes (5 minutes) [19 minutes]	2.0 minutes (5 minutes) [19 minutes]
Entire Corridor (1.3 miles)	3.1 minutes (7 minutes) [28 minutes]	3.5 minutes (7 minutes) [28 minutes]	3.7 minutes (7 minutes) [28 minutes]	3.3 minutes (7 minutes) [28 minutes]

2040 No-Build Assumptions

- Volumes and lane configurations represent the No-Build analysis for I-95 Access Improvements Study
  - Includes new Port Covington intersections along Hanover Street (i.e. Magenta Street, Blue Street, Red Street)
  - Does not include any assumed I-95 access improvements





Recap of No-Build Conditions

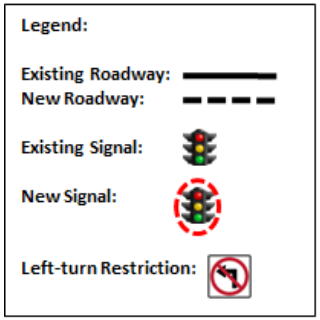
- 3 intersections operate with LOS F during the AM peak hour
  - Hanover Street at Wells Street
  - Hanover Street at McComas Street
  - Hanover Street at Blue Street
- 5 intersections operate with LOS E or LOS F during the PM peak hour
  - Hanover Street at Wells Street
  - Hanover Street at McComas Street
  - Hanover Street at Blue Street
  - Hanover Street at Red Street
  - Hanover Street at Cromwell Street

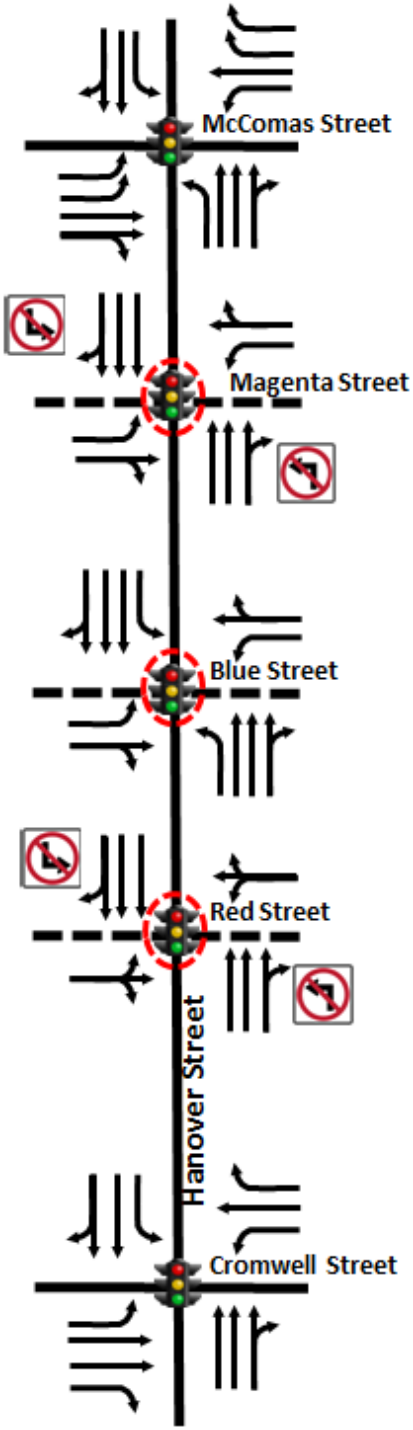
2040 Roadway Build Assumptions

- Volumes and lane configurations include improvements currently expected as part of the I-95 Access Improvements Study

  (www.mdta.maryland.gov/capital_projects/i-95_access_study/home.html)

  - I-95 NB to Hanover Street SB off-ramp relocated
  - Turn restrictions implemented along Hanover Street at three intersections
  - Side street left-turn lanes as shown





2040 Roadway Build Intersection Results

Intersection	Existing Conditions						Future Year Condtions (2040 No-Build)						Future Year Condtions (2040 Build)					
	HCM						HCM						HCM					
	Delay (sec)		Level of Service		V/C Ratio		Delay (sec)		Level of Service		V/C Ratio		Delay (sec)		Level of Service		V/C Ratio	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Hanover St & Wells St	30.7	31.0	C	C	1.00	0.91	80.4	109.2	F	F	1.17	1.35	56.0	91.7	E	F	1.13	1.29
Hanover St & McComas St	13.6	17.7	B	B	0.78	0.75	95.5	176.4	F	F	1.29	1.77	31.4	69.0	C	E	0.93	1.09
Hanover St & Magenta St	n/a						9.9	19.0	A	B	0.77	0.88	7.7	16.0	A	B	0.62	0.85
Hanover St & Blue St	n/a						264.8	180.0	F	F	2.13	1.84	27.6	42.5	C	D	0.93	1.00
Hanover St & Red St	n/a						37.1	69.5	D	E	1.06	1.17	11.4	19.2	B	B	0.68	0.81
Hanover St & Cromwell St	18.8	37.7	B	D	0.62	0.77	28.1	88.5	C	F	0.68	1.12	25.6	30.9	C	C	0.84	0.90
Potee St and Waterview Ave	21.4	7.5	C	A	0.27	0.37	11.6	12.5	B	B	0.32	0.53	13.5	15.4	B	B	0.32	0.53
Hanover St & Waterview Ave	5.1	8.6	A	A	0.46	0.39	10.9	29.3	B	C	0.59	0.55	3.8	8.7	A	A	0.59	0.55
Potee St & Cherry Hill Rd	16.1	9.9	B	A	0.34	0.45	19.7	31.8	B	C	0.40	0.61	15.5	8.8	B	A	0.40	0.61
Hanover St & Cherry Hill Rd	5.5	10.5	A	B	0.57	0.39	8.0	13.1	A	B	0.68	0.47	6.6	7.8	A	A	0.68	0.47
Potee St and Reedbird Ave	8.6	8.4	A	A	0.29	0.44	7.9	8.2	A	A	0.37	0.61	6.9	7.1	A	A	0.37	0.61
Hanover St & Reedbird Ave	4.0	5.7	A	A	0.37	0.27	39.6	19.6	D	B	0.70	0.53	39.3	14.3	D	B	0.70	0.53

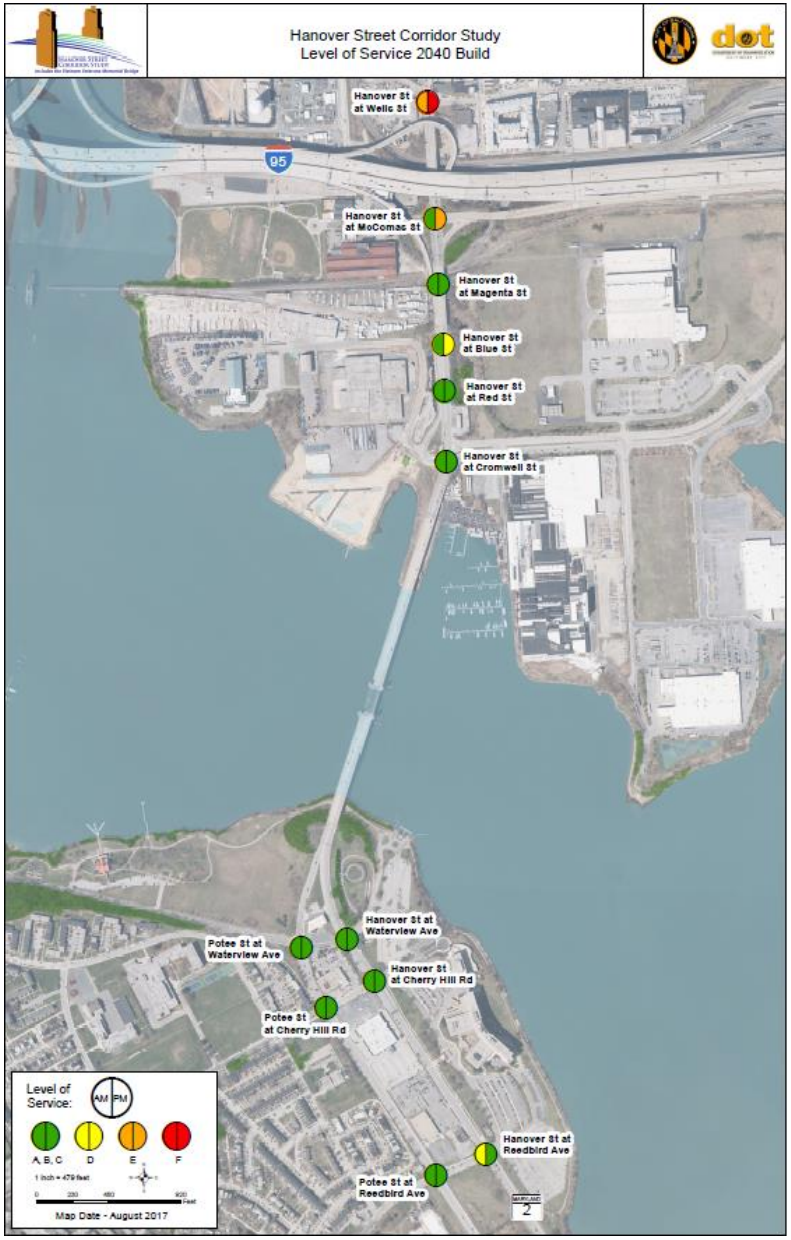
Findings

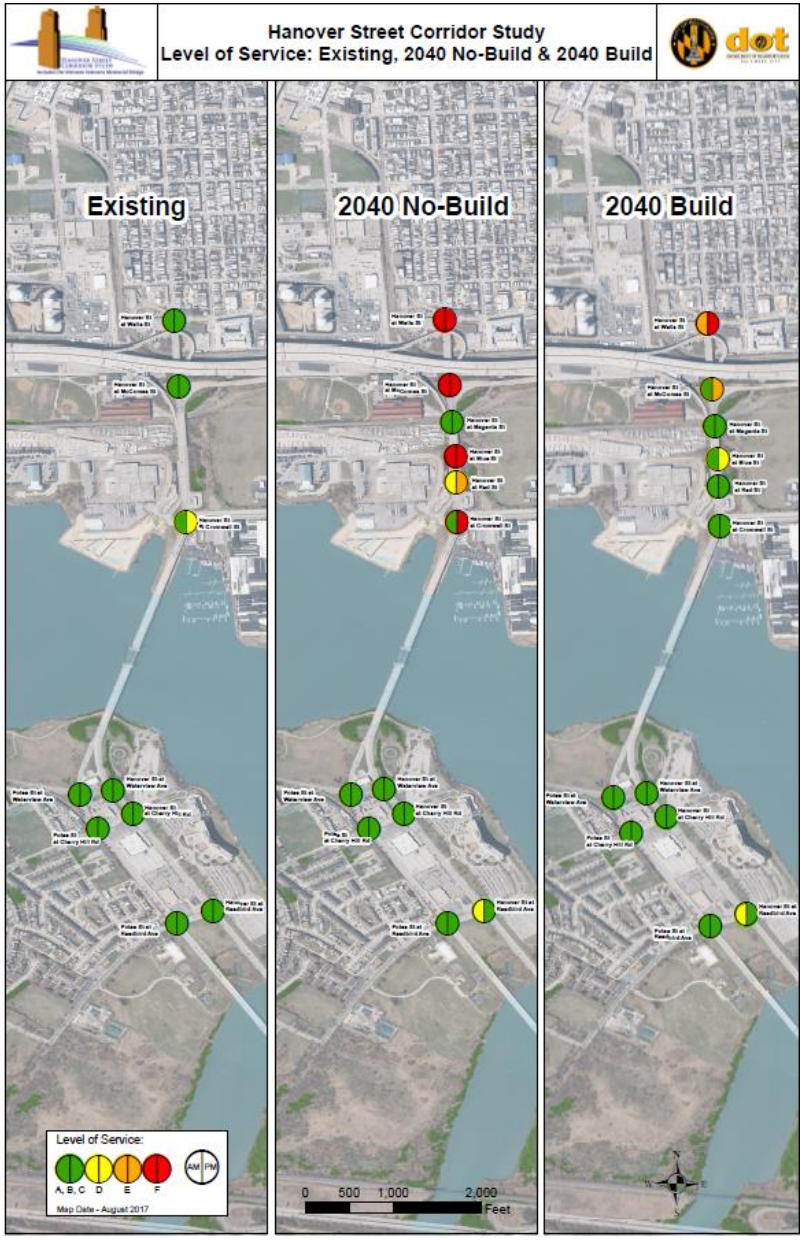
- 1 intersection operates with LOS E during the AM peak hour (Hanover Street at Wells Street)
- 2 intersections operate with LOS E or LOS F during the PM peak hour (Hanover Street at Wells Street & Hanover Street at McComas Street)

Improvements

- Intersection results improve in 2040 Build compared to 2040 No-Build because of roadway improvements (e.g. I-95 NB ramp to Hanover Street realignment, side street left-turn lanes), turn restrictions, and signal timing improvements north of the bridge

2040 Roadway Build Intersection Results





2040 Bridge Build Analysis – Impacts of Alternative Bridge Typical Sections

Travel lane scenarios examined (with x/x lanes in each direction):

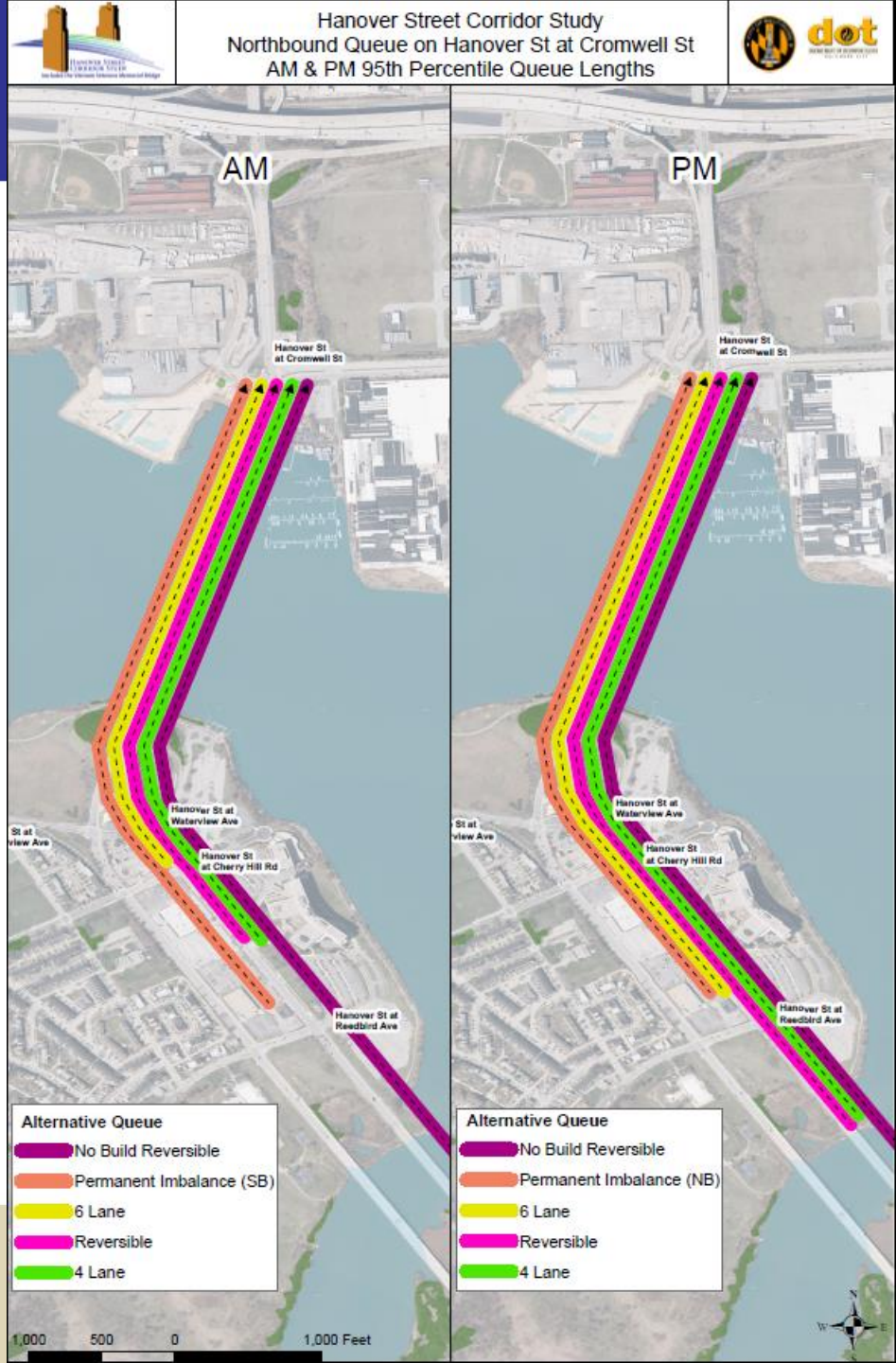
- 2/2/1 reversible lane
  - Existing bridge width and operations
- 2/2 lanes
  - Existing bridge width
  - 1 lane reconfigured for pedestrians and bikes
- 3/2 lanes
  - Existing bridge width
  - Permanent imbalance with 3 lanes in one direction and 2 in the other direction
  - No reversible lane
- 3/3 lanes
  - New bridge

Bicycle Level of Comfort On Bridge

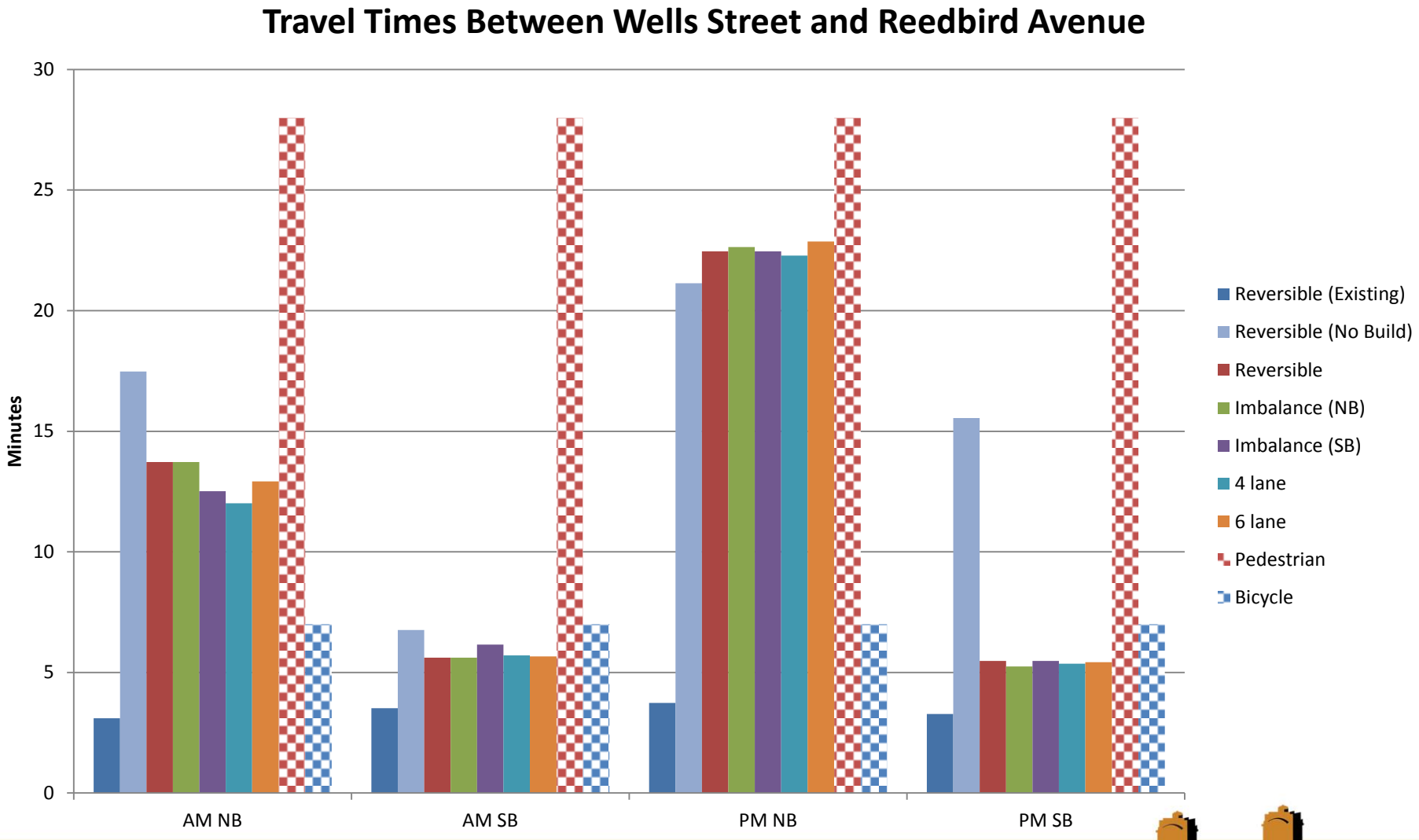
Scenario	Level of Comfort
Existing (shared travel lane)	F
2040 No Build (shared travel lane)	F
2040 Build – Options 1 and 2 (shared travel lane)	E
2040 Build – Option 3, 3A, and 3B (barrier separated ped/bike paths)	A
2040 Build – Option 4 (separate ped/bike bridge)	A
2040 Build – Option 5 (new bridge with barrier separated ped/bike paths)	A

2040 Build Results – Queues

- AM
  - Northbound queue from Cromwell Street would extend 560’ beyond Cherry Hill Road with existing bridge configuration (i.e. Reversible)
- PM
  - Northbound queue from Cromwell Street would extend 840’ beyond Reedbird Avenue with existing bridge configuration (i.e. Reversible)
  - Northbound queue at Cromwell Street reduced by approximately 1,000 feet for bridge configurations with 3rd northbound lane
- Conclusion
  - The bridge cross section will not have a significant impact on corridor travel time or queueing



2040 Build Results – Travel Times



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Next Steps

- Project Documents
  - Draft Project Report
    - Outline corridor recommendations
    - Additional cost information
    - Identify key factors needed to advance project
  - Final Project Report
- Continue robust public outreach program
  - Spring and Summer 2018 Public Meetings

Questions?