3.0 Alternatives

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act of 1969 (NEPA) require that Federal agencies "use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment."[1] The regulations call for the EIS to "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated."[2]

This chapter describes the process through which the Federal Railroad Administration (FRA) and the District Department of Transportation (DDOT) identified and evaluated the Action Alternatives and No Action Alternative for the Long Bridge Project (the Project). This chapter also identifies the Preferred Alternative for the Project. The chapter consists of the following sections:

- **Section 3.1, Alternatives Development and Screening**, describes FRA and DDOT's pre-NEPA preliminary concept development (Phase I and II Studies); the Scoping process; and the Level 1 and Level 2 Concept Screening Analyses.
- **Section 3.2, Draft EIS (DEIS) Alternatives**, describes Action Alternative A and Action Alternative B. This section also describes the No Action Alternative, which is the state in which the Project would not take place in the planning year of 2040. The CEQ regulations for implementing NEPA require analysis of a No Action Alternative.[3] The No Action Alternative serves as a baseline for assessing the impacts of the Action Alternatives.
- **Section 3.3, Conceptual Engineering for DEIS Alternatives**, describes the engineering completed for Action Alternative A and Action Alternative B, additional clearance assessments for the Maryland Avenue SW to L'Enfant Interlocking segment, and the bridge structure types for the Potomac River crossing.
- **Section 3.4, Train Volumes**, describes the anticipated number of commuter, passenger, and freight trains passing through the Long Bridge Corridor for the No Action Alternative and the Action Alternatives.
- **Section 3.5, Construction Overview**, details the construction methods and activities for the Action Alternatives, including information on access, staging, and duration.
- **Section 3.6, Comparison of Alternatives**, considers the alternatives and how they differ regarding achievement of the Purpose and Need and capital costs.
- **Section 3.7, Preferred Alternative**, identifies the Lead Agencies' Preferred Alternative for implementing the Project.

[1] 40 CFR 1502
[2] 40 CFR 1502.14
[3] 40 CFR 1502.14

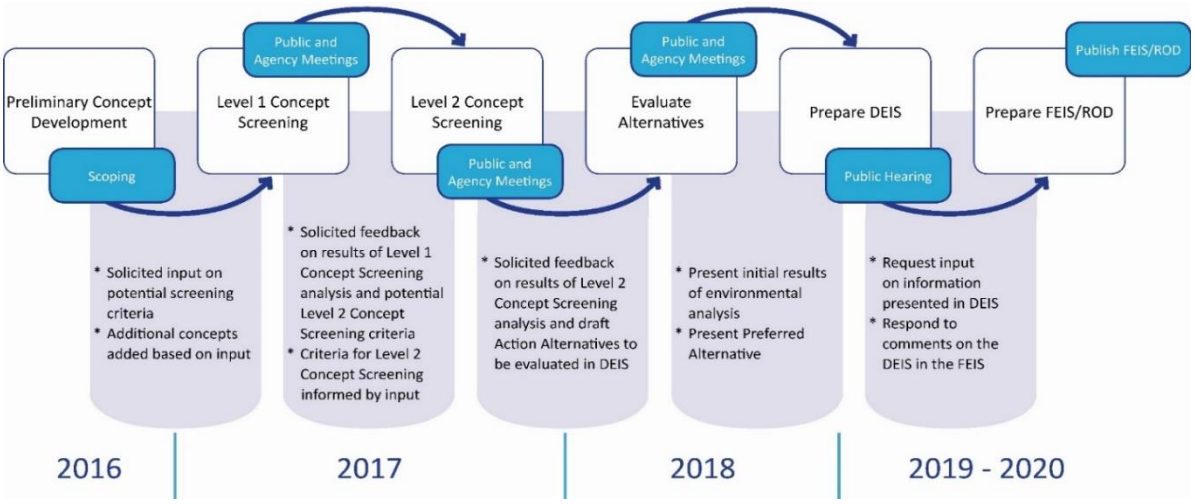
3.1 Alternatives Development and Screening

Appendix B1, **Alternatives Development Report**, provides details on the alternatives development and screening process leading up to this DEIS. This section provides a summary of the process.

During the alternatives development and screening process, FRA and DDOT identified a broad and reasonable range of concepts, in addition to a No Action Alternative, to address the Project's Purpose and Need. FRA and DDOT considered environmental impacts during the concept screening process; however, environmental considerations did not substantially differentiate the concepts based on the level of design at that stage. It was not clear that the impacts of any specific concept would be of such magnitude that they would be unreasonable. Therefore, FRA and DDOT screened concepts in a two-level process that used criteria and metrics derived from the Project's Purpose and Need statement, in addition to feasibility, to identify the Action Alternatives for evaluation in this DEIS.

The Lead Agencies involved Cooperating Agencies, Participating Agencies, and the public throughout the alternatives development and screening process. In addition, FRA and DDOT coordinated with railroad stakeholders CSX Transportation (CSXT), Amtrak, and Virginia Railway Express (VRE). These stakeholders provided input that influenced and informed each phase of project development (**Figure 3-1**). Agency and public engagement continues through the DEIS and Final EIS (FEIS) phases as outlined in **Appendix A2, Agency and Public Coordination Plan**.

Figure 3-1 | Alternatives Development and the EIS Process



3.1.1 Pre-NEPA Preliminary Concept Development (Phases I and II)

The Phase I Study, completed in 2015 before initiation of this EIS, considered eight multimodal concepts to address the deficiencies of the Long Bridge Corridor:[4]

- **Concept 1**: No Build[5]
- **Concept 2**: Two-track bridge (rehabilitation or reconstruction of existing system)
- **Concept 3**: Four-track bridge
- **Concept 4**: Four-track tunnels
- **Concept 5**: Four-track bridge with bike-pedestrian connection
- **Concept 6**: Four-track bridge with two streetcar lanes and a bike-pedestrian connection
- **Concept 7**: Four-track bridge with two shared streetcar and general-purpose automobile lanes and a bike-pedestrian connection
- **Concept 8**: Four-track bridge with two shared streetcar and general-purpose automobile lanes, two general-purpose automobile lanes, and a bike-pedestrian connection

The Phase I Study did not make recommendations related to specific concepts. Therefore, the concepts identified in the Phase I Study were carried over to the next phase. Phase II of the Long Bridge Study prepared the Project for the NEPA process by further refining engineering concepts and developing draft evaluation criteria to identify and screen concepts for analysis in the EIS. The Phase II Study expanded the eight multimodal concepts evaluated during the Phase I Study to 18 concepts (shown in **Table 3-1**) by considering three-track concepts, identifying additional multimodal concepts that would expand the Long Bridge Corridor, and adding a concept that would accommodate additional capacity by constructing a new railroad corridor in a different location. More detailed information on the concepts developed and evaluated in the Phase I & II Studies can be found in **Appendix B1**, **Alternatives Development Report**.

3.1.2 Scoping Process

On August 26, 2016, FRA and DDOT initiated the formal NEPA process for the Project and issued a Notice of Intent to prepare an EIS in the Federal Register. The Scoping process is the period in which agencies and the public collaborate to define the range of issues and possible alternatives evaluated in the EIS. The Scoping process for the EIS lasted from August 26, 2016, to October 14, 2016, and engaged the public as well as local, state, and Federal agencies. FRA and DDOT held public and agency Scoping meetings on September 14, 2016, to receive feedback on the Project's draft Purpose and Need statement, the concepts for screening, and the draft screening criteria. At the Scoping meetings, FRA and DDOT presented the 18 preliminary concepts from the pre-NEPA Phase I and II Studies.

[4] DDOT. *Long Bridge Study (Phase I Study)*. Accessed from https://ddot.dc.gov/publication/final-long-bridge-study. Accessed September 26, 2018.
[5] Phase I and II Studies used the term "No Build." The NEPA term "No Action" is used for the DEIS.

Table 3-1 | Preliminary Concepts Presented During Scoping

Concept		Description
1	**No Action**[1]	Option against which the EIS assesses the Action Alternatives. CEQ regulations require a No Action Alternative. Therefore, FRA and DDOT did not screen this option.
2	**Two-Track Bridge**	Replaces the existing two-track bridge with a new two-track structure.
3	**Three-Track Crossing**	Provides a crossing over the Potomac River with three railroad tracks.
3A	**Three-Track Crossing with Bike-Pedestrian Path**	Provides a crossing over the Potomac River with three railroad tracks and a bike-pedestrian shared-use path.
3B	**Three-Track Crossing with Streetcar**	Provides a crossing over the Potomac River with three railroad tracks and two tracks for a streetcar line.
3C	**Three-Track Crossing with General Purpose Vehicle Lanes**	Provides a crossing over the Potomac River with three railroad tracks and additional car lanes.
4	**Three-Track Tunnel**	Bores a tunnel under the Potomac River with three tracks.
5	**Four-Track Crossing**	Provides a crossing over the Potomac River with four railroad tracks.
5A	**Four-Track Crossing with Bike-Pedestrian Path**	Provides a crossing over the Potomac River with four railroad tracks and a bicycle-pedestrian shared-use path.
5B	**Four-Track Crossing with Streetcar**	Provides a crossing over the Potomac River with four railroad tracks and two tracks for a streetcar line.
5C	**Four-Track Crossing with General Purpose Vehicle Lanes**	Provides a crossing over the Potomac River with four railroad tracks and additional car lanes.
6	**Four-Track Tunnel**	Bores a tunnel under the Potomac River with four railroad tracks.
7	**Two-Track Crossing; Two-Track Tunnel**	Provides a two-track crossing over the Potomac River and bores a tunnel under the river with two railroad tracks.
8	**Five Plus-Track Crossing or Tunnel**	Provides a crossing, a tunnel, or some combination, with five or more railroad tracks in total.
8A	**Five Plus-Track Crossing or Tunnel with Bike-Pedestrian Path**	Provides a crossing, a tunnel, or some combination, with five or more railroad tracks in total and a bike-pedestrian shared-use path.
8B	**Five Plus-Track Crossing and/or Tunnel with Streetcar**	Provides a crossing, a tunnel, or some combination, with five or more railroad tracks in total and two tracks for a streetcar line.
8C	**Five Plus-Track Crossing and/or Tunnel with General Purpose Vehicle Lanes**	Provides a crossing, a tunnel, or some combination, with five or more railroad tracks in total and additional car lanes.
9	**New Location**	Constructs new railroad capacity along an entirely different corridor.[2]

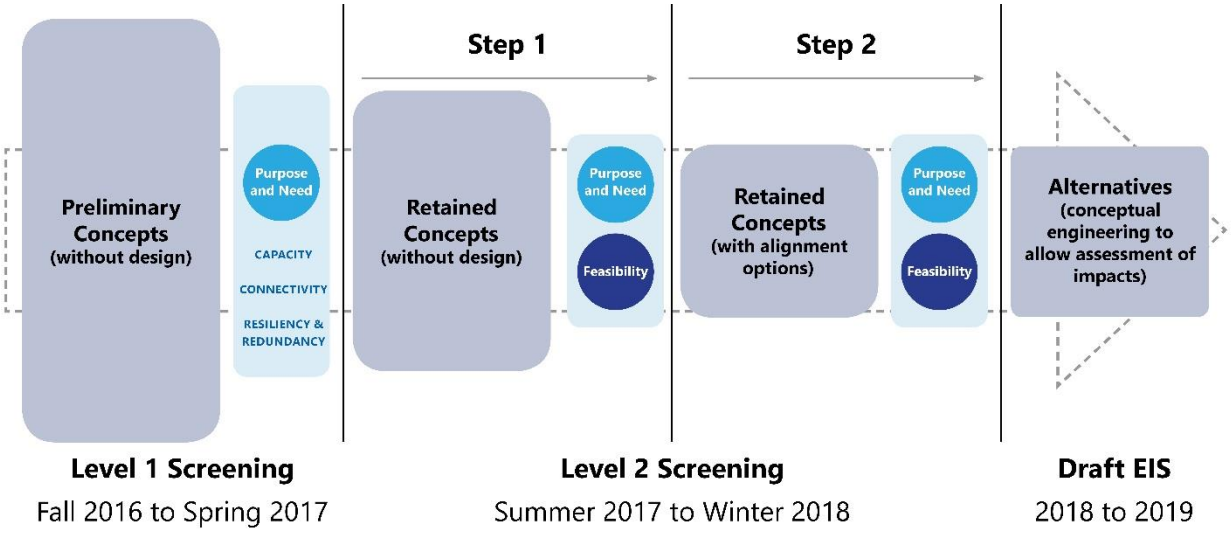
[1] Public and agency Scoping materials referred to this concept as the "No Build."
[2] Based on comments received during the Scoping period, FRA and DDOT split Concept 9 into two concepts for the Level 1 Concept Screening process: one concept would construct new railroad capacity in a new corridor but retain or replace the existing bridge, and the other concept would build new railroad capacity in a new corridor and remove the existing bridge.

During the Scoping period, FRA and DDOT received 21 comment submissions from agencies and 80 comment submissions from the public. **Appendix A1, Scoping Report**, summarizes the comments. Most public comments focused on the alternatives that FRA and DDOT should consider in the DEIS. Based on comments received, Concept 9 "New Location" became two concepts. One concept would construct new railroad capacity in a new corridor but retain or replace the existing bridge, and the other concept would build new railroad capacity in a new corridor and remove the existing bridge. At the end of the Scoping process, FRA and DDOT determined that 19 concepts, including the No Action, would advance to the Level 1 Concept Screening.

3.1.3 Concept Screening Process

After initiation of the EIS and completion of the Scoping process in Fall 2016, FRA and DDOT conducted a two-level screening process, documented in the **Appendix B1**, **Alternatives Development Report**, to identify the reasonable range of Action Alternatives for further conceptual engineering and evaluation in the DEIS (**Figure 3-2**).

Figure 3-2 | Long Bridge Project Screening Process



3.1.3.1 Level 1 Concept Screening

In Spring 2017, the Level 1 Concept Screening evaluated the 18 preliminary concepts developed and retained through pre-NEPA Phase I and II studies, as well as the one additional concept introduced during Scoping, for a total of 19 concepts. FRA and DDOT advanced the No Action Alternative without evaluation, as NEPA requires its evaluation in the EIS. The concepts varied based on number of railroad tracks provided; inclusion of additional transportation options, including a bike-pedestrian path, streetcar, or general-purpose vehicle lanes; and the type of crossing (bridge over or tunnel under the Potomac River in the current location or along a new corridor). The concepts at this stage focused on the elements (such as number of tracks) to be included in the Project and FRA and DDOT presumed that these elements could be provided in a variety of ways. These preliminary concepts included those presented in **Table 3-1**.

During Level 1 Concept Screening, FRA and DDOT evaluated the 19 preliminary concepts for their ability to meet the Project Purpose and Need. For the three Level 1 Concept Screening criteria, FRA and DDOT developed five metrics to assess the preliminary concepts. For each metric, the screening evaluated whether the preliminary concept was consistent or inconsistent with the metric. If any of the concepts were inconsistent with a metric, the screening considered it a "fatal flaw" and FRA and DDOT did not advance the concept to the Level 2 Concept Screening for further consideration, as the concept did not meet the Purpose and Need. **Table 3-2** describes the metrics.

Table 3-2 | Level 1 Concept Screening Metrics

Metric	Description
Criterion 1: Railroad Capacity	
1	Concept allows trains to pass one another in the Corridor while maintaining bidirectional service, which is necessary to enhance the ability to maintain schedules under normal operations and provide flexibility to recover during periods of higher demand and service delays.
Criterion 2: Network Connectivity	
2A	Concept improves or does not diminish connectivity to existing railroad stations, major employment and residential nodes, freight railroad infrastructure, and other modes of transportation service.
2B	Concept includes features shown in relevant adopted regional, state, and local transportation plans (including features planned to connect to regional, state, and local transportation infrastructure). Concepts that include features not shown in adopted regional, state, and local transportation plans are inconsistent with the Purpose and Need.
2C	Concept does not preclude the operations and connections envisioned in the CSXT National Gateway program[1] and the MARC Growth and Investment Plan.[2]
Criterion 3: Resiliency and Redundancy	
3	Concept provides the ability for trains to operate through the Corridor when one track is out of service due to planned maintenance or emergency conditions.

[1] CSXT. CSXT National Gateway Program. Accessed from https://www.csx.com/index.cfm/about-us/projects-and-partnerships/national-gateway/. Accessed June 21, 2018.
[2] MARC. MARC Growth and Investment Plan. Accessed from https://mta.maryland.gov/sites/default/files/marcplanfull.pdf. Accessed June 21, 2018.

Table 3-3 shows the results of the concept evaluation. A red "X" mark shows that the screening found the concept inconsistent with the metric, while a green "check" mark denotes that the screening found the concept consistent with the metric. FRA and DDOT retained the concepts highlighted in green for the Level 2 Concept Screening. **Appendix B1, Alternatives Development Report**, provides more detail on the screening results.

Table 3-3 | Level 1 Concept Screening Results

Concepts		Metrics					Concept Retained
		1. Railroad Capacity	2. Network Connectivity			3. Resiliency and Redundancy	
		1	2A	2B	2C	3	
1	No Action	--	--	--	--	--	✓
2	Two-Track Bridge	✗	✓	✓	✓	✗	✗
3	Three-Track Crossing	✓	✓	✓	✓	✓	✓
3A	Three-Track Crossing with Bike-Ped Path	✓	✓	✓	✓	✓	✓
3B	Three-Track Crossing with Streetcar	✓	✗	✗	✓	✓	✗
3C	Three-Track Crossing with Vehicle Lanes	✓	✓	✗	✓	✓	✗
4	Three-Track Tunnel	✓	✗	✓	✗	✗	✗
5	Four-Track Crossing	✓	✓	✓	✓	✓	✓
5A	Four-Track Crossing with Bike-Ped Path	✓	✓	✓	✓	✓	✓
5B	Four-Track Crossing with Streetcar	✓	✗	✗	✓	✓	✗
5C	Four-Track Crossing with Vehicle Lanes	✓	✓	✗	✓	✓	✗
6	Four-Track Tunnel	✓	✗	✓	✗	✗	✗
7	Two-Track Crossing; Two-Track Tunnel	✗	✓	✓	✓	✗	✗
8	Five Plus-Track Crossing or Tunnel[1]	✓	✓	✓	✓	✓	✓
8A	Five Plus-Track Crossing or Tunnel with Bike-Ped Path[1]	✓	✓	✓	✓	✓	✓
8B	Five Plus-Track Crossing or Tunnel with Streetcar	✓	✗	✗	✓	✓	✗
8C	Five Plus-Track Crossing or Tunnel with Vehicle Lanes	✓	✓	✗	✓	✓	✗
9	New Corridor – Retain or Replace Existing	✗	✗	✗	✗	✗	✗
10	New Corridor – Remove Existing	✓	✗	✗	✗	✓	✗

[1] ***The screening eliminated tunnel options for these concepts but kept aboveground (bridge) crossings. FRA and DDOT eliminated tunnel options as a tunnel would not connect existing freight infrastructure due to the relatively flat grade required for freight trains and the depth required for a tunnel to avoid other infrastructure in the area. See Appendix B1, Alternatives Development Report, for more information on the elimination of the tunnel options.***

FRA and DDOT retained six concepts, plus the No Action concept (Concept 1), for the Level 2 Concept Screening:

- Concept 1: No Action
- Concept 3: Three-Track Crossing
- Concept 3A: Three-Track Crossing with Bike-Pedestrian Path
- Concept 5: Four-Track Crossing
- Concept 5A: Four-Track Crossing with Bike-Pedestrian Path
- Concept 8: Five Plus-Track Crossing
- Concept 8A: Five Plus-Track Crossing with Bike-Pedestrian Path[6]

On May 16, 2017, following the Level 1 Concept Screening, FRA and DDOT presented the draft retained concepts to the public and agencies for comment. **Chapter 25, Public Involvement and Agency Coordination**, provides a summary of the comments received on the draft retained concepts. After considering the comments, DDOT and FRA determined the concepts reviewed during Level 1 Concept Screening would carry forward to the Level 2 Concept Screening.

3.1.3.2 Long Bridge Current Condition

Several of the concepts retained from the Level 1 Concept Screening included the option to retain the existing Long Bridge. The owner of the bridge, CSXT, stated prior to the Level 2 Concept Screening Process that they maintain Long Bridge in proper condition for railroad purposes and the bridge is sufficient to meet the needs of their freight customers for the foreseeable future. CSXT annually inspects all their bridges and completed a rehabilitation of Long Bridge in October 2016. Therefore, FRA and DDOT carried the concepts that retained the existing Long Bridge forward to the Level 2 Concept Screening.

3.1.3.3 Consideration of a Bike-Pedestrian Crossing

Following the Level 1 Screening, FRA and DDOT determined that any number of tracks or track alignment options could potentially accommodate opportunities to include a bike-pedestrian crossing. The presence or absence of a bike-pedestrian crossing did not affect a concept's performance related to the Purpose and Need and feasibility metrics used in the Level 2 Concept Screening. Therefore, FRA and DDOT did not screen bike-pedestrian crossing opportunities using these metrics. However, evaluation of the feasibility of bike-pedestrian crossing opportunities continued. After completing safety and engineering analyses and railroad operator coordination, FRA and DDOT carried Bike-Pedestrian Crossing Option 2 forward as potential mitigation for impacts to properties protected under Section 4(f)

[6] The screening eliminated the tunnel options for Concepts 8 and 8A but kept the aboveground (bridge) crossings. FRA and DDOT eliminated tunnel options as a tunnel would not connect existing freight infrastructure due to the relatively flat grade required for freight trains and the depth required for a tunnel to avoid other infrastructure in the area. See **Appendix B1, Alternatives Development Report**, for more information on the elimination of the tunnel options.

of the United States Department of Transportation Act of 1966.[7] Please see **Chapter 22, Bike-Pedestrian Crossing**, for more information.

3.1.3.4 Level 2 Concept Screening

In addition to presenting the draft retained concepts at the May 16, 2017, agency and public meetings, DDOT and FRA sought input on proposed Level 2 Concept Screening criteria. **Chapter 25, Public Involvement and Agency Coordination**, provides a summary of the comments received on the proposed screening criteria.

After considering the public and agency comments, FRA and DDOT determined metrics to further assess the retained concepts' ability to meet the Purpose and Need, as well as feasibility. FRA and DDOT considered cost and environmental issues during the Level 2 Concept Screening; however, these considerations did not substantially differentiate the concepts at this stage in the process. **Appendix B1, Alternatives Development Report**, includes a detailed explanation of each screening metric; **Table 3-4** summarizes the metrics.

Table 3-4 | Level 2 Concept Screening Metrics

Metric	Description
Criterion 1: Purpose and Need	
1A	Concept ensures the investment in Long Bridge does not preclude proposals for expanded capacity in the railroad network connecting to the Corridor and the crossing does not become a bottleneck in the foreseeable future.
1B	Concept provides the ability to maintain at least two tracks in regular operation at all times over the river, including during construction, planned maintenance, or unanticipated outages.
Criterion 2: Feasibility	
2A	Concept provides sufficient space between bridges to enable vessels to access the bridges for construction, maintenance, and future inspection needs. A 25-foot horizontal separation between superstructures over the river is based on railroad industry best practices and engineering judgement.[1]
2B	Concept must allow for replacement or reconstruction of the existing bridge, whether as part of the Project or at a later date.
2C	Concept must not require interlocking infrastructure such as switches, turnouts, or crossovers over the Potomac River. Interlocking infrastructure increases the risk of a derailment, which presents a substantial safety concern when that interlocking infrastructure is located over water.
2D	Concept must avoid the Department of Defense (DOD) Facility located between the existing Long Bridge Corridor and the National Park Service (NPS) National Capital Region headquarters for security reasons. Concept should be at least 10 feet from the fence line of the facility to enable equipment and personnel to access the railroad for construction and maintenance purposes. This distance is the minimum distance needed to provide access for construction and maintenance vehicles, based on industry standards.

[1] The 25-foot clearance is an established FRA safety requirement. It represents the minimum distance for a clear zone from the center line of an outside track to a work area. Work within the 25-foot zone requires appropriate worker protection measures.

[7] 49 USC 303

The Level 2 Concept Screening was a two-step process:

- **Step 1** considered whether each concept, which varied in terms of number of tracks crossing the Potomac River, could be designed with track alignments that would meet the Purpose and Need and additional feasibility metrics. Step 1 did not assess specific alignment options. If the answer was "no" to any metric, FRA and DDOT eliminated the concept from further consideration because it did not meet Purpose and Need, or it was infeasible to construct.
- **Step 2** considered multiple track alignment options for crossings over the Potomac River for the concepts retained from Step 1. The screening evaluated each alignment option using the same Purpose and Need and feasibility metrics as in Step 1. If the answer was "no" to any metric, FRA and DDOT eliminated the concept alignment option from further consideration because it did not meet Purpose and Need, or it was infeasible to construct.

Level 2, Step 1 Concept Screening Analysis

The Level 2, Step 1 Screening showed that only Concept 5 (four-track crossing) and Concept 5A (four-track crossing with bike-pedestrian path) are consistent with all Purpose and Need and feasibility metrics (**Table 3-5**).

Table 3-5 | Results of Level 2, Step 1 Concept Screening

Concept	Purpose and Need		Feasibility				Concept Retained
	1A	1B	2A	2B	2C	2D	
No Action	--	--	--	--	--	--	✓
Concept 3 and 3A (Three Tracks)	✗	✓	✓	✓	✓	✓	✗
Concept 5 and 5A (Four Tracks)	✓	✓	✓	✓	✓	✓	✓
Concept 8 and 8A (Five Tracks)	✗	✓	✓	✓	✗	✓	✗

Level 2, Step 2 Concept Screening Analysis

In Step 2 of the Level 2 Concept Screening, FRA and DDOT developed nine alignment options based on the remaining two concepts, both of which include a four-track crossing of the Potomac River. These nine alignments represent the full range of potential bridge and track configurations.[8] For each potential configuration, FRA and DDOT developed a single horizontal alignment option based on safety

[8] There could be slight variations in location within which a specific configuration would be feasible. NEPA does not require consideration of every conceivable alignment for a project; it requires consideration of a reasonable range of potentially feasible alignments that will foster informed decision-making and public participation.

considerations, engineering standards, the need for two tracks to remain in operation during construction, and the desire to minimize right-of-way impacts. As noted above, any of these alignment options could potentially accommodate a bike-pedestrian crossing.

FRA and DDOT evaluated the nine alignment options using the same Purpose and Need and feasibility metrics as in Step 1 (**Table 3-4**). If an alignment option failed to meet any criterion, FRA and DDOT eliminated it from further consideration. **Table 3-6** describes the track alignment options and **Figure 3-3** depicts the options**.**

Table 3-6 | Alignment Options Evaluated in Level 2, Step 2 Concept Screening

Alignment Option	Description
A	New two-track bridge upstream of existing bridge, with existing two-track bridge retained.
B	New two-track bridge upstream of existing bridge, with existing two-track bridge replaced with a new two-track bridge.
C	New two-track bridge downstream of existing bridge, with existing two-track bridge retained.
D	New two-track bridge downstream of existing bridge, with existing two-track bridge replaced with a new two-track bridge.
E	New four-track bridge upstream of existing bridge, overlapping the footprint of the existing bridge. Construction of this option would occur in phases. The first phase would construct a new two-track bridge close to the existing alignment. The next phase would then demolish the existing bridge and expand the new bridge to four tracks.
F	New four-track bridge downstream of existing bridge, overlapping the footprint of the existing bridge. Construction of this option would occur in phases. The first phase would construct a new two-track bridge close to the existing alignment. The next phase would then demolish the existing bridge and expand the new bridge to four tracks.
G	New single-track bridge on each side of existing bridge; retain or replace existing bridge.
H	New four-track bridge upstream of existing bridge; demolish existing bridge.
I	New four-track bridge downstream of existing bridge; demolish existing bridge.

Figure 3-3 | Alignment Options Evaluated in Level 2, Step 2 Concept Screening

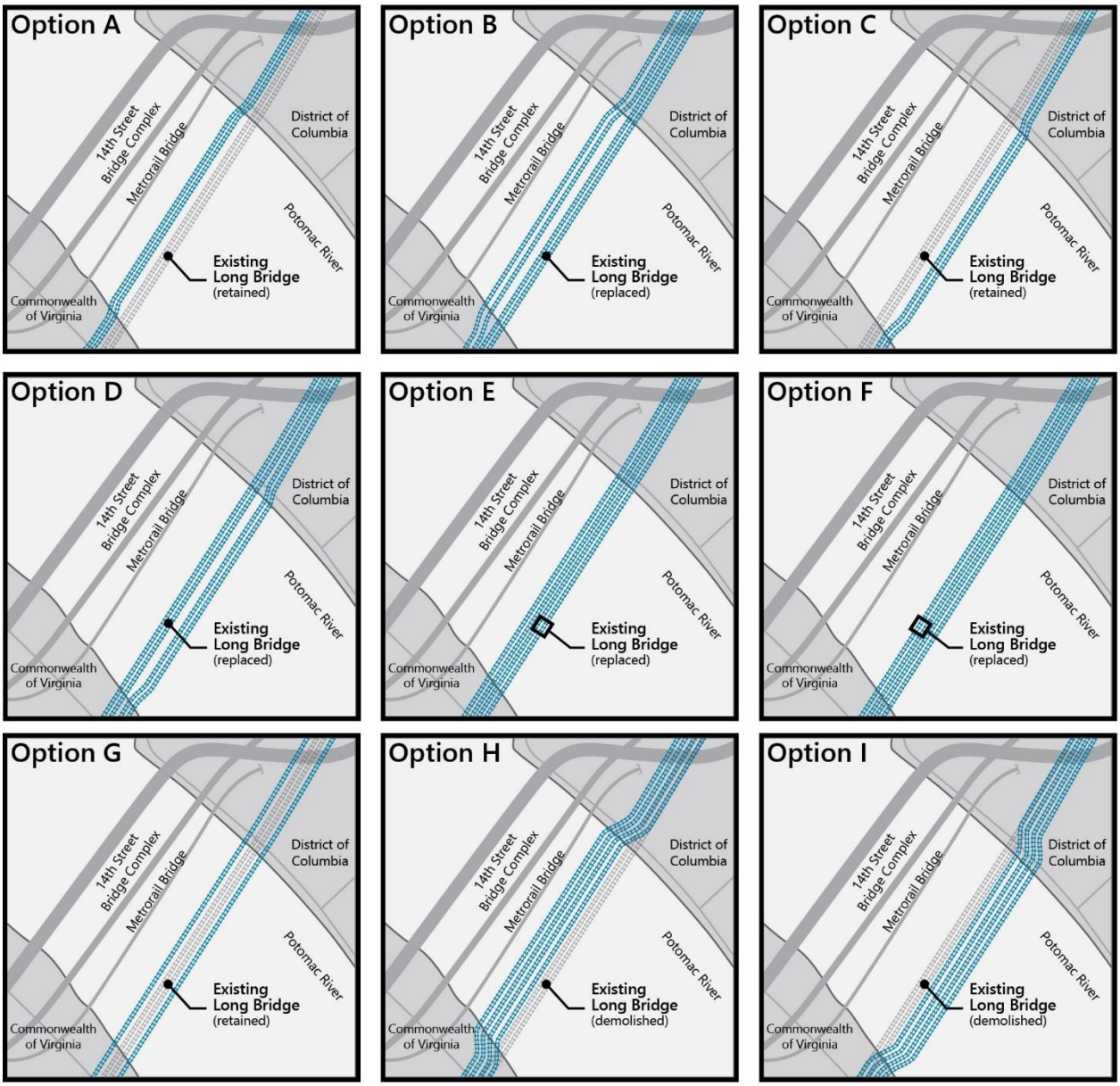


Table 3-7 summarizes the results of the Level 2, Step 2 screening. **Appendix B1, Alternatives Development Report**, provides more information on the screening results. Based on this screening, FRA and DDOT determined that only concepts with a new two-track bridge upstream provide needed resiliency and redundancy and could avoid the DOD facility. Alignment Option G, which would construct two new single-track bridges on either side of the existing bridge, could not maintain two tracks in operation during construction (if replacing the existing bridge as part of the Project) or would preclude future replacement and potentially preclude rehabilitation of the existing bridge.

Table 3-7 | Results of Level 2, Step 2 Concept Screening

Four-Track Crossing Alignment Options	Purpose and Need Metrics		Feasibility Metrics				Concept Retained Yes/No
	1A	1B	2A	2B	2C	2D	
No Action	--	--	--	--	--	--	✓
A: New two-track bridge upstream, retain existing	✓	✓	✓	✓	✓	✓	✓
B: New two-track bridge upstream, replace existing	✓	✓	✓	✓	✓	✓	✓
C: New two-track bridge downstream, retain existing	✓	✓	✓	✓	✓	✗	✗
D: New two-track bridge downstream, replace existing	✓	✓	✓	✓	✓	✗	✗
E: New four-track bridge upstream, overlapping existing	✓	✗	✓	✓	✓	✓	✗
F: New four-track bridge downstream, overlapping existing	✓	✗	✓	✓	✓	✗	✗
G: New track on either side, retain or replace existing	✓	✗	✓	✗	✓	✓	✗
H: New four-track bridge upstream	✓	✗	✓	✓	✓	✓	✗
I: New four-track bridge downstream	✓	✗	✓	✓	✓	✗	✗

Therefore, only two alignment options remained (in addition to No Action):

- **Alignment Option A**: Retain existing two-track bridge; construct new two-track bridge upstream of existing bridge.
- **Alignment Option B**: Replace existing two-track bridge with a new two-track bridge; construct another new two-track bridge upstream.

In December 2017, FRA and DDOT held agency and public meetings to present the draft Level 2 Concept Screening results. FRA and DOOT proposed that Alignment Options A and B be advanced as Action Alternatives for evaluation in the DEIS.

Most of the comments and questions addressed the opportunity for a bike-pedestrian connection across the Potomac River, or clarifications related to the concept screening and the issues for analysis in the DEIS. **Appendix A3**, **December 2017 Public Meeting Summary**, describes comments received on the Level 2 Concept Screening process in detail. Based on feedback received at meetings and subsequent comment period, FRA and DDOT concluded that no changes to the proposed alternatives were necessary.

FRA and DDOT identified Action Alternative A (previously Alignment Option A) and Action Alternative B (previously Alignment Option B) to be analyzed in this DEIS.

3.2 DEIS Alternatives

As described above, the alternatives evaluated in detail in this DEIS are Action Alternative A, Action Alternative B, and the No Action Alternative. Both Action Alternatives would expand the north-south Long Bridge Corridor from two to four railroad tracks and include necessary infrastructure improvements between RO Interlocking in Arlington, Virginia and LE Interlocking in the District.[9] The Action Alternatives vary in whether they retain or replace the existing Long Bridge over the Potomac River and the railroad bridge over the George Washington Memorial Parkway (GWMP). **Figures 3-4** and **3-5** show Action Alternatives A and B at a corridor-level and are accompanied by **Figures 3-7 through 3-11**, **3-13**, and **3-14**, which show segments of the Corridor in more detail, where noted.

[9] For the purposes of this EIS, directionality is described relative to the north-south orientation of the railroad corridor. Therefore, at times elements will be described as “east” when they are compass south, or “west” when they are compass north.

Figure 3-4 | Corridor View: Action Alternative A

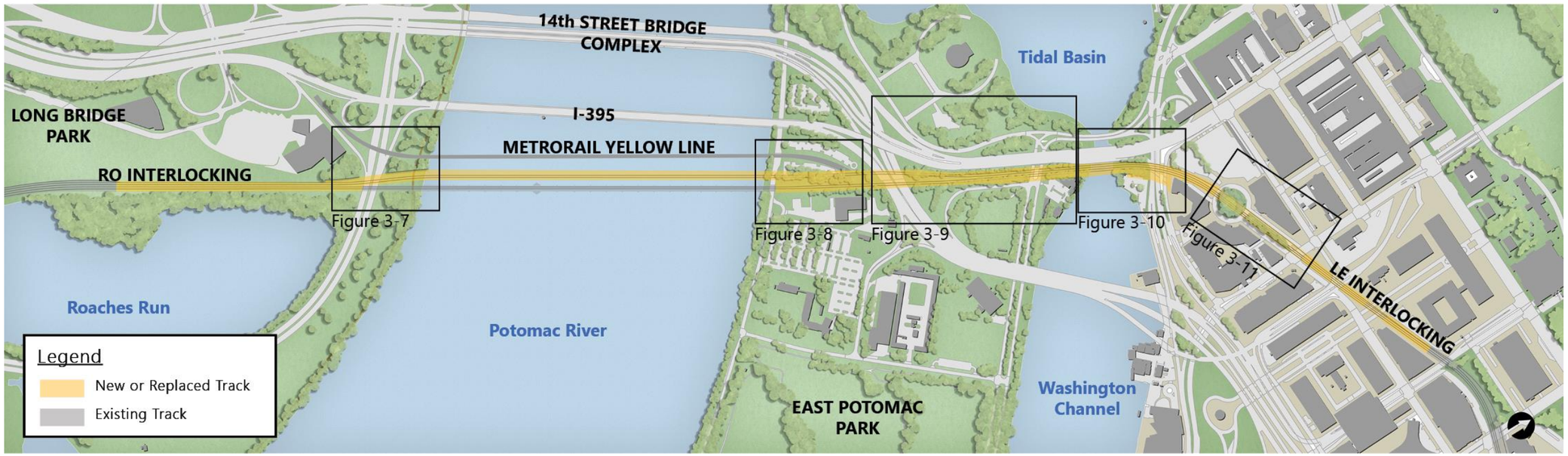
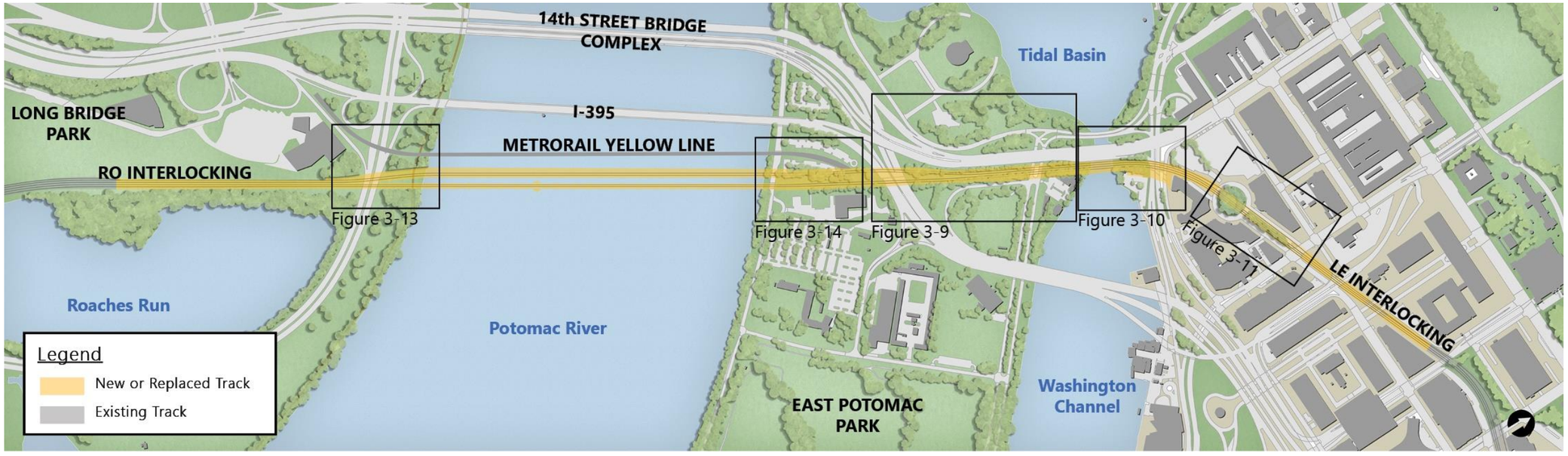


Figure 3-5 | Corridor View: Action Alternative B



3.2.1 No Action Alternative

The CEQ regulations for implementing NEPA require consideration of a No Action Alternative, which is an alternative that represents the conditions that would exist in the planning year (in this case, 2040) if a Proposed Action (in this case, the Project) is not implemented.[10] While the No Action Alternative does not meet the Project's Purpose and Need, it serves as a baseline for comparison against the potential impacts of the Action Alternatives. **Table 3-8** and **Figure 3-6** show the projects included in the No Action Alternative for the Long Bridge Project.

Table 3-8 | Projects Included in the No Action Alternative

Project	Location	Description	Year Complete	Reference
RAILROAD PROJECTS				
Fourth Track from AF to RO Interlocking[1]	Arlington and Alexandria, VA	Add a fourth track from the AF to RO Interlocking, with associated improvements to RO Interlocking, as part of corridor-wide upgrades to support higher operating speeds.	2025	Washington, DC to Richmond Southeast High-Speed Rail (DC2RVA) FEIS and Record of Decision
VRE L'Enfant Station Improvements	VRE L'Enfant Station (DC)	Create an island platform and allow for simultaneous boarding of two tracks at L'Enfant Station, and extend and widen platform to accommodate eight-car trains and a future fourth track.	2024	VRE Capital Improvement Plan (CIP)
L'Enfant North and South Storage Tracks	VRE L'Enfant Station (DC)	Convert existing side tracks at VRE L'Enfant Station to storage tracks while permanent Midday Storage Facility is under construction.	2018	VRE CIP
Fourth Track LE to Virginia (VA) Interlocking	12th St Expressway to 3rd St SW (DC)	Provide additional main track between the VA and LE Interlocking in DC.	2023	VRE CIP
Virginia Avenue Tunnel (under construction)[2]	Under Virginia Ave between 2nd Street SE and 11th Street SE (DC)	Replace existing tunnel with two new tunnels capable of accommodating double-stack intermodal freight trains.	2018	Virginia Avenue Tunnel FEIS and Record of Decision
ROADWAY PROJECTS				
Boundary Channel Drive Interchange	Boundary Channel Drive/I-395 Interchange (Arlington, VA)	Redesign and reconstruction of Long Bridge Park Drive interchange with I-395 and Boundary Channel Drive to increase safety and better accommodate multimodal transportation.	2021	Arlington County CIP

[1] "AF" and "RO" are the proper names of the interlockings. They are not acronyms.
[2] The Virginia Avenue Tunnel is not within the Study Area, but directly relates to the operations and infrastructure of the corridor and therefore was included as part of the No Action Alternative Infrastructure.

[10] 40 CFR 1502.14

Figure 3-6 | No Action Alternative Projects

The Long Bridge Corridor is part of a multimodal transportation network that consists of railroads, transit, trails (bicycle and pedestrian), and roadways. The No Action Alternative consists of the existing transportation network, plus all transportation projects proposed to be completed by the planning year of 2040 within the Study Area of 0.25 miles from the existing Long Bridge Corridor (**Table 3-8** and **Figure 3-6**).[11]

The No Action Alternative includes all projects that could affect or be affected by the Project. Because no non-transportation projects are within the footprint of the Project, the No Action Alternative includes only transportation projects and maintenance projects necessary to keep the existing bridge and Corridor in service. The evaluation of cumulative effects considers non-transportation projects in the Study Area (see **Chapter 21, Cumulative Impacts**). The projects included in the No Action Alternative all have independent utility from the Project**.**

3.2.2 Action Alternative A (Preferred Alternative)

The sections below describe Action Alternative A (**Figure 3-4**). They describe the elements of Action Alternative A in segments starting at the south end of the Corridor in Arlington County, Virginia, and moving north across the Potomac River and into the District. Infrastructure elements of Action Alternative A are generally contained within the existing railroad right-of-way (for more detailed information on the right-of-way and property impacts see **Chapter 12, Land Use and Property**). Key infrastructure elements within several of the segments are also depicted in **Figures 3-7 through 3-11**. Alternative A is the Preferred Alternative as described in **Section 3.7, Action Alternative A: Preferred Alternative**.

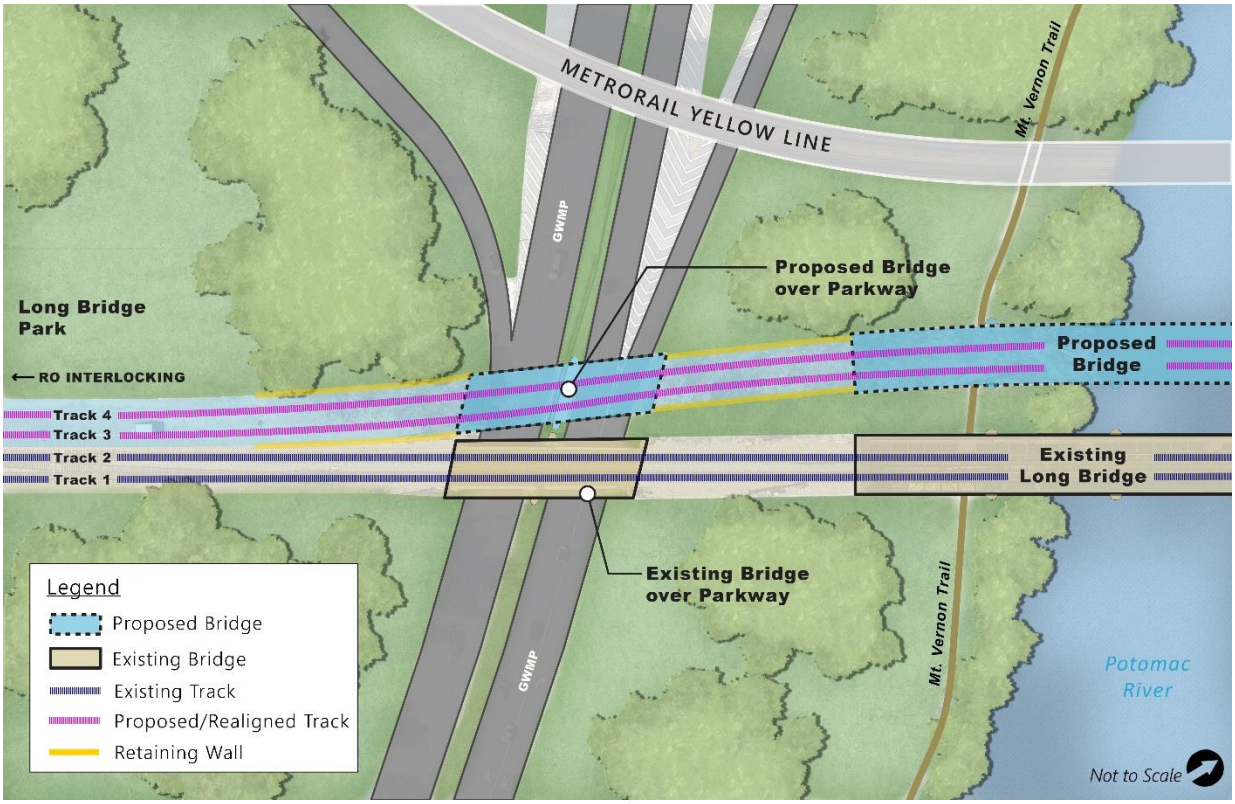
3.2.2.1 RO Interlocking to the GWMP

RO Interlocking, a series of signals and track crossovers allowing trains to switch between tracks, is the southern Project limit. As documented in the DC2RVA FEIS, the Virginia Department of Rail and Public Transportation (DRPT) is proposing a four-track crossover alignment at RO Interlocking.[12] Action Alternative A would tie into the proposed four tracks by adding two new tracks west of the existing two tracks. The new and existing tracks would meet the switching and crossover length requirements necessary at an interlocking for interoperability.

Moving north along the Corridor, the two new tracks and two existing tracks in Action Alternative A would continue adjacent to Long Bridge Park and then cross over the GWMP on two railroad bridges. Action Alternative A would construct a new railroad bridge west of the existing railroad bridge over the GWMP carrying the two new tracks. The current two-track bridge would remain (**Figure 3-7**). After crossing the GWMP roadway, the new track would be carried on a short section of embankment supported by retaining walls.

[11] The analysis used the 0.25-mile radius for transportation projects because it encompasses changes to the transportation network that could affect operations within the Long Bridge Corridor.
[12] DRPT. *DC2RVA Tier II DEIS*, Appendix A – Alternatives Technical Report. Accessed from http://dc2rvarail.com/files/9615/0413/6228/Appendix_A-Attachment_A_Corridor_Segments.pdf. Accessed July 18, 2018.

Figure 3-7 | Action Alternative A – Long Bridge Park to the GWMP



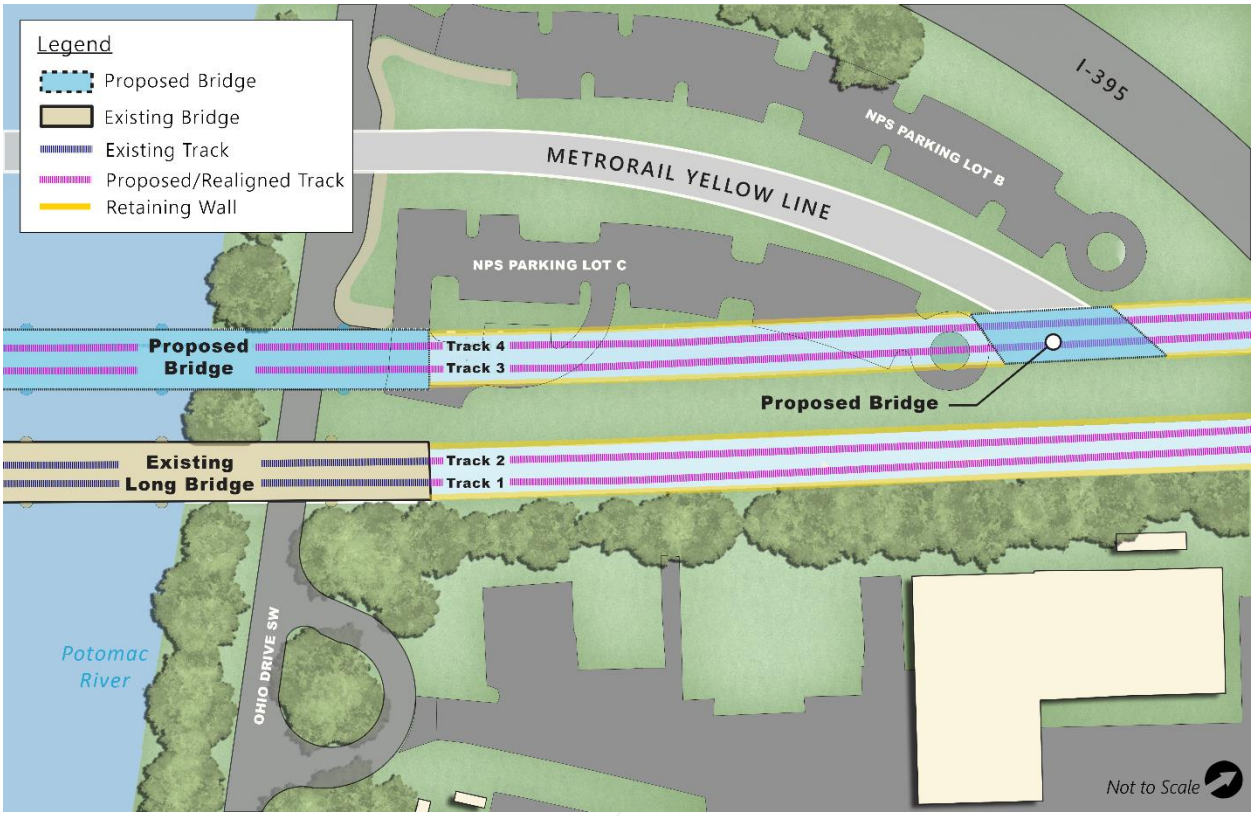
3.2.2.2 Spanning the Mount Vernon Trail and Potomac River

Action Alternative A would construct a new two-track bridge over the Mount Vernon Trail (MVT) and across the Potomac River west (upstream) of the Long Bridge. Action Alternative A would retain the existing Long Bridge over the MVT and Potomac River. The 22 new bridge piers would align with the existing bridge piers for navigational consistency. The bottom of the beams on the new bridge would be no lower than the bottom of beam elevation of the existing Long Bridge. To meet present-day design criteria and maintain similar span lengths, the top of the new rails would be approximately 5 feet higher than the existing top of rails. The top of rail height increase is due to increased loading on the structure from current design vehicle loads, the additional loading from a concrete deck with ballast and a 6-foot-high concrete railing, and to maintain the existing vertical clearance at the GWMP and Ohio Drive SW crossings. See **Appendix B4, Structures Study Report**, for further design details.

3.2.3 Ohio Drive SW to the Metrorail Portal

After crossing the Potomac River, the new two-track railroad bridge would extend over Ohio Drive SW in the District (**Figure 3-8**). The two new upstream tracks would continue off the bridge on an embankment through NPS Parking Lot C. The two tracks would then span the Washington Metropolitan Area Transit Authority (WMATA) Metrorail Yellow Line tunnel portal, located at the northern end of the surface parking lot, on a new, two-track, single-span bridge.

Figure 3-8 | Action Alternative A – Ohio Drive SW to Metrorail Portal

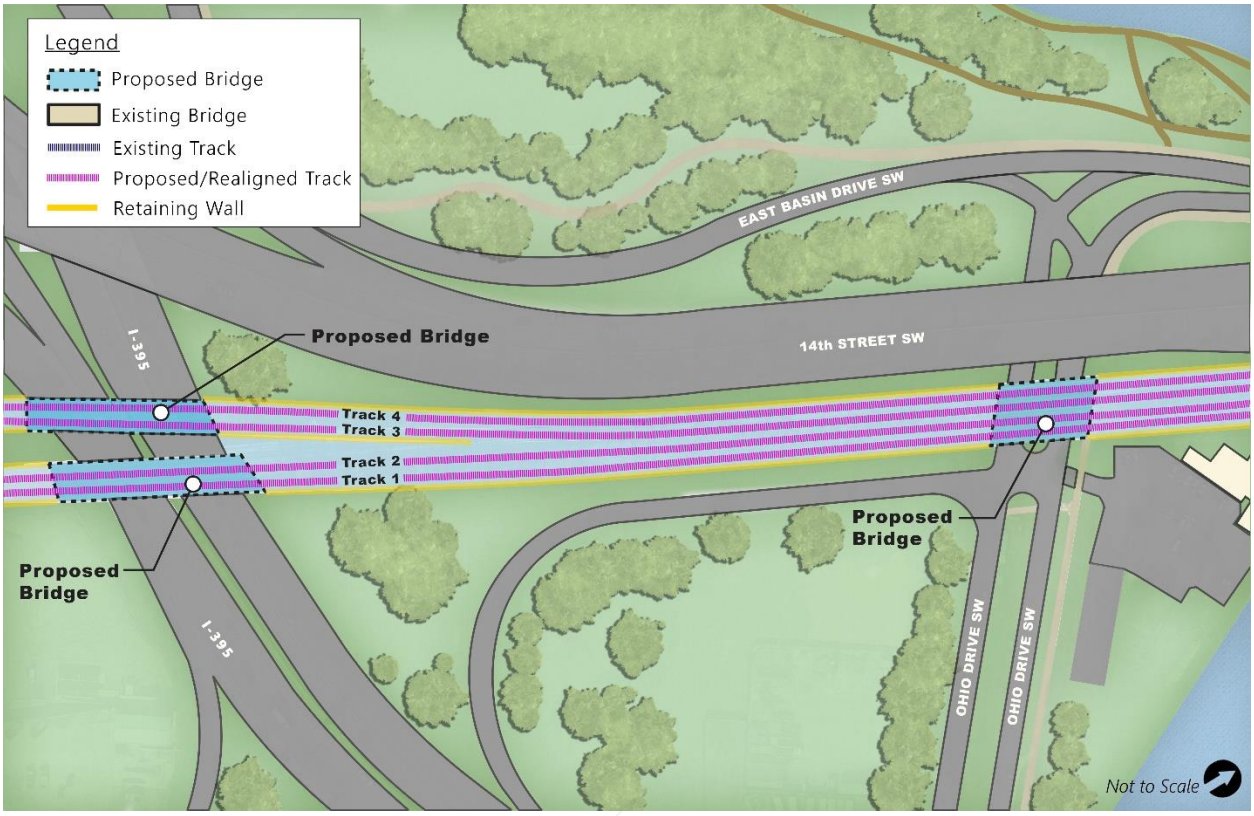


Action Alternative A would realign the existing two tracks extending from the north end of Long Bridge over the Metrorail Portal. The realignment is required to minimize or avoid impacts to other structures further north within the Corridor. In this segment of the Corridor, the proposed realignment shifts slightly to the east to allow for construction of the entire four-track railroad infrastructure and match the realignment at the proposed bridges over I-395. Action Alternative A would also raise the existing two tracks to meet the vertical clearance requirement over the Metrorail portal, and to meet vertical clearance requirements over the existing roadways located further north. Action Alternative A would require retaining walls on both sides of each two-track alignment to retain embankment fills and minimize right-of-way impacts.

3.2.3.1 I-395 to Ohio Drive SW

The two new tracks and two realigned existing tracks would continue across I-395 on two new independent two-track bridges (**Figure 3-9**). Action Alternative A would demolish the existing structure over I-395 once the western bridge is complete and realign the two existing tracks to match the profile of the new crossing structure. Building independent bridges at this crossing allows for the construction of one bridge off the existing mainline alignment while maintaining operations on the two existing tracks.

Figure 3-9 | Action Alternative A – I-395 to Ohio Drive SW

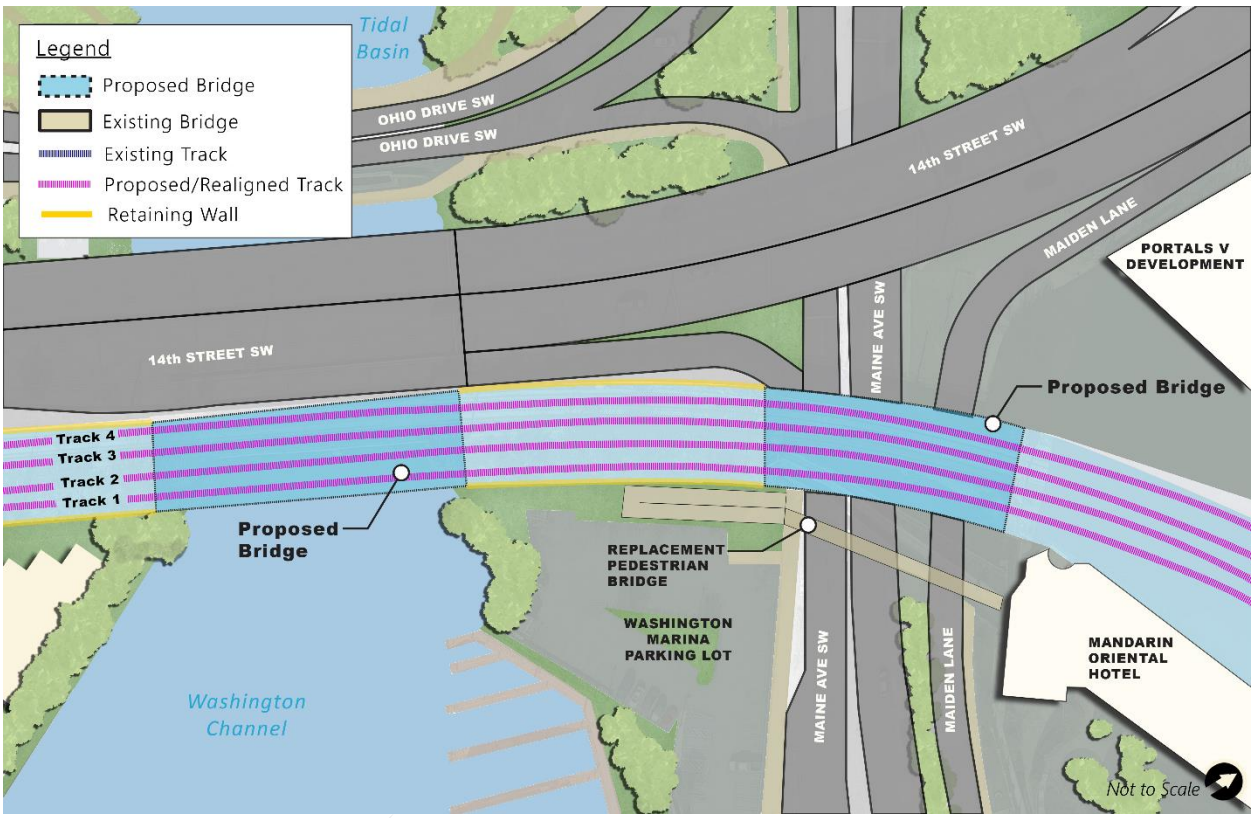


After spanning I-395, the two new tracks would converge with the two realigned existing tracks and the Corridor would widen to the east of the existing alignment but would remain within the existing right-of-way. The four tracks would continue north along the Corridor and cross over Ohio Drive SW for a second time as a new four-track bridge. Action Alternative A would demolish the existing two-track bridge to make room for the new bridge. Retaining walls on either side of the Corridor would retain embankment fill slopes.

3.2.3.2 Washington Channel to Maine Avenue SW

The two new tracks and two existing realigned tracks would cross the Washington Channel at the mouth of the Tidal Basin on a new four-track bridge that would replace the existing bridge while not impacting 14th Street SW (**Figure 3-10**). The channel is not navigable underneath the existing two-track Washington Channel bridge and would remain unnavigable underneath the new four-track bridge.

Figure 3-10 | Action Alternative A – Washington Channel to Maine Avenue SW



Just north of the Washington Channel crossing, the two new tracks and two existing realigned tracks would cross Maine Avenue SW and Maiden Lane on a new four-track bridge. The geometry and configuration of the existing bridge makes it infeasible to retain the bridge with any alignment changes. Action Alternative A must realign the tracks to avoid major impacts to nearby properties and the traffic network. Therefore, Action Alternative A would demolish the existing bridge to make room for the new bridge.

Action Alternative A would reconstruct the existing retaining wall to the west side of the tracks along the 14th Street SW off-ramp and the ramp may require realignment at the intersection. Action Alternative A would require a new retaining wall along the east side of the railroad Corridor between the tracks and the Washington Marina parking lot.

The realignment of the two existing tracks and the addition of two new tracks would require replacing the Maine Avenue SW pedestrian bridge at a location east of the existing location. The design of the new pedestrian bridge would meet Americans with Disabilities Act of 1990 requirements.

3.2.3.3 Maryland Avenue SW Overbuild

The two new tracks and two existing realigned tracks would proceed along the Corridor between the Mandarin Oriental Hotel and the Portals V development and would continue underneath the existing Maryland Avenue SW overbuild (**Figure 3-11**). The overbuild, which is a viaduct constructed over the railroad right-of-way to provide access to the buildings along Maryland Avenue SW, is a four-span structure with center piers and crashwalls that run the entire length of Maryland Avenue SW.

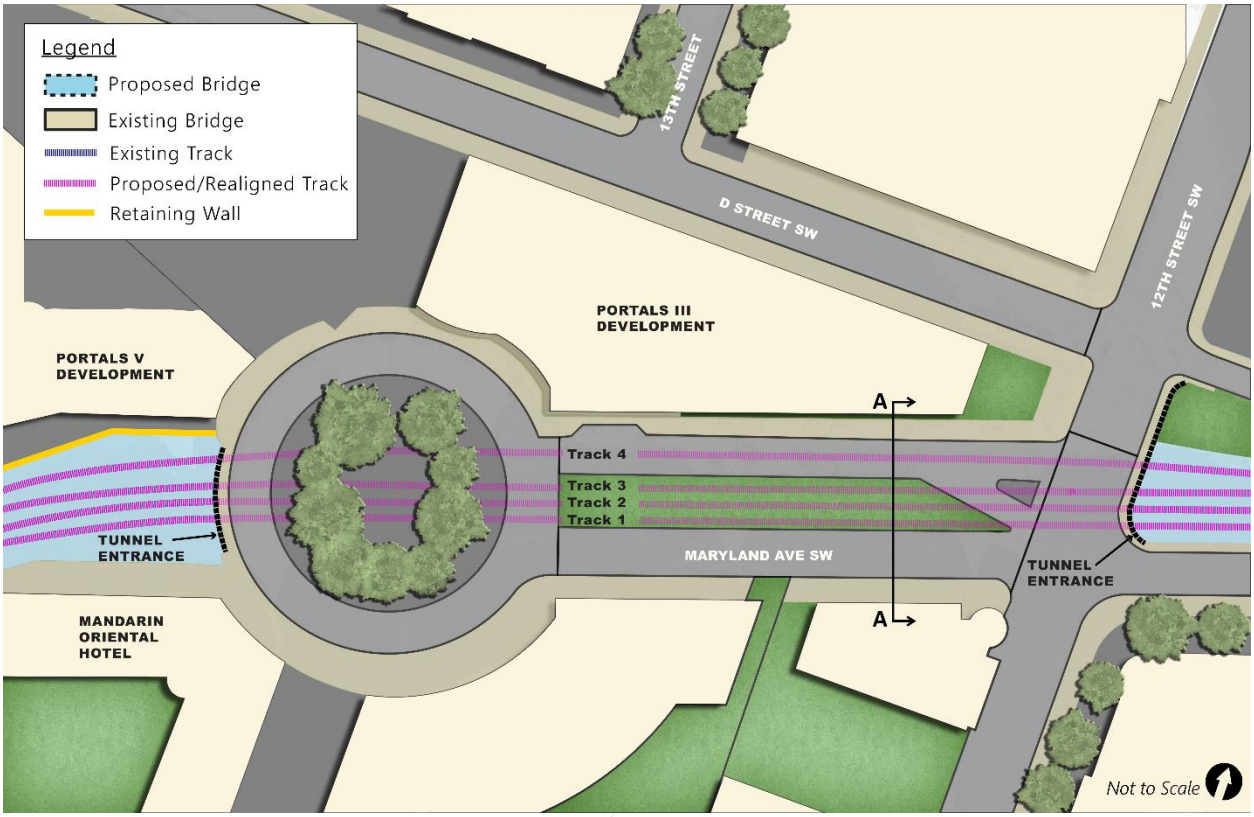
The configuration through Maryland Avenue SW currently includes a siding track in the center western bay and two tracks in the center eastern bay. Action Alternative A would replace the siding track with a single track and the remaining three tracks would be located in the center eastern bay. While the tracks would be interoperable for passenger and freight trains, the two western tracks would typically carry passenger trains and the two eastern tracks would typically carry freight trains (**Figure 3-12**). This is due to the location of existing stations and tunnels. VRE passenger stations at L'Enfant Plaza and Crystal City and the First Street Tunnel to Washington Union Station are on the west side of the Corridor. The entrance to the CSXT Virginia Avenue Tunnel is on the east side of the Corridor.

Action Alternative A would provide a new crashwall at the Mandarin Oriental Hotel and make modifications to the existing crashwalls on the viaduct piers to meet current American Railway Engineering and Maintenance-of-Way Association (AREMA) and CSXT standards. Action Alternative A must complete drainage work to lower the track in the center west bay to achieve the required vertical clearance from the top of rail to the bottom of the overbuild superstructure. Action Alternative A would include additional safety enhancements, such as the addition of clearance detectors, lighting, friction modifications, and safety fencing. **Appendix B5, Maryland Avenue SW to L'Enfant Interlocking Clearance Assessment**, provides more information on the four-track alignment options considered and the design limitations in this segment of the Corridor**.**

3.2.3.4 12th Street SW to LE Interlocking

From Maryland Ave SW, the two new tracks and two existing realigned tracks would travel along the Corridor underneath 12th Street SW, and the 12th Street Expressway. Near L'Enfant Plaza SW, the two new tracks and two existing realigned tracks would tie into the proposed four tracks at LE Interlocking, planned as part of VRE's project to add a fourth track between LE and VA Interlocking which is approximately 3,700 feet north of LE Interlocking on the railroad Corridor. Action Alternative A would meet the switching and crossover length requirements necessary at an interlocking for interoperability.

385 **Figure 3-11** | Action Alternative A – Maryland Avenue SW Overbuild



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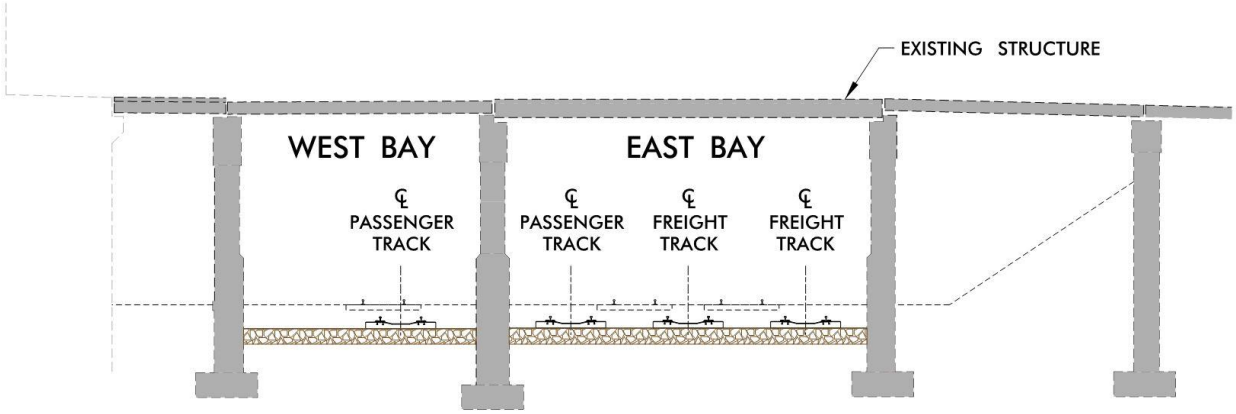
388 **Figure 3-12** | Action Alternative A – Cross Section A – A (see **Figure 3-11**) of Bays Below the Maryland
389 Avenue SW Overbuild



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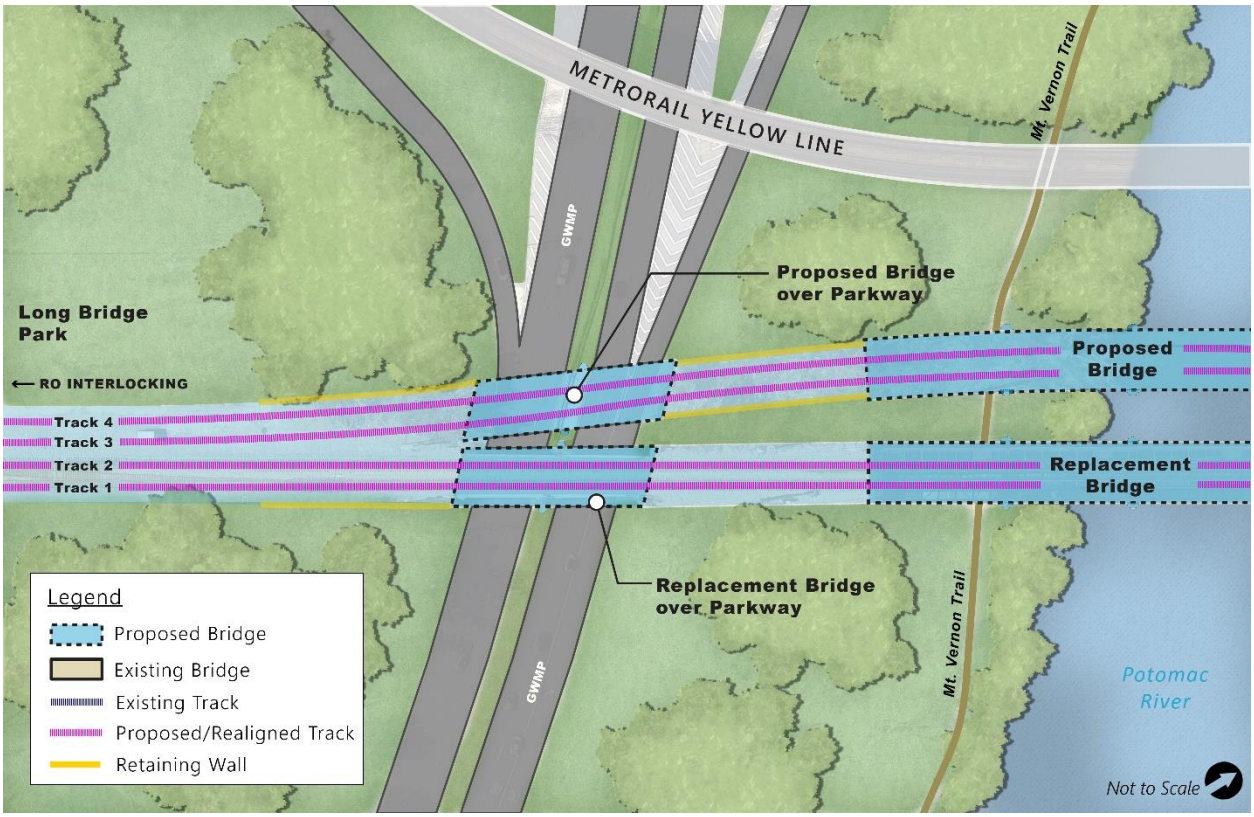
3.2.4 Action Alternative B

Action Alternative B is similar to Action Alternative A but would replace the existing Long Bridge over the Potomac River and the railroad bridge over the GWMP rather than retaining those bridges (**Figure 3-5**). Infrastructure elements of Action Alternative B are generally contained within the existing railroad right-of-way (for more detailed information on the right-of-way and property impacts see **Chapter 12, Land Use and Property**). The sections below describe Action Alternative B in segments along the Corridor moving south to north. Key infrastructure elements within several of the segments are also depicted in **Figures 3-13** and **3-14**.

3.2.4.1 RO Interlocking to the GWMP

Elements of Action Alternative B in this segment are the same as Action Alternative A, except Action Alternative B would replace the existing two-track railroad bridge over the GWMP in approximately the same location as the current bridge. The new bridges would be designed in accordance with current design standards, which includes accommodating for heavier loading. The new structures would maintain similar pier and abutment locations as the existing bridge over the GWMP, thus requiring a deeper superstructure to support the increased design loads over the same span length. Therefore, the replacement bridge track profile would be raised and would have a consistent elevation with the new bridge over the GWMP (**Figure 3-13**).

Figure 3-13 | Action Alternative B – Long Bridge Park to the GWMP



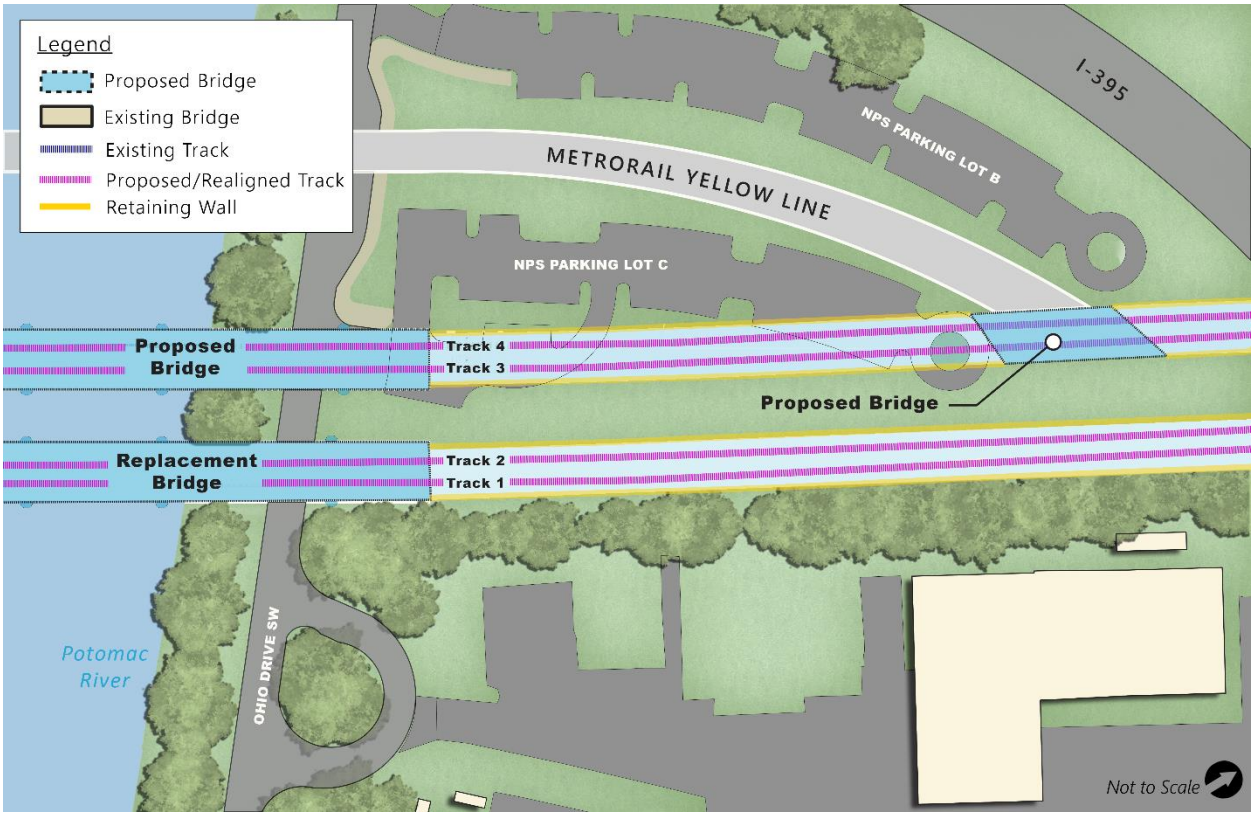
3.2.4.2 Spanning the MVT and Potomac River

Elements of Action Alternative B in this segment are the same as Action Alternative A, except Action Alternative B would demolish the existing Long Bridge and replace it with a two-track bridge within the alignment of the current bridge over the MVT and the Potomac River. The DEIS analysis considers replacement of the entire bridge, including superstructure and substructures. Similar to the replacement GWMP bridge, the new superstructure depth would be deeper than the existing, resulting in an overall raise in profile to meet vertical clearance requirements. The replacement Long Bridge elevation would be consistent with the new upstream bridge over the Potomac River.

3.2.4.3 Ohio Drive SW to the Metrorail Portal

Elements of Action Alternative B in this segment are the same as Action Alternative A, except for replacement of the existing Long Bridge (**Figure 3-14**). See **Section 3.2.1.3**, **Ohio Drive SW to the Metrorail Portal**.

Figure 3-14 | Action Alternative B – Ohio Drive SW to Metrorail Portal



3.2.4.4 I-395 to Ohio Drive SW

All elements of Action Alternative B in this segment are the same as Action Alternative A (**Figure 3-9**). See **Section 3.2.1.4**, **I-395 to Ohio Drive SW.**

3.2.4.5 Washington Channel to Maine Avenue SW

All elements of Action Alternative B in this segment are the same as Action Alternative A (**Figure 3-10**). See **Section 3.2.1.5**, **Washington Channel to Maine Avenue SW.**

3.2.4.6 Maryland Avenue SW Overbuild

All elements of Action Alternative B in this segment are the same as Action Alternative A (**Figure 3-11**). See **Section 3.2.1.6**, **Maryland Avenue SW Overbuild.**

3.2.4.7 12th Street SW to LE Interlocking

All elements of Action Alternative B in this segment are the same as Action Alternative A. See **Section 3.2.1.7**, **12th Street SW to LE Interlocking.**

3.3 Conceptual Engineering for DEIS Alternatives

FRA and DDOT advanced conceptual engineering for Action Alternatives A and B to provide sufficient information for evaluation of impacts and selection of a Preferred Alternative. As explained in **Appendix B2, Basis of Design Report**, design considerations and technical criteria included the following:

- All mainline tracks should be designed to meet or increase the existing speeds to the extent practicable through the Project Area.
- All mainline tracks should be designed to meet or exceed the existing minimum vertical clearances at overhead bridges.
- On tracks to be owned and maintained by CSXT, mainline track centers should meet or be wider than CSXT's standard track center width of 15 feet. Track centers less than 15 feet apart would require design exceptions and formal approval by CSXT.
- On tracks to be owned and maintained by CSXT, lateral clearances should meet or be greater than CSXT's standard clearance of 18 feet. Lateral track distances less than 18 feet would require design exceptions and formal approval by CSXT.
- Preliminary design should not preclude future electrification along passenger tracks.
- Both new and existing mainline tracks should be designed for resiliency, redundancy, interoperability, and connectivity between all passenger and freight service.

3.3.1 Maryland Avenue SW to L'Enfant Interlocking

Throughout the southern limits of the Long Bridge Corridor, each Action Alternative would provide 15 feet of track spacing with 18 feet or greater lateral clearance of structures to meet minimum design standards as defined by the Corridor owner and operator, CSXT. However, underneath the Maryland Avenue overbuild between Maine Avenue SW and the L'Enfant (LE) Interlocking, several bridges and

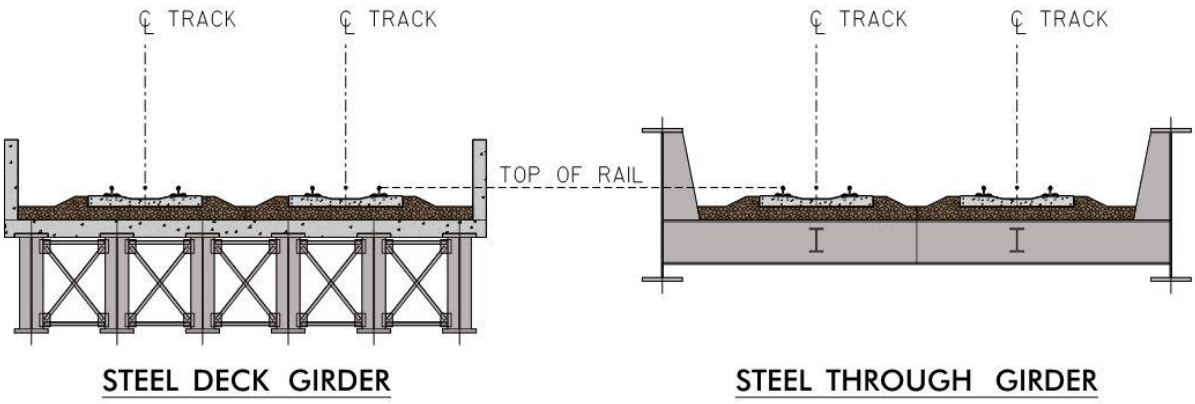
retaining walls present major obstacles to meeting these standards and would require extensive structural modifications to the bridges, buildings, and walls with major impacts to local roads, businesses, and private properties. Therefore, as detailed in **Appendix B5**, **Maryland Avenue SW to LE Interlocking Clearance Assessment,** FRA and DDOT completed an assessment to determine the feasibility of various four-track alignment options within that section.

Currently, the approximately 1,800-foot-long corridor between Maine Avenue SW and LE Interlocking contains two mainline tracks and one stub-end track used for VRE equipment storage. The existing track centers are 13 feet apart, with 8.5 feet of lateral clearance. Following the assessment of options to accommodate four tracks in this section, Amtrak, VRE, and DRPT have agreed to 14-foot track centers with 7.5 feet of minimum lateral clearance. DDOT submitted a design exception request to CSXT for this configuration on September 7, 2018, and this DEIS evaluates this configuration as the proposed design for both Action Alternatives.

3.3.2 Bridge Structure Types

The structure type evaluation considers the same bridge types for both Action Alternatives. The new bridge(s) would be either a steel deck girder bridge or a steel through girder bridge, as shown in **Figure 3-15.** These bridge types are common railroad bridge structures used in the United States and are the two standard types used by CSXT. **Appendix B4, Structures Study Report**, provides more information on the evaluation and identification of the two proposed bridge structure types.

Figure 3-15 | Structure Types Under Consideration



These steel structure types are considerably more cost effective than other structure types, including a signature span option. A signature navigational span would greatly stand out amongst the surrounding bridges and interfere with the unobstructed view from Virginia and the Potomac River towards the Monumental Core of the District.

Additional considerations for the bridge type include limitations at the site that restrict the overall structure height, depth, and pier placement; constructability challenges that could result in higher construction costs; and the need to maintain the vertical clearance at the navigational channel. These considerations include:

- The span lengths and pier locations would match the existing bridge to maintain the hydraulic characteristics of the Potomac River in this area, which would result in deeper girders to support increased loads such as the additional concrete deck and 1 to 2 feet of stone ballast. The span lengths of the existing bridge were optimized for lighter loads and have an open timber deck with wood ties supported directly on steel beams (and therefore no concrete deck or stone ballast loading). However, the new bridge(s) must maintain a relatively flat grade for the railroad tracks while also maintaining the vertical clearance for boats traveling on the Potomac River, thus precluding the use of very deep girders, such as concrete girder types, at this location.
- The overall structure height and selection of construction equipment is limited due to the proximity of the project to airport flight paths and the corresponding height restrictions imposed by the FAA. The use of shorter cranes results in having less lifting capacity, thus limiting superstructure options that might enable the use of shallower girders.

Therefore, the DEIS proposes only steel girder types for the new bridge(s) over the Potomac River.

3.4 Train Volumes

FRA and DDOT developed train volumes in the Long Bridge Corridor for the No Action Alternative and Action Alternatives to estimate railroad performance in the Corridor and to inform the evaluation of the alternatives (**Table 3-9**). FRA and DDOT based these volumes on the long-range system plans and input from the railroad operators, as well as from operations simulation modeling performed for the concurrent DC2RVA FEIS.

Table 3-9 | Train Volumes in the Long Bridge Corridor

Train Operator	Current Number of Trains per Day[1]	No Action Alternative Number of Trains per Day[2]	Action Alternatives Number of Trains per Day[3]
VRE	34[4]	38	92
MARC	0	0	8
Amtrak/DC2RVA	24	26	44
CSXT	18	42	42
Norfolk Southern	0	6	6
TOTAL	**76**	**112**	**192**

[1] Current train volumes are based on existing operation agreements and confirmed by bridge stakeholders.
[2] Planning year 2040 No Action train volumes were established based on the concurrent DC2RVA EIS, Rail Service Growth in the No Build Alternative, Table 2.5-2, http://www.dc2rvarail.com/files/5315/0412/9086/Chapter_02_Alternatives_DC2RVA_DEIS.pdf, and confirmed by bridge stakeholders.
[3] Planning year 2040 planned train volumes were established based on input from bridge stakeholders, including CSXT, VRE, Amtrak, Norfolk Southern, and MARC, as well as the concurrent DC2RVA EIS.
[4] The current number of VRE trains per day includes non-revenue movements.

FRA and DDOT based the current train volumes on existing operation agreements the railroad operators (VRE, MARC, Amtrak, and Norfolk Southern) have with CSXT, the owner of Long Bridge. These agreements specify a maximum number of trains each operator can run per day through the Long Bridge Corridor. For the No Action Alternative, FRA and DDOT used train volumes based on reasonably

foreseeable decisions by the railroad operators given railroad capacity constraints.[13] This approach is consistent with the No Action Alternative train volumes used in the DC2RVA FEIS.[14] As the No Action Alternative would not increase the capacity of the Long Bridge Corridor, FRA and DDOT confirmed with CSXT that they would not renegotiate the agreements with the railroad operators to give them additional slots. This is based on CSXT's need to maintain adequate capacity to allow for the operation of its present and future freight network demands. Therefore, in the No Action Alternative, each operator would run the maximum number of trains allowed under the current agreement with CSXT, while CSXT would continue to add trains as needed within the available capacity limits. The train volumes in the No Action Alternative are significantly lower than the volumes anticipated in the operators' long-range plans. With the Action Alternatives, once the capacity is available, the operators would run additional trains based on their long-range plans.

3.5 Construction Overview

The sections below describe the construction methods and activities for Action Alternatives A and B. The construction methods, access and staging locations, and overall construction schedule represent an estimate of how the Project could construct the Action Alternatives while maintaining two railroad tracks in operation throughout construction. The final construction methods used will require additional input from various disciplines, including geotechnical, hydraulics and drainage, utilities analysis, and more detailed structural design. The resource chapters, **Chapters 5 to 21**, evaluate and discuss potential environmental impacts resulting from Project construction, as well as mitigation measures to minimize their adverse effects.

DRPT, the project sponsor for final design and construction (see **Chapter 1.4.4, Project Sponsor**), will advance preliminary and final design, permitting, right-of-way acquisitions, construction activities, and mitigation measures to reduce the impact of construction of the Preferred Alternative. The Record of Decision (ROD), planned to be prepared concurrently with the FEIS, will identify mitigation measures.

The addition of two tracks along the Corridor would pose major impacts to several structures. The Long Bridge Corridor contains six existing undergrade bridges, four existing overgrade bridges and viaducts, and one pedestrian bridge as well as Long Bridge.[15] **Section 3.2.2, Action Alternative A (Preferred Alternative)**, and **Section 3.2.3, Action Alternative B**, describe the existing structures requiring significant structural work (replacement) as well as new infrastructure required to accommodate the new tracks.

Other work through the Corridor would include reconfiguring existing tracks, installing track turnouts, installing new communication and signal equipment, completing drainage modifications, and

[13] To test the capacity of the No Action infrastructure, the Phase II Study operations simulation presumed both freight and passenger operators would run their full desired service. As noted in **Section 2.2.2, Long Bridge Phase II Study, 2016**, the future No Action infrastructure scenario in this simulation resulted in fatally poor results that were operationally unacceptable for both passenger and freight operations.

[14] DRPT. 2017. *DC2RVA Tier II DEIS*, Rail Service Growth in the No Build Alternative, Table 2.5-2. Accessed from http://www.dc2rvarail.com/files/5315/0412/9086/Chapter_02_Alternatives_DC2RVA_DEIS.pdf. Accessed July 18, 2018.

[15] Undergrade bridges are bridges with the truss below the roadway, as in a deck bridge. Overgrade bridges are bridges with the truss above the roadway.

constructing several thousand linear feet of retaining walls along the railroad alignment. See **Appendix B6, Conceptual Engineering Plans**, for track work and structure locations.

3.5.1 Construction Methods and Activities

Construction of the Action Alternatives would require various construction methods and activities. While the construction components for each bridge within the Long Bridge Corridor are similar, access and construction would require multiple methods, including traffic control measures, phased construction, temporary excavation support structures, temporary finger piers,[16] and work from barges, within the temporary limits of disturbance (LOD). The permanent LOD is the area within which the Project cause permanent ground disturbance. The development of traffic control plans and scheduling lane closures would require close coordination between the contractor, local agencies, land owners, operators, and the public. Additionally, permissions from Federal agencies, CSXT, and private property owners to use their property for construction staging and access would require legal agreements prior to construction. DRPT would work with CSXT to develop the necessary agreements for work within CSXT's right-of-way.

As described in **Section 3.2.2, Action Alternative A (Preferred Alternative)**, and **Section 3.2.3, Action Alternative B**, creation of new embankments to accommodate the railroad alignment would result in the need for retaining walls. The construction of the railroad subgrade, ballast, ties, tracks, drainage, and other railroad appurtenances would use standard railroad construction methods.

3.5.1.1 Phased Construction

Structure types along the Corridor would include both steel through girder and steel deck girder structures. Contractors would construct the through girder structures at locations off the active two-track alignment. The deck girder structures allow for on-alignment phased construction, which contractors would complete in phases to maintain two-tracks in operation throughout construction. The Ohio Drive SW, I-395, Washington Channel, and Maine Avenue SW bridges would all require phased construction. During construction of these structures, extensive track shifts would be necessary to maintain railroad traffic.

The Project would coordinate construction and maintenance of traffic for the railroad with the various owners and operators to minimize disruption. The Project would maintain two tracks in operation at all times at the request of the host railroad, CSXT, with the exception of minimal planned shutdowns for activities such as beam erection that crews cannot conduct over live tracks. Phased construction activities may require temporary short-term (1 to 2 hours) single-track operations or complete railroad shutdown work windows during certain critical construction activities, such as crane lifts, demolition, and installing turnouts. **Appendix B2**, **Basis of Design Report**, discusses additional details on railroad turnouts and track alignments.

3.5.1.2 Construction on Land

With high volumes of traffic along the roadways near the bridges in the Corridor, building new structures over the roadways would impact traffic. The structures over the GWMP, Ohio Drive SW,

[16] Finger piers consist of driving piles into the earth and constructing a bridge-like surface to support construction loads. This method results in less disturbance to the shoreline than temporary finger piers.

I-395, and Maine Avenue SW would require traffic control and potentially intermittent lane closures primarily during night-time hours for construction vehicle access. Construction would require lane shifts and reduced lane and shoulder widths due to space constraints and to allow for activities pertaining to material and equipment deliveries, temporary support of excavation required to construct piers and abutments, and construction of superstructures and substructures.

3.5.1.3 Construction over Water

Structures over the water would require cofferdams for construction of the piers and some abutments, as well as barges to store and assemble materials, to deliver labor and equipment, and to support various construction activities. Crews would place stationary, or spud, barges able to support a large crane at each pier for construction purposes as well as downstream for staging. Contractors would maneuver spud barges using several tugboats and anchor the barges during construction. Personal watercraft would transport workers to and from the barges, and temporary finger piers on each shore would allow crews to load and unload materials and equipment from the barges. The finger piers would extend into the river enough to meet the depth required for a boat or barge to access the finger piers.

To install each bridge pier, the contractor would construct a cofferdam by installing steel sheeting around the limits of the pier so that crews can dewater the area down to the bottom of the footing elevation. Once crews have installed sheeting, they would excavate the river bottom to the depth needed to accommodate the installation of foundations and piers.

Crews would erect superstructures with barges and cranes. This process would likely require the delivery of materials from downstream. Due to the proximity to Ronald Reagan Washington National Airport, the Federal Aviation Administration has a height restriction of 81 feet for maximum crane height in the project limits that would impact allowable crane sizes and material lifts.[17]

The marine traffic on the Potomac River would be managed through collaboration and coordination with the United States Coast Guard (USCG) and other entities to ensure the safe and orderly construction of the Project. The main navigational channel and adjacent spans may be periodically closed for short-term movements of equipment and materials during construction. These closures would be facilitated, much the same as intermittent roadway closures, on each end of the channel limits and would be for purposes such as moving large cranes or steel beams and other materials in place. All closures or stoppages will be short term and coordinated closely with the USCG and other entities for conveyance to mariners.

3.5.2 Action Alternative A (Preferred Alternative) Construction

The following sections describe construction access, staging locations, and duration along the Corridor for Action Alternative A.

3.5.2.1 Construction Access and Staging Locations

The following sections provide a description of construction access and staging locations for Action Alternative A. Information regarding construction access and staging locations represents what is

[17] See **Appendix A1, Scoping Report**, for correspondence with the Metropolitan Washington Airports Authority regarding the maximum allowed heights in the Long Bridge Corridor.

reasonably foreseeable for the purposes of the EIS analysis but is subject to change as the engineering and design of the Project advances. **Chapter 12, Land Use and Property**, discusses temporary construction impacts associated with working on and around the various properties along the Corridor.

RO Interlocking to Potomac River

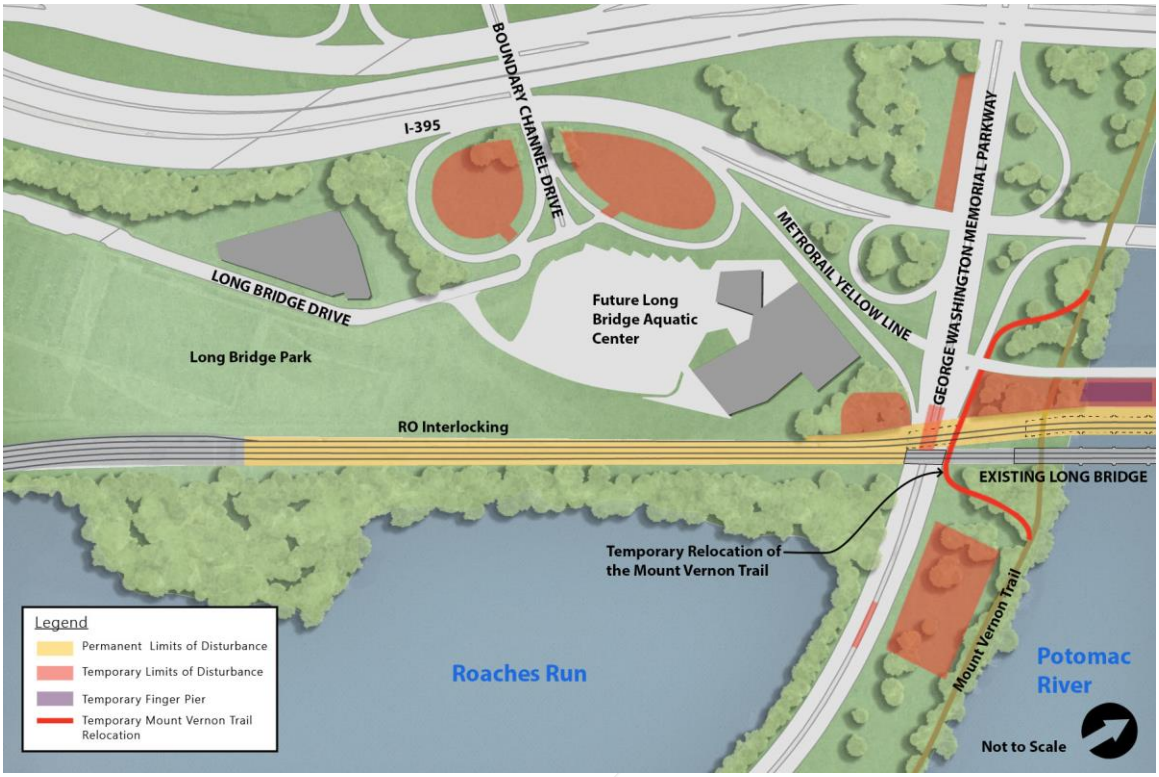
The southernmost construction access points proposed for the Project are the railroad corridor in Long Bridge Park near RO Interlocking, just south of the future Long Bridge Aquatics and Fitness Center and Park Expansion (currently under construction) as shown in **Figure 3-16**. These access points would allow for temporary storage, deliveries, and staging areas for various equipment and materials needed to construct elements of the RO Interlocking, the railroad embankment, retaining walls for the southern section of the project, and the south abutment for the bridge over GWMP in Action Alternative A.

NPS Management Policies 2006 and Federal regulations for commercial vehicle access on park land prohibit commercial vehicles from travelling on the GWMP.[18,19] The NPS policies state that "commercial traffic will be prohibited on roads within parks, except for the purpose of serving park visitors and park operations."[20] If access to private lands is otherwise not available, the Park Superintendent has the discretion to issue permits for commercial vehicles. Crews can access some areas of the proposed construction project limits for Action Alternative A from locations other than the GWMP, including via barge on the Potomac River. However, building a new bridge over the GWMP, embankments, retaining walls, tracks and other general construction in the area requires commercial vehicles to have access to the roadway; therefore, the Project would seek approval for construction vehicle access on the GWMP.

The new bridge carrying two new railroad tracks over the GWMP roadway would require traffic control measures, temporary lane closures, and temporary lane shifts on the GWMP for the delivery of materials and for construction activities for the abutments, pier, and superstructure while maintaining a safe work zone. For staging areas and construction access to the GWMP, the Project has identified two additional locations at the Boundary Channel Drive clover leaf and the triangular section of land between I-395, the 14th Street Bridge, and the GWMP (**Figure 3-16**). These locations limit use of the GWMP by construction vehicles because of their proximity to both I-395 and the GWMP.

[18] NPS. 2006. *NPS Management Policies 2006*, 9.2.1.2.1. Accessed from https://www.nps.gov/policy/MP_2006.pdf. Accessed June 21, 2018.
[19] 36 CFR 5.6
[20] NPS. 2006. *NPS Management Policies 2006*, 9.2.1.2.1. Accessed from https://www.nps.gov/policy/MP_2006.pdf. Accessed June 21, 2018.

Figure 3-16 | Action Alternative A Construction Access and Staging Locations – RO Interlocking to Potomac River



In addition to lane closures on the southbound lanes of the GWMP for deliveries from I-395, temporary removal of the center median would allow for construction vehicle movement into the laydown and staging areas located between the GWMP, MVT, and the CSXT railroad bridge. Crews would remove and replace a portion of the temporary median barrier as needed when vehicles need access through the median. Construction vehicles would be able to exit the staging area by traveling northbound on the GWMP for a short distance to take the exit ramp onto I-395 and 14th Street SW across the river.

To facilitate construction of the new structure over the MVT in Action Alternative A, the Project would temporarily relocate the trail from its current path south along the GWMP. Temporary barriers and the existing bridge abutments would protect the trail to ensure a safe travel way for trail users (**Figure 3-16**). The relocation would allow for construction of bridge abutments, retaining walls, and the bridge superstructure within the trail vicinity. Construction vehicles may need minimal crossings of the relocated trail. If so, flaggers would control the trail crossing.

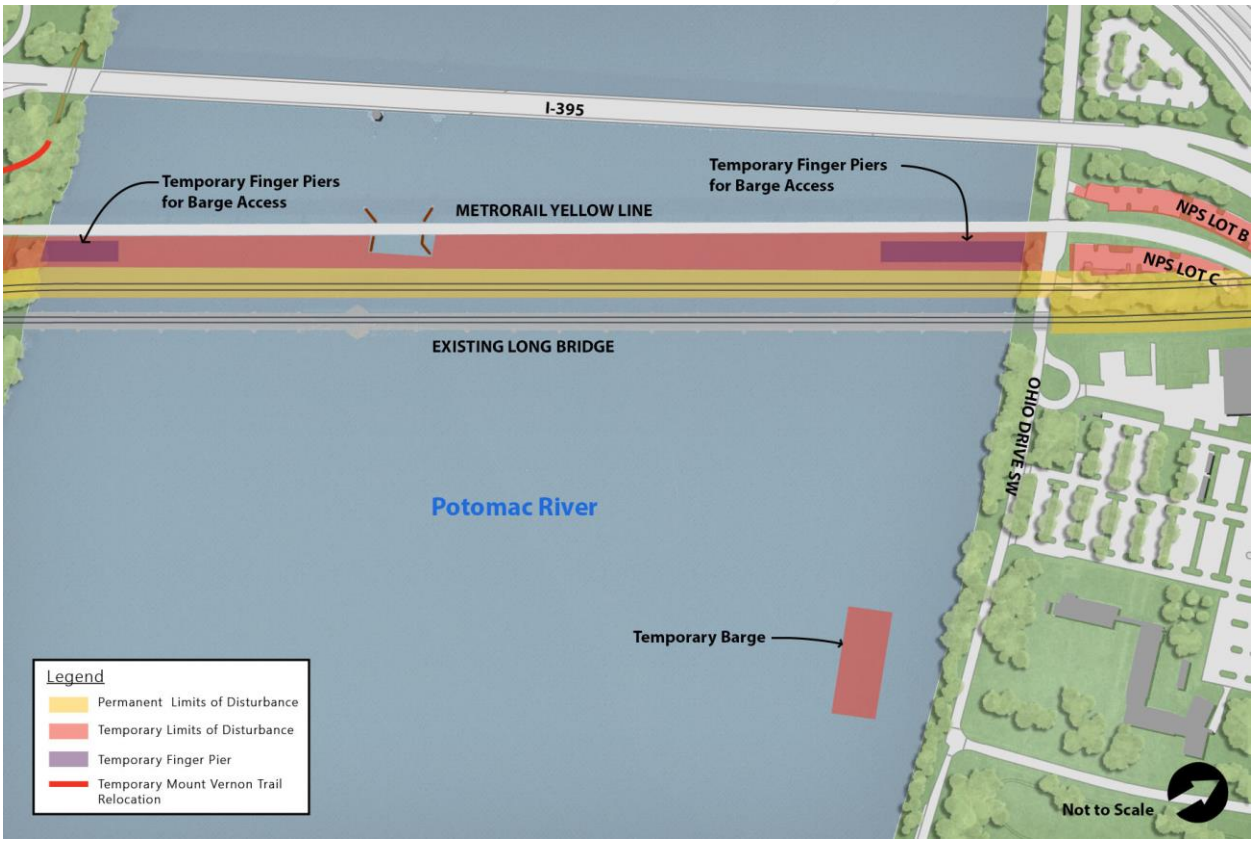
Potomac River

Construction of the new upstream railroad bridge spanning the Potomac River would use access points along the river between the Metrorail bridge and Long Bridge (**Figure 3-17**).[21] Crews would construct temporary finger piers along the shoreline between the existing Metrorail bridge and the new railroad bridge to allow for the delivery of equipment and materials via barge for the construction of the foundations, piers, and superstructure bridge components of Action Alternative A. **Appendix B4, Structures Study Report**, provides additional discussion on the railroad bridge superstructure.

Potomac River to Maine Avenue SW

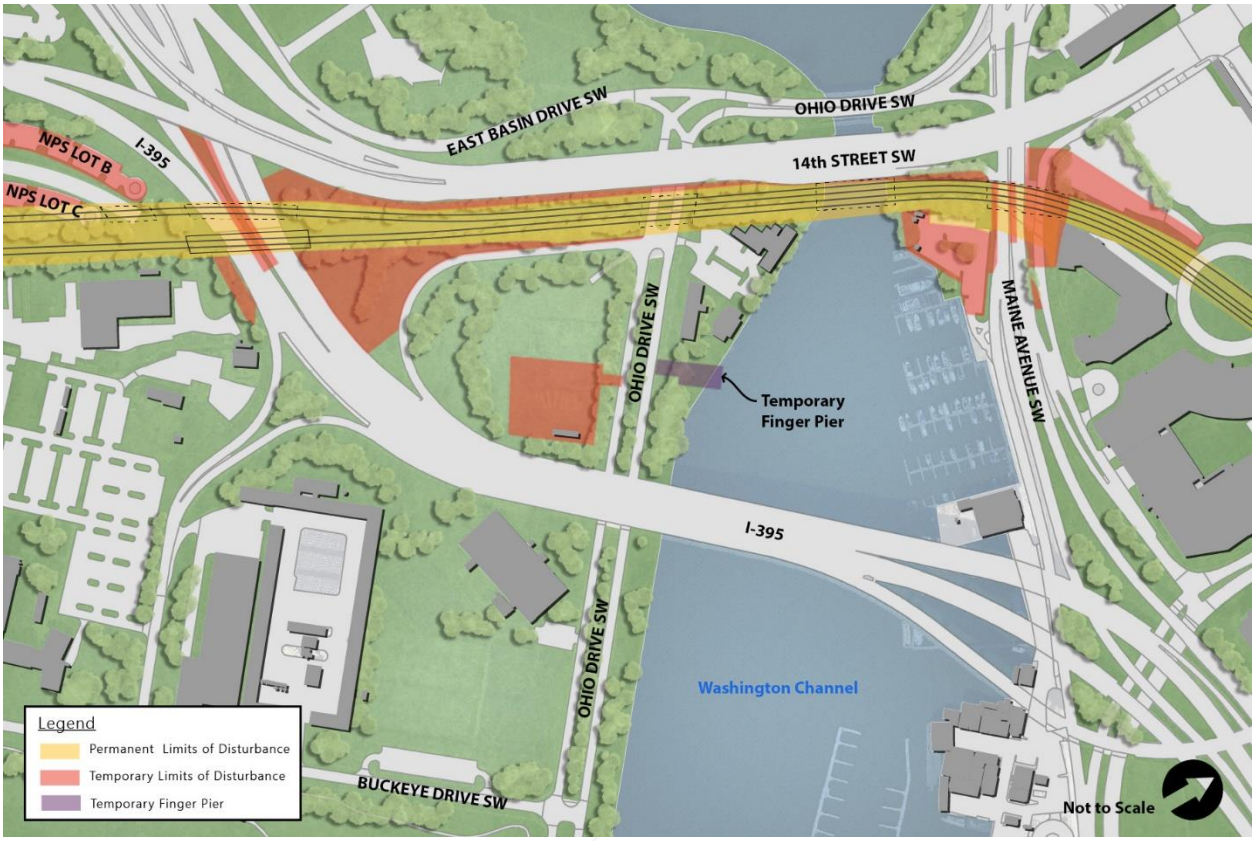
Construction access from the Potomac River to the proposed bridges over I-395 in Action Alternative A is limited by the alignment's proximity to the NPS buildings and DOD facilities north of Long Bridge as well as the right-of-way east of the existing alignment. Thus, necessary construction access for the new railroad corridor would be provided within NPS Parking Lots B and C as well as on adjacent sides of the Metrorail portal (**Figures 3-17 and 3-18**).

Figure 3-17 | Action Alternative A Construction Access and Staging Locations – Potomac River



[21] Construction would avoid the Metrorail bridge fender system at the Potomac River navigation channel, as depicted in the figure.

Figure 3-18 | Construction Access and Staging Locations – Potomac River to Maine Avenue SW



NPS Parking Lot C is closest to the railroad and the contractor would use it for equipment and material storage. The contractor would use NPS Parking Lot B to set up a temporary concrete plant for the heavy infrastructure work required as part of the Project. The location of an on-site temporary concrete plant operation would reduce the overall time it takes to transport and place the concrete. Concrete placement typically needs to be completed 90 minutes after mixing or the material begins to become less fluid and impact proper placement which can ultimately result in rejection by field inspectors. Heavy traffic in the area, as well as transporting large volumes of concrete to the site by truck and then onto barges to be transported out to piers in the river could cause significant delays beyond the 90-minute limit that would put the concrete materials at risk of rejection if the concrete plant were located further away. Therefore, a temporary plant located on NPS Parking Lot B would reduce concrete waste and minimize truck deliveries via the surrounding roads.

Construction activities for the construction of the piers and abutments for the bridges over I-395, Ohio Drive SW, and Maine Avenue would require temporary traffic shifts, potential shoulder closures, and lane closures to allow for abutment, pier, and superstructure construction in Action Alternative A.

The Washington Channel bridge construction would use a temporary finger pier along the shoreline on NPS property to allow delivery of equipment and materials. Crews would also use a temporary barge in the channel for the construction of the foundations, piers, and superstructure bridge components (**Figure 3-18**).

Crews would construct the Ohio Drive SW, Washington Channel, and Maine Avenue SW bridges concurrently. Crews would construct each bridge in three phases. Crews would construct the easternmost track and bridge section on all the previously mentioned new bridges first, followed by construction between the eastern and western tracks, completing the middle section of the bridges. Crews would complete the westernmost section of the bridges last. The ramp from the 14th Street SW Bridge to Maine Avenue SW would require intermittent closures, with signed detours to allow for the multi-phased construction. Action Alternative A would rebuild the retaining wall along this ramp to accommodate the track alignment. This may result in realigning the ramp to improve the intersection after completion of the retaining wall and new Maine Avenue SW abutment.

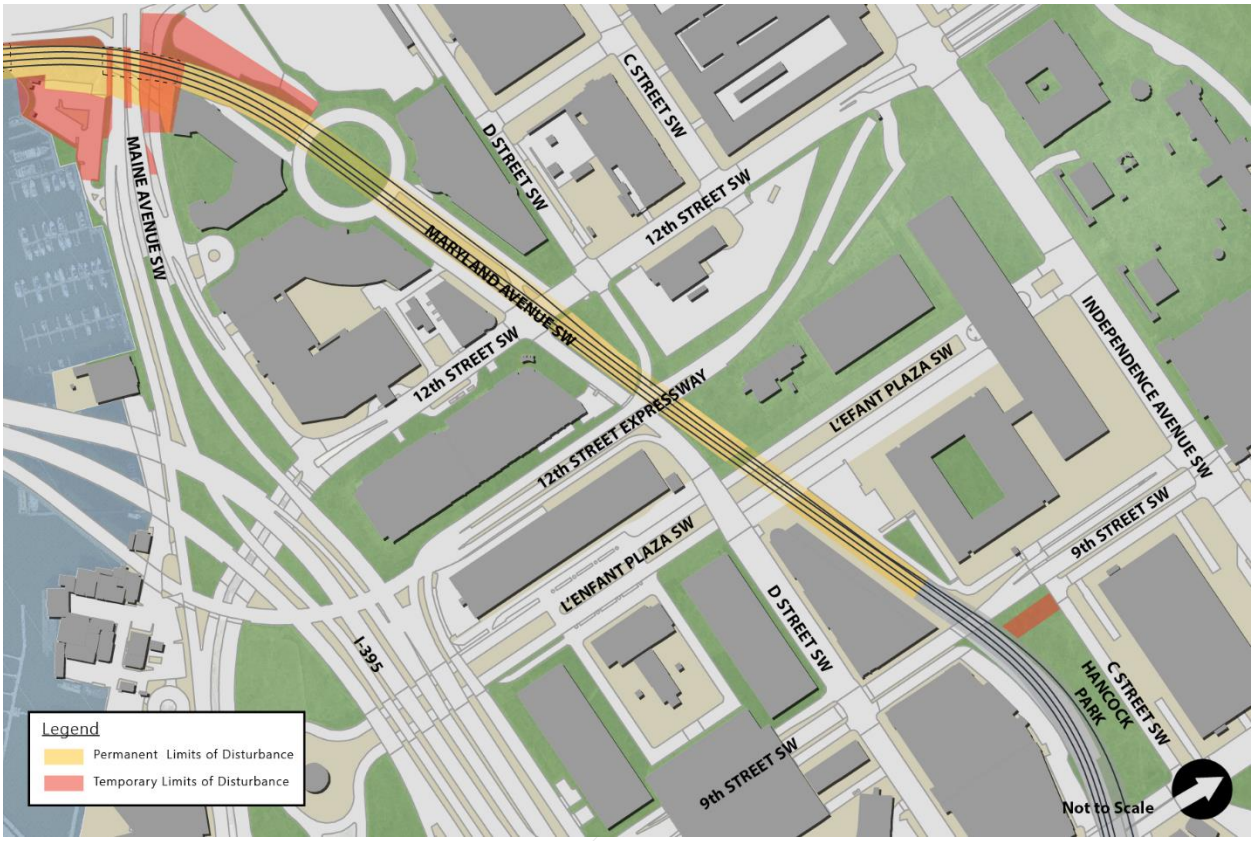
Prior to railroad bridge construction, crews would remove the Maine Avenue SW pedestrian bridge connecting the Mandarin Oriental Hotel with the Washington Marina. Construction of the new pedestrian bridge would not begin until the easternmost section of the railroad bridge over Maine Avenue SW is complete. Additionally, construction would require temporary relocation of a portion of the surface parking lot at the marina to a location to be determined. This would allow access to the abutment construction for both Maine Avenue SW and the Washington Channel.

Maryland Avenue SW to L'Enfant Plaza

Construction access north of Maine Avenue SW would use the existing access road through the Portals V development near Maryland Avenue SW, along D Street between L'Enfant Plaza and the 12th Street Expressway, and Hancock Park on the west side of the Corridor (**Figure 3-19**). The Portals V and Hancock Park access would allow for railroad materials, equipment, and crews to enter the depressed railroad corridor. Access via Hancock Park would be limited to the southern end of the park away from most park activity. D Street SW access would allow crews to lift equipment and materials from delivery trailers over the existing walls via boom trucks or small cranes into the railroad for construction.

Aside from track lowering and drainage modifications, Action Alternative A would require minimal work from Maryland Avenue SW through L'Enfant Plaza. Work may include adding enhanced safety measures through this section of Corridor due to limited horizontal clearance. See **Appendix B5**, **Maryland Avenue SW to L'Enfant Interlocking Clearance Assessment**, for additional discussion on work through this area.

Figure 3-19 | Construction Access and Staging Locations – Maryland Avenue to L'Enfant Plaza



3.5.2.2 Construction Schedule

The estimated construction duration for Action Alternative A is based on estimated work hours that include nighttime construction for any roadway lane closure activities, and considered restricted access, site complexities, and the work sequencing required to maintain two tracks in operation at all times. The total estimated construction duration for Action Alternative A is 5 years, which assumes that construction activities at different locations may be occurring at the same time. **Table 3-10** provides the estimated construction durations at each location along the Corridor and is ordered geographically starting at the south end of the Project and continuing north along the railroad. This table is not meant to demonstrate the sequence of construction activities, but rather provides estimated construction durations at the individual locations.

731 **Table 3-10 |** Estimated Construction Durations – Action Alternative A

Locations	Estimated Durations	Description
Long Bridge Park	4 yrs, 2 mos	Staging and access to the railroad to deliver equipment and materials
Boundary Channel Drive	2 yrs	Staging and access to the GWMP for railroad bridge construction
Bridge over GWMP	2 yrs	Construction of single two-track bridge, including pier in median of GWMP and new abutments
MVT	2 yrs	Relocate trail during construction of new bridge overhead
Bridge over MVT, Potomac River, and Ohio Drive SW	3 yrs, 4 mos	Construction of single two-track bridge, including approach spans over MVT and Ohio Drive SW and main channel spans over Potomac River
NPS Parking Lots B and C	4 yrs, 9 mos	Staging for railroad bridge construction
Bridges over Metrorail Portal and I-395	4 yrs, 9 mos	Construction of bridges over Metrorail portal and I-395, including two new two-track bridges with abutments and center piers in median of I-395
Bridge over Ohio Drive SW & Washington Channel	4 yrs, 1 mo	Construction of single four-track bridge, including center pier and abutments
Bridge over Maine Avenue SW and Maiden Lane	4 yrs, 1 mo	Construction of a single four-track bridge during three construction phases, includes at least two center piers and abutments
Washington Marina Parking Lot	4 yrs, 1 mo	Staging and access for construction of new bridge over Washington Channel; relocate marina parking
Maryland Avenue SW decking (viaduct) over railroad tracks	0	Minimal structures work anticipated
D Street	3 yrs	Staging and access to railroad to transport equipment and materials
12th Street SW & 12th Street Expressway over railroad	0	Minimal structures work anticipated
Hancock Park	3 yrs	Staging and access to railroad to transport equipment and materials
Barge access	4 yrs, 2 mos	Transport equipment and materials; construct bridge across the river
Track work along Corridor	5 yrs	Includes preparation and final track work for the entire duration of the Project

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3.5.3 Action Alternative B Construction

Construction of Action Alternative B would include the same activities in Action Alternative A (described in **Section 3.5.2, Action Alternative A [Preferred Alternative] Construction**) as well as replacing the existing bridge over the GWMP and the existing Long Bridge.

The existing structures at both the GWMP and Long Bridge would require demolition to accommodate the new structures proposed as part of this Alternative. Both existing superstructures consist of steel through plate girders that support the tracks. The removal of the Potomac River navigational channel truss would consist of torching or welding off existing bolts at the bearings to release the truss from the substructures, placing the truss on a barge via jacking methods, and floating it off site for disposal. For the through girders, once they have removed the track, crews would use a similar method as for the truss to release the girders from the bearings so crews can lift them via cranes. Crews can then secure the steel to trucks or barges to be transported off site for removal. Both structures would be tested for lead paint prior to removal, and remediation may be required.

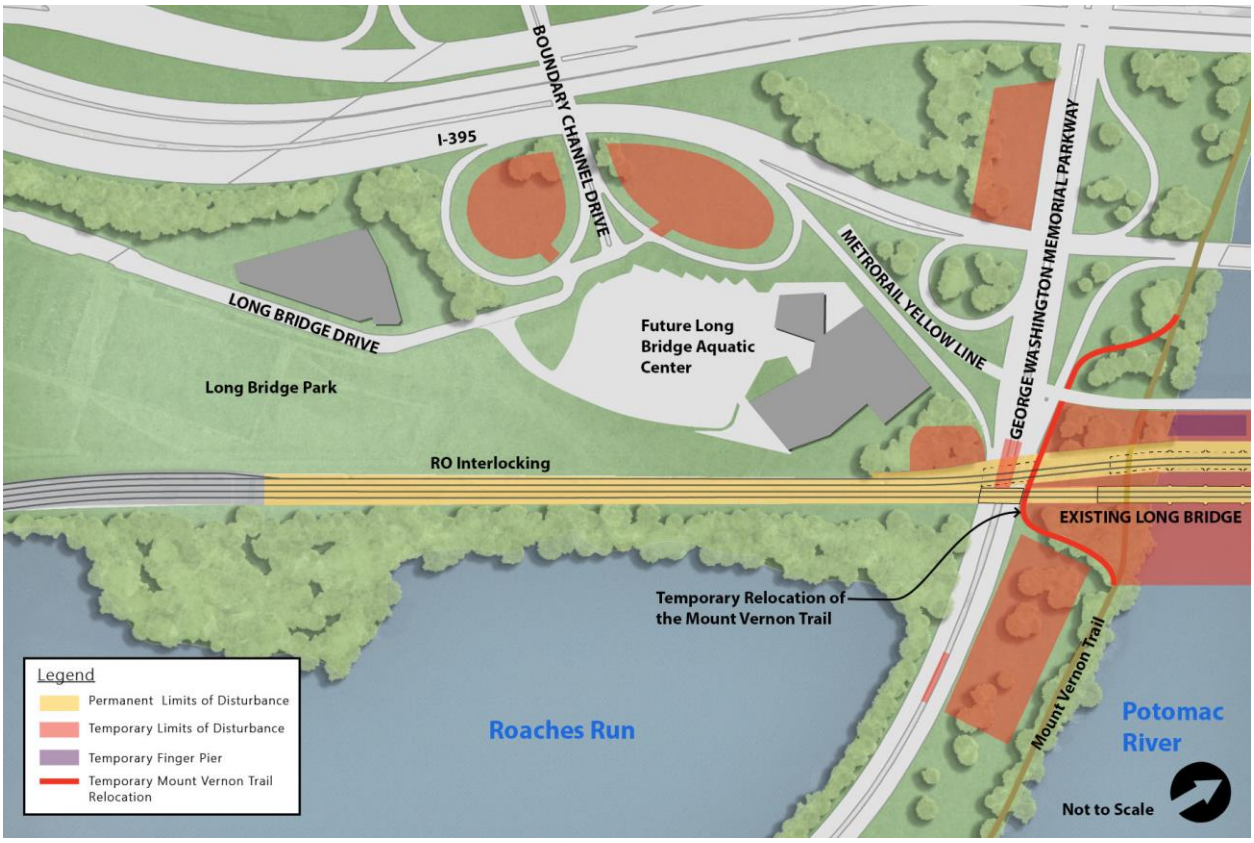
The piers and abutments consist of a combination of large stone masonry blocks and concrete on timber piles. Several hundred timber piles would conflict with the new substructures and piling, which would require their removal. Crews can remove the timber piles by pulling the piles out with a crane or having the drilled shaft cut through the pile. Crews would lift stone masonry out in full blocks, or, in some cases, would demolish the masonry, which includes breaking the concrete mortar with an excavator to load smaller pieces onto barges or trucks for removal off-site. Crews would construct cofferdams around each pier for the remaining pier removal and construction of new piers in the water. The demolition of the GWMP and Long Bridge would require removing several thousand cubic yards of concrete and stone masonry. **Appendix B3, Geotechnical Engineering Report**, provides existing foundation information.

The new structures could then follow similar construction means and methods proposed for the new bridges over the GWMP and new upstream bridge over the Potomac River as described for Action Alternative A. Work would include additional traffic control, lane closures, staging areas, and time to complete the construction.

3.5.3.1 Construction Access and Staging Locations

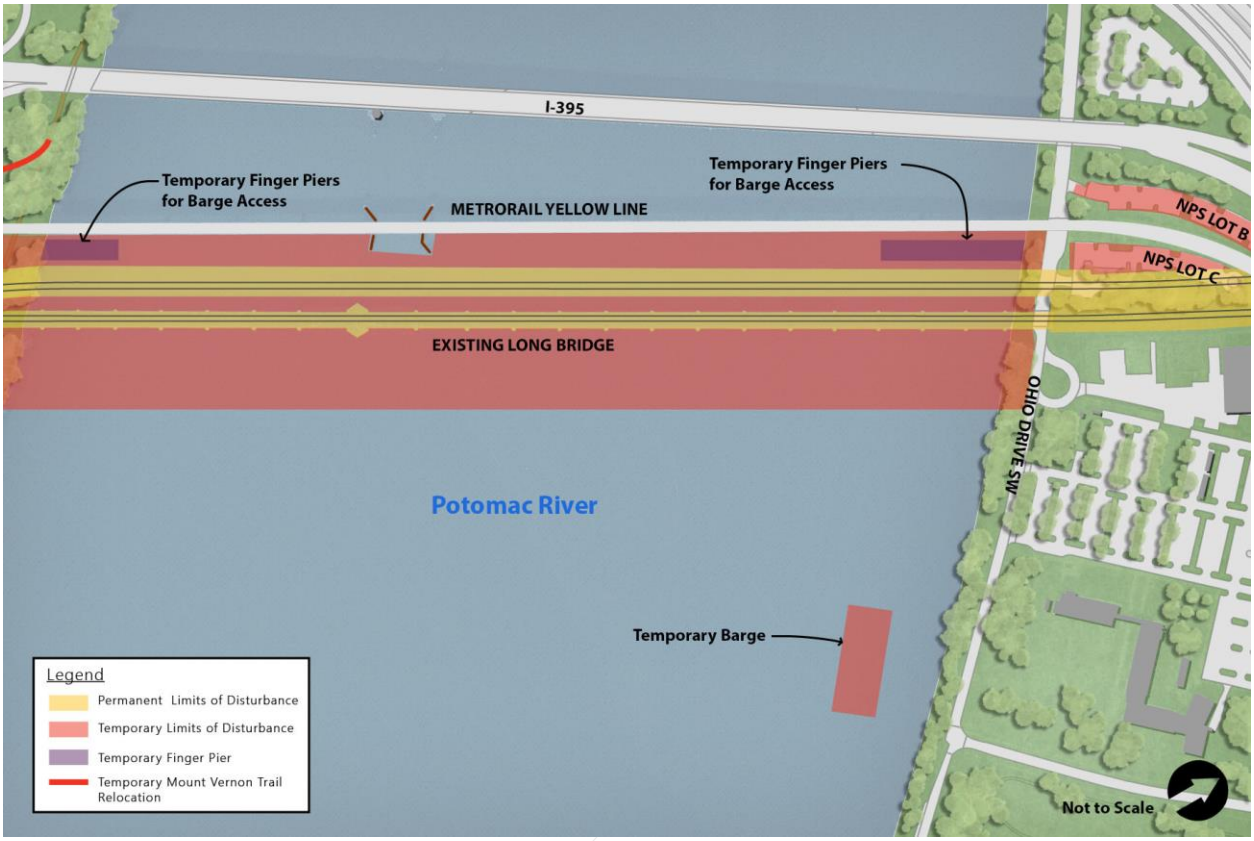
In addition to the construction access and staging areas required to construct Action Alternative A, construction of Action Alternative B would require additional construction access areas east of Long Bridge, extending from south of the railroad bridge over the GWMP north across the Potomac River and Ohio Drive SW. The Project would need this to accommodate the demolition and replacement of the existing bridges (see **Figures 3-20** and **3-21**).

Figure 3-20 | Action Alternative B Construction Access and Staging Locations – RO Interlocking to Potomac River



To construct the replacement for Long Bridge, crews would need to relocate the MVT, which would add an additional 3 years and 2 months of construction duration compared to Action Alternative A. Action Alternative B would require similar lane closures to Action Alternative A, again for an additional 3 years and 2 months in order to remove the existing structure. Action Alternative B would also require cofferdams around the existing substructures to allow for their removal and reconstruction. **Section 3.5.1, Construction Methods and Activities**, and its subsections, provide additional information on construction methods and access.

Figure 3-21 | Action Alternative B Construction Access and Staging Locations – Potomac River



3.5.3.2 Construction Schedule

The estimated duration for construction of Action Alternative B is 8 years and 3 months. While all other work would be the same as Action Alternative A, replacing the existing Long Bridge and bridge over the GWMP would add 4 years and 9 months, and 3 years and 2 months, respectively, to the construction schedule. The estimated durations for the bridge construction over the GWMP include non-consecutive construction periods that includes time required to complete the Long Bridge and other structures before shifting rail traffic onto the new alignments and demolishing the existing GWMP bridge. Additionally, staging areas such as near Boundary Channel Drive, along the GWMP, and in NPS Parking Lots B and C would continue for longer durations. **Table 3-11** depicts the estimated durations at each location along the Corridor and is ordered geographically starting from the south end of the Project and continuing north along the railroad. This table is not meant to demonstrate the sequence of construction activities, but rather provides estimated construction durations at the individual locations.

Table 3-11 | Estimated Construction Durations – Action Alternative B

Locations	Estimated Durations	Comments
Long Bridge Park	6 yrs, 8 mos	Staging and access to the railroad to deliver equipment and materials
Boundary Channel Drive	5 yrs, 2 mos	Staging and access to the GWMP for railroad bridge construction
Bridges over GWMP	5 yrs, 2 mos	Construction of two single two-track bridges, including pier in median of GWMP and new abutments
MVT	5 yrs, 2 mos	Relocate trail during construction of new bridges overhead
Bridges over MVT, Potomac River, and Ohio Drive SW	8 yrs, 1 mo	Construction of two single two-track bridges, including approach spans over MVT and Ohio Drive SW and main channel spans over Potomac River; replacement of existing Long Bridge
NPS Parking Lots B & C	8 yrs, 1 mo	Staging for railroad bridge construction
Bridges over WMATA Portal and I-395	4 yrs, 9 mos	Construction of bridges over WMATA Portal and I-395, including two new two-track bridges with abutments and center piers in median of I-395
Bridge over Ohio Drive SW & Washington Channel	4 yrs, 1 mo	Construction of a single four-track bridge during three construction phases, includes a center pier and abutments
Bridge over Maine Avenue SW and Maiden Lane	4 yrs, 1 mo	Construction of single four-track bridge, including center pier and abutments
Washington Marina Parking Lot	4 yrs, 1 mo	Staging and access for construction of new bridge over Washington Channel; relocate marina parking
Maryland Avenue SW decking (viaduct) over railroad tracks	0	Minimal structures work anticipated
D Street	5 yrs	Staging and access to railroad to transport equipment and materials
12th Street SW & 12th Street Expressway over railroad	0	Minimal structures work anticipated
Hancock Park	5 yrs	Staging and access to railroad to transport equipment and materials
Barge access	8 yrs, 1 mo	Transport equipment and materials; construct bridge across the river
Track work along Corridor	8 yrs, 3 mos	Includes preparation and final track work for the entire duration of the Project

3.6 Comparison of Alternatives

This section compares and summarizes the structural elements, potential benefits and costs of the No Action Alternative, Action Alternative A (see **Section 3.2.2**), and Action Alternative B (see **Section 3.2.3**). Action Alternatives A and B both consist of constructing a new bridge upstream of the existing Long

Bridge and other related railroad infrastructure improvements in the Long Bridge Corridor. Action Alternative B differs from Action Alternative A in that it would replace the existing Long Bridge over the Potomac River and the railroad bridge over the GWMP rather than retaining those bridges. **Table 3-12** summarizes the structure elements of the Action Alternatives along the Corridor moving south to north and highlights the areas where the structure elements differ between Action Alternatives. The differences in structure elements between the two Action Alternatives leads to differentiating construction durations and intensity of impacts.

Table 3-12 | Summary of the Structure Elements Included in the Action Alternatives

Corridor Segment	Action Alternative A	Action Alternative B
RO Interlocking to the GWMP		
Four tracks tie into proposed four tracks at RO Interlocking	Yes	Yes
Number of new tracks	2	2
New two-track bridge across GWMP west of existing railroad bridge	Yes	Yes
Existing railroad bridge over GWMP replaced	No	Yes
Spanning the MVT and Potomac River		
New bridge over MVT and Potomac River west of existing Long Bridge	Yes	Yes
Existing Long Bridge replaced within current alignment	No	Yes
Ohio Drive SW to the Metrorail Portal		
New two-track bridge across Ohio Drive SW west of existing bridge	Yes	Yes
Embankment with two tracks extended through NPS Parking Lot C	Yes	Yes
New two-track bridge spanning Metrorail portal	Yes	Yes
Existing two tracks realigned	Yes	Yes
I-395 to Ohio Drive SW		
Two new two-track bridges across I-395	Yes	Yes
New four-track bridge over Ohio Drive SW	Yes	Yes
Existing bridges over I-395 and Ohio Drive SW demolished	Yes	Yes
New retaining walls to retain embankment fill slopes	Yes	Yes
Washington Channel to Maine Avenue SW		
New four-track bridge across Washington Channel	Yes	Yes
Existing bridge spanning Washington Channel demolished	Yes	Yes
Existing retaining wall along 14th Street SW Bridge off-ramp reconstructed	Yes	Yes
14th Street SW Bridge off-ramp realigned	Yes	Yes
New retaining wall between tracks and Washington Marina Parking Lot	Yes	Yes
Maine Avenue SW pedestrian bridge replaced	Yes	Yes
Maryland Avenue SW Overbuild		
Four tracks underneath Maryland Avenue	Yes	Yes
New crashwalls at Mandarin Oriental Hotel and Portals V development	Yes	Yes
Modifications to pier crashwalls to meet AREMA and CSXT standards	Yes	Yes
Tracks lowered to meet vertical clearance requirements	Yes	Yes
12th Street SW to LE Interlocking		
Four tracks tie into proposed four tracks at LE Interlocking	Yes	Yes

Table 3-13 summarizes the potential overall short-term and long-term benefits and costs of the No Action Alternative, Action Alternative A, and Action Alternative B. The performance of each alternative is based on the quantitative and qualitative results of the environmental impact technical analyses and the

estimated capital costs. **Chapters 5 to 21** and **Appendix D3, Environmental Consequences Report**, give details related to the impacts of the alternatives on the resources evaluated in the DEIS. **Appendix B7, Conceptual Engineering Construction Cost Estimates Report**, provides more information on the capital costs of the alternatives.

Table 3-13 | Summary of Potential Benefits and Costs of the Alternatives

	No Action Alternative	Action Alternative A	Action Alternative B
Support for Purpose and Need			
Capacity: Eliminates/prevents operational bottleneck	No	Yes	Yes
Network Connectivity: Facilitates access to existing stations, nodes, freight network, and trains	No	Yes	Yes
Resiliency and Redundancy: Facilitates continued operations during planned maintenance or emergency conditions	No	Yes	Yes
Capital Costs and Construction Duration			
Capital Costs	--	Approx. $1.9 billion	Approx. $2.8 billion
Construction Duration	--	5 years	8 years, 3 months

Action Alternatives A and B provide the same benefits in support of the Purpose and Need of the Project. Both Action Alternatives:

- Add two additional tracks, alleviating the existing bottleneck in the Corridor and providing needed capacity for future plans. The two additional tracks enhance the ability to maintain schedules under normal operations and provide the flexibility needed to recover during periods of higher demand or service delays by enabling trains to pass one another.
- Provide additional tracks in the Corridor, which improves connectivity to existing railroad stations, employment and residential nodes, freight railroad infrastructure, and other modes of transportation service.
- Provide four interoperable tracks on two structures over the river. This facilitates continued operation of both passenger and freight trains during planned maintenance or emergency conditions by providing the ability to resume normal operations and minimize cascading delays following an unplanned event.

The construction duration of the two Action Alternatives differ. The anticipated construction duration for Action Alternative A is 5 years; for Action Alternative B, it is 8 years and 3 months. The extended construction duration of Action Alternative B increases the amount and duration of construction impacts such as traffic, periodic interruptions to railroad service, closures and realignments of bicycle and pedestrian paths, and impacts to aquatic biota from construction activities in the river. Action Alternative B would also have greater construction period (temporary use) impacts to properties protected under Section 4(f) due to the longer construction duration and additional staging areas needed within the GWMP and in East Potomac Park.

Action Alternative B also has greater permanent impacts than Action Alternative A, due to the demolition and replacement of the existing bridges (Long Bridge and the existing railroad bridge over the GWMP) and replacement of associated infrastructure, as detailed in **Chapters 5 to 21**. Both bridges are historic properties, so their removal would be an adverse effect as discussed in **Chapter 15, Cultural Resources**, and as described in **Appendix E3, Long Bridge Project Section 106 Assessment of Effects Report**.[22] The loss of the historic structures in Action Alternative B also results in a permanent use of Section 4(f) property, as detailed in **Chapter 24, Draft Section (4f) Evaluation**. The replacement of Long Bridge and the existing railroad bridge over the GWMP would also increase the capital cost of the Project. The projected capital cost of Action Alternative A is estimated to be $1.9 billion and the projected capital cost of Action Alternative B is estimated to be $2.8 billion, an increase of approximately $900 million.

3.7 Action Alternative A: Preferred Alternative

FRA and DDOT selected Action Alternative A as the Preferred Alternative for the Project after considering the potential short-term and long-term benefits and impacts, public and agency comments, and costs.

Action Alternatives A and B both support the Purpose and Need and provide the same anticipated benefits, but Action Alternative A has a shorter construction duration, fewer impacts as detailed in **Chapters 5 to 21**, least overall harm to Section 4(f) properties, and a lower capital cost, as detailed in **Section 3.6**, **Comparison of Alternatives**. CSXT owns and operates Long Bridge and states that they are responsible for annually inspecting all their bridges. They completed a rehabilitation of Long Bridge in October 2016 and maintain the bridge in proper condition for railroad purposes. CSXT has confirmed that Long Bridge is sufficient to meet the needs of their freight customers for the foreseeable future. Therefore, there is no need to replace the existing bridge.

The public and agencies will have the opportunity to comment on the Preferred Alternative during the review period and public hearing for the DEIS. The comments received will inform the Lead Agencies' preparation of the FEIS and the ROD.

[22] Section 106 of the National Historic Preservation Act of 1966 requires Federal agencies to consider and determine the direct and indirect effects of a proposed undertaking on historic properties; consult with State Historic Preservation Offices, Tribes, and other consulting parties; and avoid, resolve, or mitigate adverse effects to historic properties (36 CFR 800).