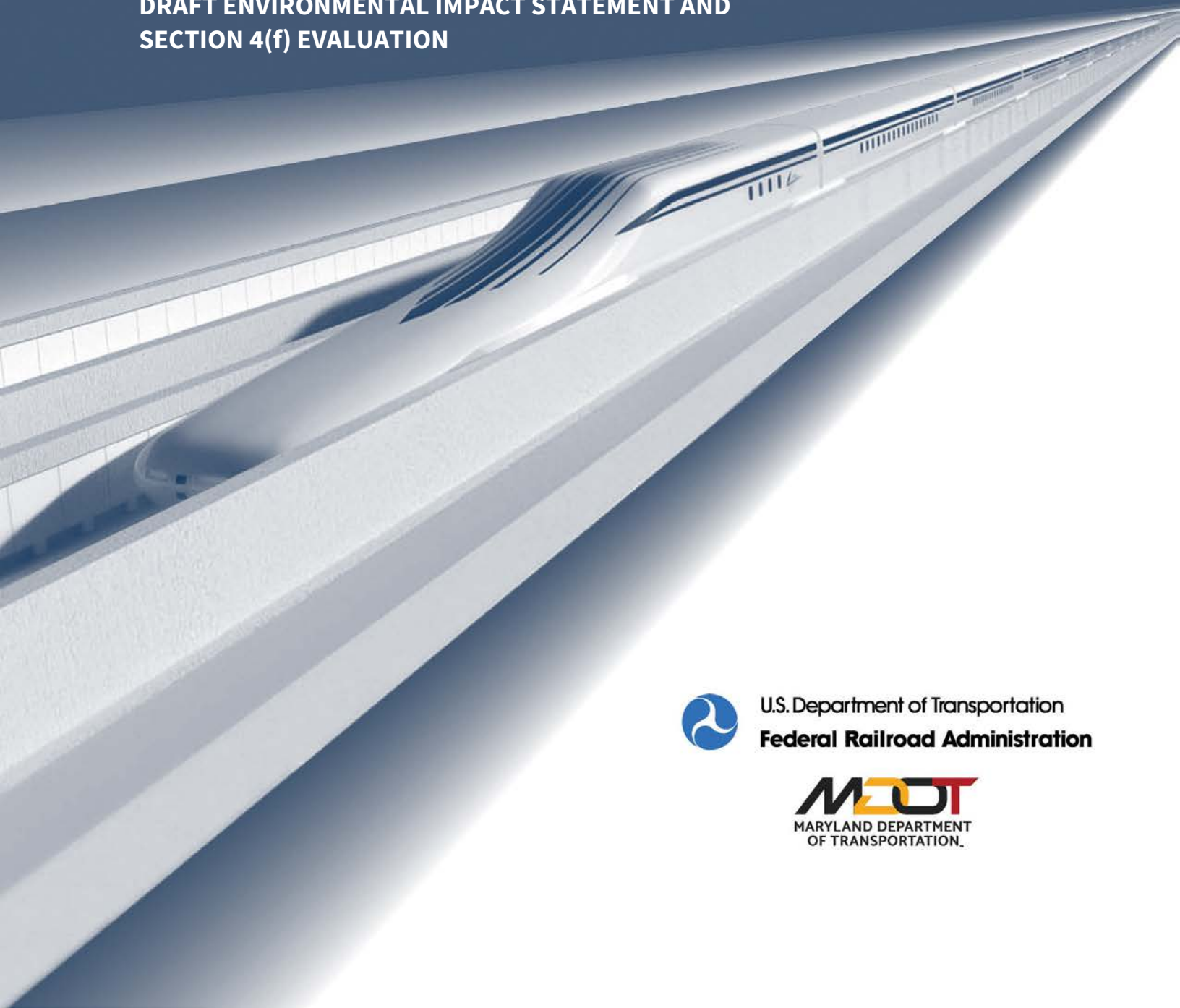


Appendix C Alternatives Development Summary

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
SECTION 4(f) EVALUATION



U.S. Department of Transportation
Federal Railroad Administration

MDOT
MARYLAND DEPARTMENT
OF TRANSPORTATION.

TABLE OF CONTENTS

<i>Appendix C</i> Alternatives Development Summary.....	C-1
C.1 Introduction	C-1
C.2 Previous Studies	C-1
C.2.1 Preliminary Alternatives Screening Report (PASR), January 2018.....	C-1
C.2.2 Alternatives Report, November 2018.....	C-9
C.2.3 Results of the Alternatives Report Evaluation, November 2018.....	C-25
C.3 Refinements to Alternatives, May 2020	C-26
C.3.1 Refinements to Dedicated Guideway	C-29
C.3.2 Refinements to TMF options	C-30
C.3.3 Refinements to Maintenance of Way Facilities	C-31
C.3.4 Station Refinements.....	C-32
C.3.5 FA/EE Site Refinements.....	C-33
C.3.6 Power Facilities Refinements	C-34
C.3.7 Operations, Signals, and Communications Facilities Refinements	C-36
C.3.8 Major Utility Relocation Refinements.....	C-36
C.3.9 Relocation of Public Roadways Refinements	C-36
C.3.10 Stormwater Management Refinements	C-37
C.4 Definition of Alternatives.....	C-37

LIST OF TABLES

Table C-1: TMF Locations, 2018 Alternatives Report.....	C-19
Table C-2: Initial Findings of TMF Locations, 2018 Alternatives Report.....	C-19
Table C-3: Additional TMF Locations Considered, 2018 Alternatives Report.....	C-21
Table C-4: Summary of Dedicated Guideway Refinements.....	C-29
Table C-5: Summary of TMF Refinements.....	C-30
Table C-6: Summary of MOW Options Refinements.....	C-32
Table C-7: Summary of Station Design Refinements.....	C-32
Table C-8: Summary of FA/EE Site Design Refinements.....	C-34
Table C-9: Summary of Power Substation Design Refinements.....	C-35
Table C-10: DEIS Build Alternatives.....	C-38

LIST OF FIGURES

Figure C-1: PASR Screening Process.....	C-3
Figure C-2: Alignments Screened in the PASR.....	C-4
Figure C-3: Project Elements Retained from PASR for Study in the Alternatives Report.....	C-6
Figure C-4: Washington, D.C. Station Zones Evaluated in the PASR.....	C-8
Figure C-5: BWI Marshall Airport Station Zone Evaluated in the PASR.....	C-8
Figure C-6: Baltimore Station Zones Evaluated in the PASR.....	C-9
Figure C-7: Project Elements Considered in the Alternatives Report.....	C-11
Figure C-8: Project Elements Considered in the Alternatives Report.....	C-12
Figure C-9: BARC TMF, 2018 Alternatives Report.....	C-16
Figure C-10: MD 198 TMF, 2018 Alternatives Report.....	C-17
Figure C-11: Patapsco Avenue TMF (with Cherry Hill Station), Post 2018 Alternatives Report.....	C-18
Figure C-12: Potential Additional TMF Locations Considered (South of MD 198).....	C-22
Figure C-13: Potential Additional TMF Locations Considered (North of MD 198).....	C-23
Figure C-14: Alternatives Retained for Further Study, 2018 Alternatives Report.....	C-27

Appendix C Alternatives Development Summary

C.1 Introduction

This appendix provides a summary of the alternatives development process that supports the definition of alternatives presented in Chapter 3, Alternatives Considered. It also discusses the design and operational refinements to the Build Alternatives made by the Project Sponsor that are evaluated in this Draft Environmental Impact Statement (DEIS). All information summarized in this appendix is based on technical reports, conceptual engineering, and preliminary engineering prepared by the Project Sponsor.

C.2 Previous Studies

Several studies prior to DEIS evaluated the implementation of a magnetic levitation system between Washington, D.C. and Baltimore, MD. These studies informed the basis for identifying feasible alignments for this Super Conducting Magnetic Levitation (SCMAGLEV) Project. However, none of the previous studies advanced beyond feasibility planning and National Environmental Policy Act (NEPA) documentation. The previous studies considered for this DEIS are listed below.¹

- Baltimore-Washington Corridor Maglev Feasibility Study, 1994: This study identified four feasible alignments for analysis in subsequent studies.
- Maglev Deployment Program Programmatic Environmental Impact Statement (PEIS), 2001: The PEIS set the stage for project level NEPA review of applying maglev technology in the Baltimore-Washington, D.C. corridor.
- Baltimore-Washington Maglev Project, DEIS and Section 4(f) Evaluation, 2003: The 2003 document was a project-level study that further evaluated alignment alternatives for a magnetic levitation technology system in the Baltimore-Washington, D.C. corridor.
- Baltimore-Washington Maglev Project, Final Environmental Impact Statement (FEIS) and Section 4(f) Evaluation (Unpublished), 2007: The 2007 FEIS further evaluated alternatives retained from the 2003 DEIS.
- Baltimore-Washington Maglev Project, Alternatives Study (Unpublished), 2012: A private entity (The Northeast Maglev, LLC) conducted a study that considered additional alignments for implementing Maglev technology.

C.2.1 Preliminary Alternatives Screening Report (PASR), January 2018

The PASR identified a reasonable range of alignments and possible station locations for the SCMAGLEV Project. The PASR first focused on existing transportation corridors and identifying straight alignments that would optimize operating speed for the

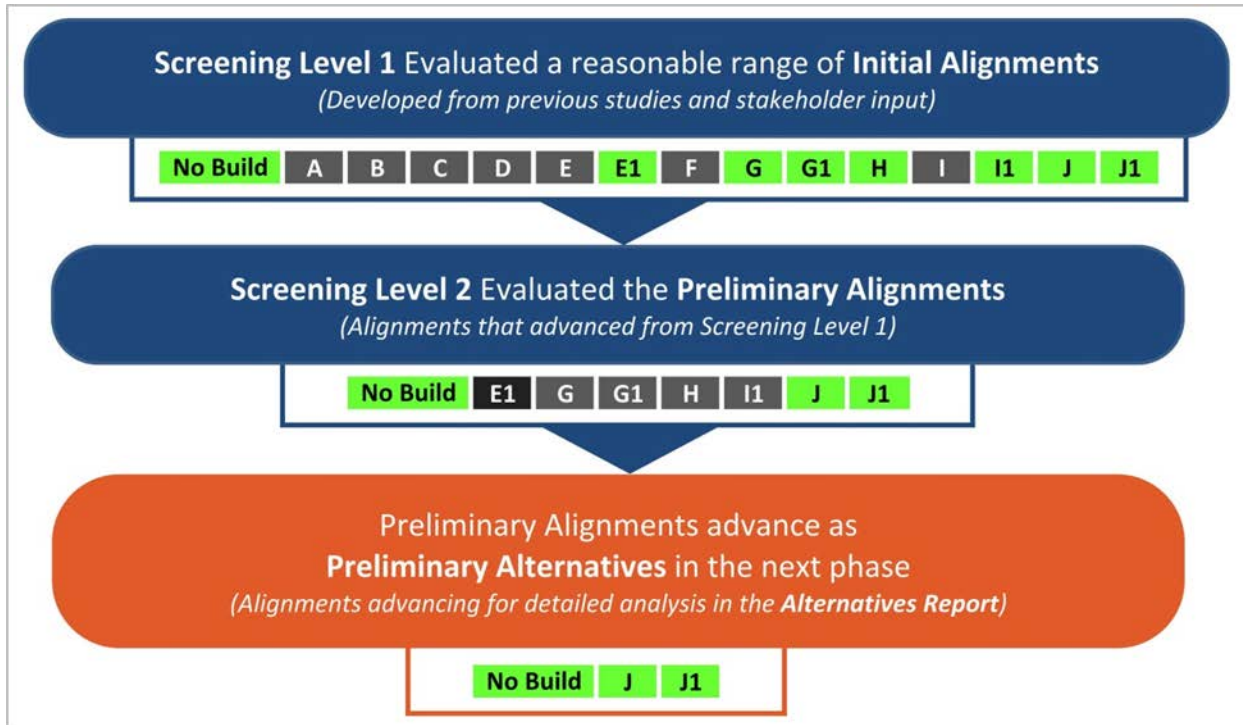
¹ For more information on these previous studies, visit <https://www.bwmaglev.info/index.php/project-documents/reports>

SCMAGLEV Project in the corridor. During this initial step, straight alignments bisected the Patuxent Research Refuge (PRR), a large, federally protected property between the Baltimore-Washington Parkway (BWP) and Amtrak corridors. In early discussions, representatives from the U.S. Fish and Wildlife Service (USFWS) cautioned that they would not support any Project route that bisected the PRR. Therefore, Federal Railroad Administration (FRA) and Maryland Department of Transportation/Maryland Transit Administration (MDOT MTA) directed the Project Sponsor to develop and evaluate alignments that avoid or minimize impacts to the PRR property. This step resulted in the identification of 14 initial alignments listed below.

- I-95 Parallel (A)
- Baltimore-Washington Parkway Parallel (B)
- Amtrak Parallel (C)
- Linthicum/City Options (D)
- Amtrak Corridor (E)
- Amtrak Modified (E1)
- Baltimore-Washington Parkway Corridor (F)
- Washington Baltimore & Annapolis (WB&A) Corridor (G)
- WB&A Modified (G1)
- WB&A to Amtrak (H)
- Amtrak to WB&A (I)
- Amtrak Modified to WB&A (I1)
- Baltimore-Washington Parkway Modified East (J)
- Baltimore-Washington Parkway Modified West (J1)

Next, FRA and MDOT MTA screened the initial alignments proposed by BWRR using additional criteria including geometric requirements for SCMAGLEV Project operations, numbers of residential and business property impacts and displacements, park and trail impacts, construction phase impacts and issues, impacts to existing transportation systems, and safety. **Figure C-1** summarizes the screening process presented in the PASR. **Figure C-2** shows the alignments identified. Green shading indicates the alignments that FRA and MDOT MTA retained for further study at the end of each screening step, while the gray-shading indicates which alignments FRA and MDOT MTA eliminated.

Figure C-1: PASR Screening Process

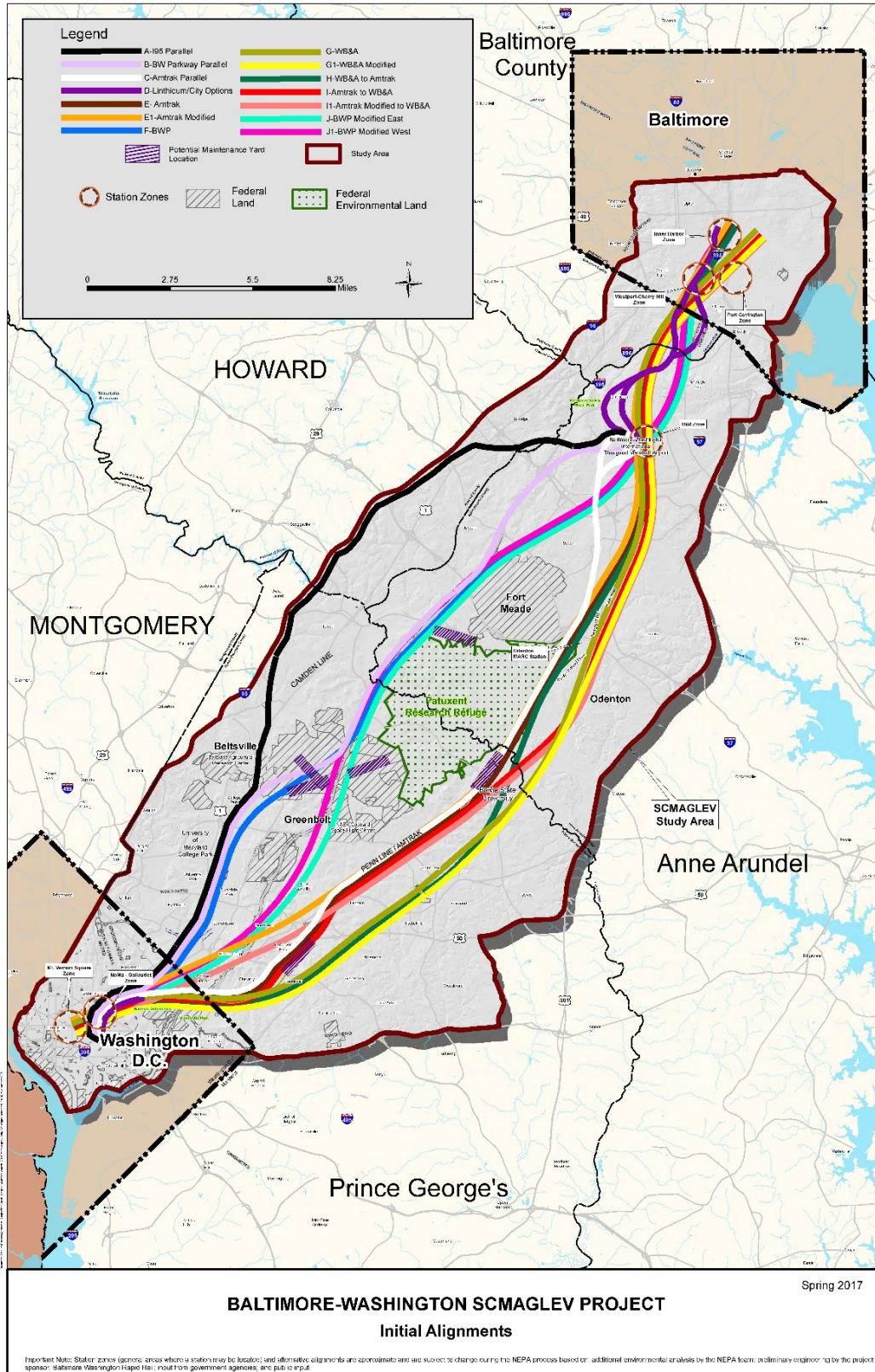


Source: PASR, 2018

Note: Gray shading – alignment dropped during PASR screening; Black shading – alignment dropped after October 2017 Public Meetings; Green shading – alignment advanced for further analysis.

FRA and MDOT conducted public and agency outreach to assist in evaluating the alignments and station areas. As described in the PASR, outreach focused on providing information about the alternatives development and screening process and receiving input from Federal, state, regional and local agencies in the corridor as well as the public. Primary comment topics related to the screening process included concerns related to property impacts, community opposition to some alignments (particularly G1 and H) and tunneling impacts.

Figure C-2: Alignments Screened in the PASR



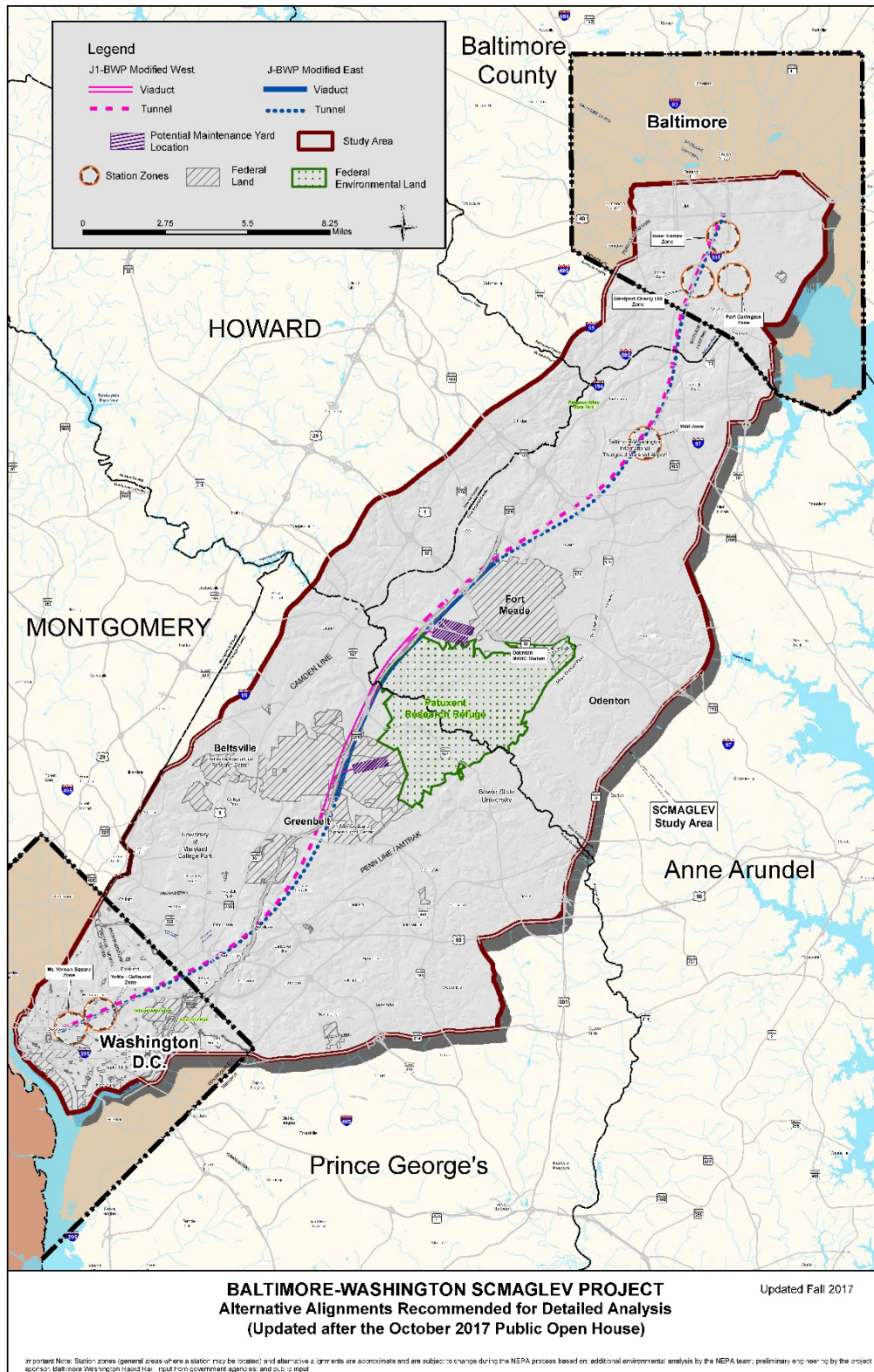
As a result of level 1 and level 2 screening, FRA and MDOT MTA eliminated several alignments for the reasons summarized below:

- Alignments A, B, C, D, E, F, and I: the geometry requirements for SCMAGLEV Project operation were not achievable due to curve radius restrictions (PASR Table 2).
- Alignment E1: the number of residential impacts and displacements (126) would be higher than other alternatives evaluated, close proximity to the Northeast Corridor (NEC) raises safety concerns, tunnel portal impacts to planned Odenton Town Center Transit-Oriented Development at the Maryland Area Regional Commuter (MARC) Odenton Station, and displacement of the MARC Seabrook Station.
- Alignments G and G1: the number of residential impacts and displacements (429 and 408, respectively) would be higher than other alternatives evaluated, highest potential visual and noise impacts to surrounding neighborhoods and communities because of longest elevated section (38 miles), high impacts on parks and trails; and community input concerning the WB&A corridor.
- Alignments H and I1: potential for temporary construction phase impacts to rail operations on the NEC and constructability issues related to crossing the NEC, constraints to potential future expansion of the NEC, and displacement of the MARC Seabrook Station (I1).

Alignments retained for further study in the PASR included the No Build Alternative, Alignment J and Alignment J1 (shown in **Figure C-3**) because each achieves the geometrical requirements for SCMAGLEV Project operation and, compared to the other alternatives, would include the following:

- Relatively fewer residential property acquisitions and displacements (0 and 77, respectively);
- Fewer visual and noise impacts to surrounding neighborhoods and communities because of a shorter elevated section (36 miles);
- No future safety, constructability, or future expansion concerns related to the NEC;
- No impact to the planned Odenton Town Center Transit-Oriented Development at the MARC Odenton Station;
- No displacement of the MARC Seabrook Station; and
- Fewer impacts on parks and trails.

Figure C-3: Project Elements Retained from PASR for Study in the Alternatives Report



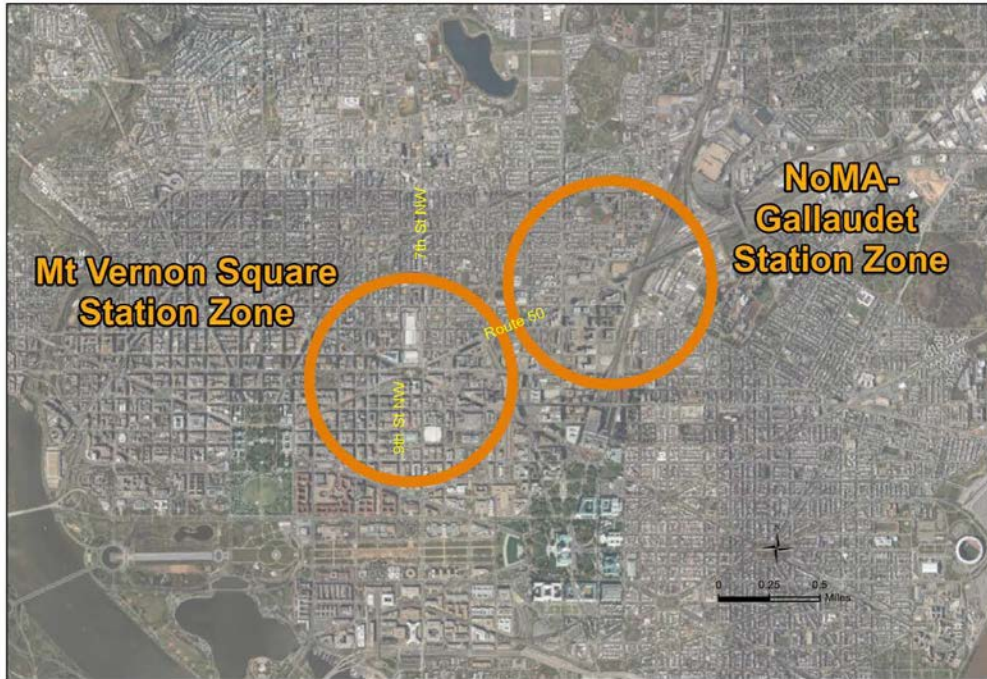
The PASR also examined alternative station zones. The zones are general locations comprising one-mile radius circular areas within which future planning would determine exact station locations. In the station zone screening, FRA and MDOT MTA applied engineering and operational criteria, including whether the design criteria for an SCMAGLEV system can be achieved (geometric feasibility), compatibility with the alignments, whether the alignments can be constructed without substantial challenges (constructability), and ability to connect to multiple transportation options or modes in the station zone (intermodal connectivity). FRA and MDOT MTA initially evaluated five station zones at the northern terminus in Baltimore (Harbor East, Inner Harbor (including Camden Yards and Calvert St./Light St.), Port Covington, Westport (including Cherry Hill Light-Rail), and Penn Station). For the southern terminus in Washington, D.C., FRA and MDOT MTA initially evaluated four station zones (Union Station, North of Massachusetts Avenue NE (NoMa)-Gallaudet, Farragut Square, and Mount Vernon Square). In addition to the terminus stations, FRA and MDOT MTA proposed an intermediate stop at Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport Station).

The results of the station screening eliminated the following station zones:

- Harbor East zone: insufficient intermodal connectivity and substantial challenges to construction in the available area.
- Penn Station zone: SCMAGLEV geometrical track design requirements preclude a feasible route to the Penn Station, as well as complex construction challenges related to existing rail and utility infrastructure conflicts that would not allow for top-down station construction and availability of staging areas.
- Farragut Square zone: geometric constraints affecting alignment operating speed, construction constraints related to insufficient staging areas, conflicts with existing infrastructure facilities, and limited surface/street access.
- Union Station zone: geometrical constraints affecting alignment operating speed and construction constraints related to station depth and access.

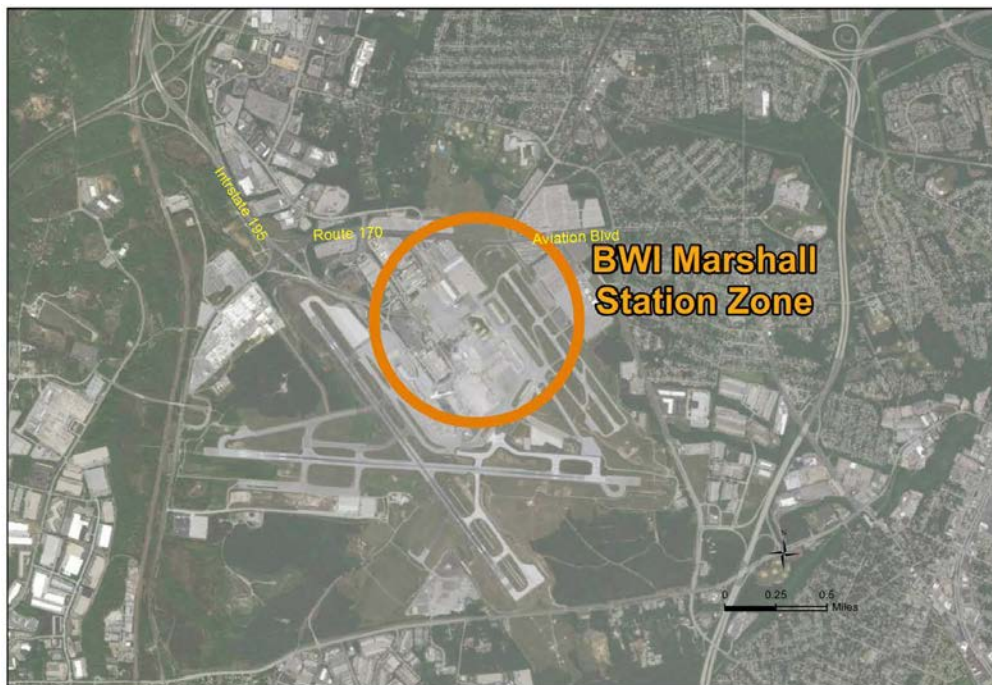
The station zones retained for further study included terminus stations in Washington, D.C. (Mount Vernon Square and NoMa-Gallaudet), Baltimore (Inner Harbor, Westport, and Port Covington) and an intermediate station (BWI Marshall Airport). The station zones that were retained do not exhibit the problems of the station zones that were eliminated, particularly intermodal connectivity or geometrical constraints. **Figures C-4 through C-6** show station zones.

Figure C-4: Washington, D.C. Station Zones Evaluated in the PASR



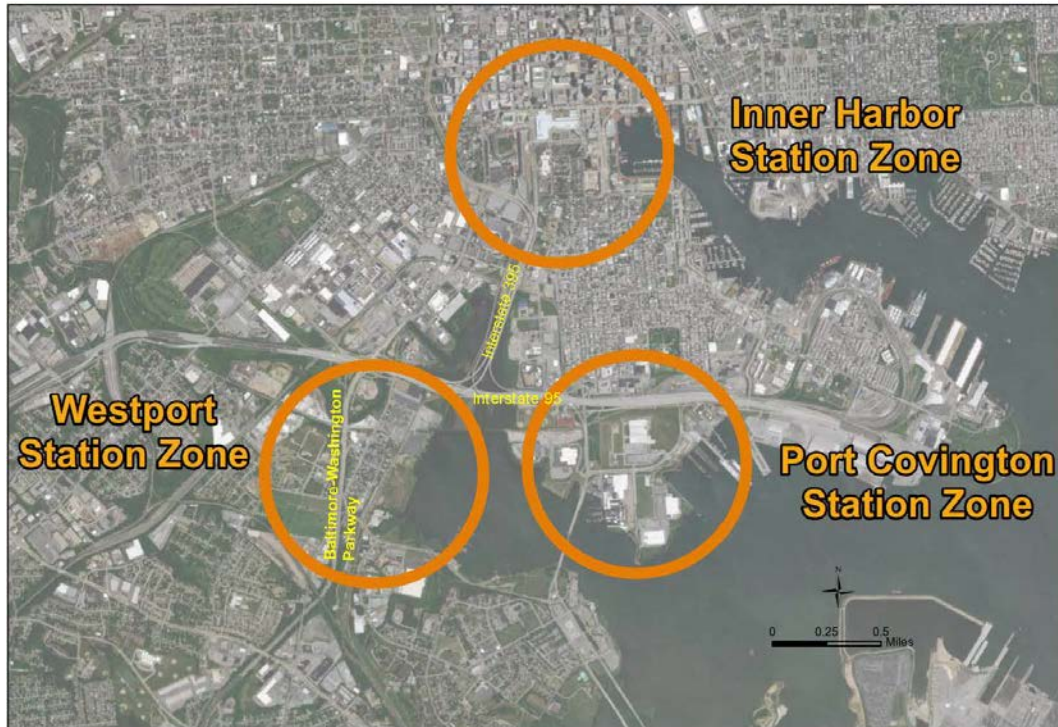
Source: PASR 2018

Figure C-5: BWI Marshall Airport Station Zone Evaluated in the PASR



Source: PASR 2018

Figure C-6: Baltimore Station Zones Evaluated in the PASR



Source: PASR, 2018

C.2.2 Alternatives Report, November 2018

The 2018 *Alternatives Report*² documents the continued alternatives development, refinement, and environmental evaluation of Alignments J and J1. The 2018 *Alternatives Report* also documents the more detailed study of stations and trainset maintenance facility (TMF) options.

The Project Sponsor, BWRR, made refinements to Alternatives J and J1 based on input from the public, Federal, state, and local agencies to reduce or eliminate property impacts, improve horizontal and/or vertical geometry, and lengthen tunnel sections. Likewise, the Project Sponsor refined the TMF site size, location and configuration. The evaluation of alternatives and ancillary facilities included development of initial station concepts within the station zones. Additional ancillary facilities examined in the 2018 *Alternatives Report* included the following:

- Maintenance of way (MOW) facilities that serve as depots for the maintenance of vehicles and storage of equipment,

² The 2018 *Alternatives Report* is available on the project website (<https://www.bwmaglev.info/index.php/project-documents/reports>)

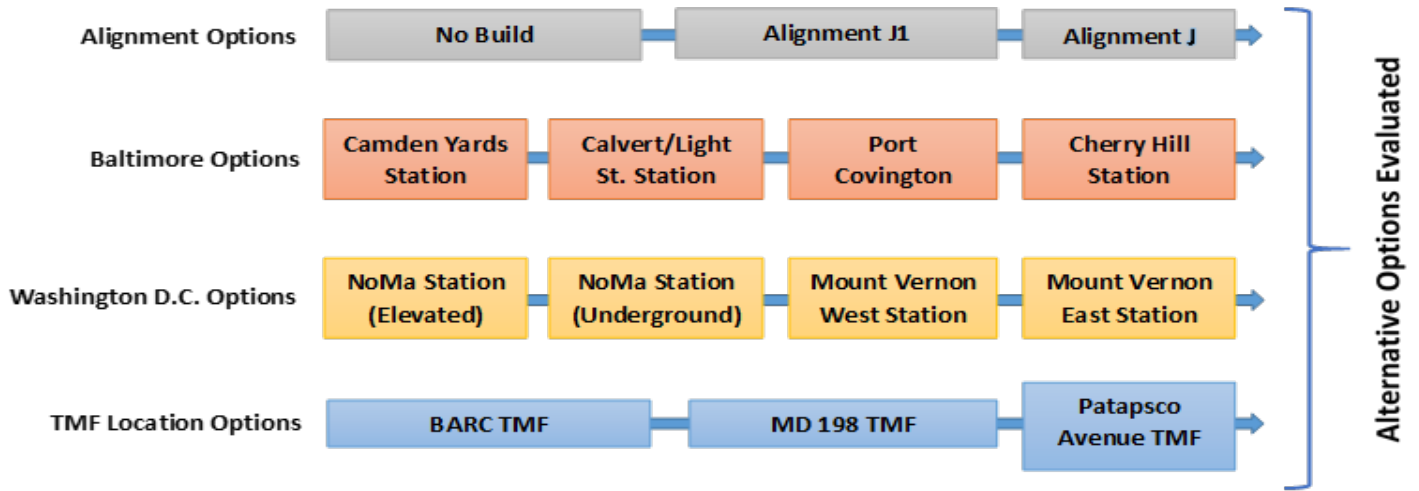
- Fresh air structures that provide fresh air circulation in tunnel sections of the guideway,
- Emergency access (or egress) sites associated with tunnel sections,
- Electrical substations that energize the guideway, and
- Station parking facilities.

FRA and MDOT MTA integrated stations, TMF sites, and the other ancillary facilities into Alternatives J and J1 to form a total of 16 different combinations of alignment, station, and TMF options. Subsequently, FRA and MDOT MTA screened the 16 combinations (eight for Alternative J and eight for Alternative J1) by quantifying potential impacts on the following natural and human environment factors:

- Property acquisitions and displacements (residential, commercial and community resources),
- Minority and low-income Census Block Groups (Environmental Justice Communities),
- Historic sites and landmarks,
- Parks and refuges,
- Federal properties, and
- Natural resources.

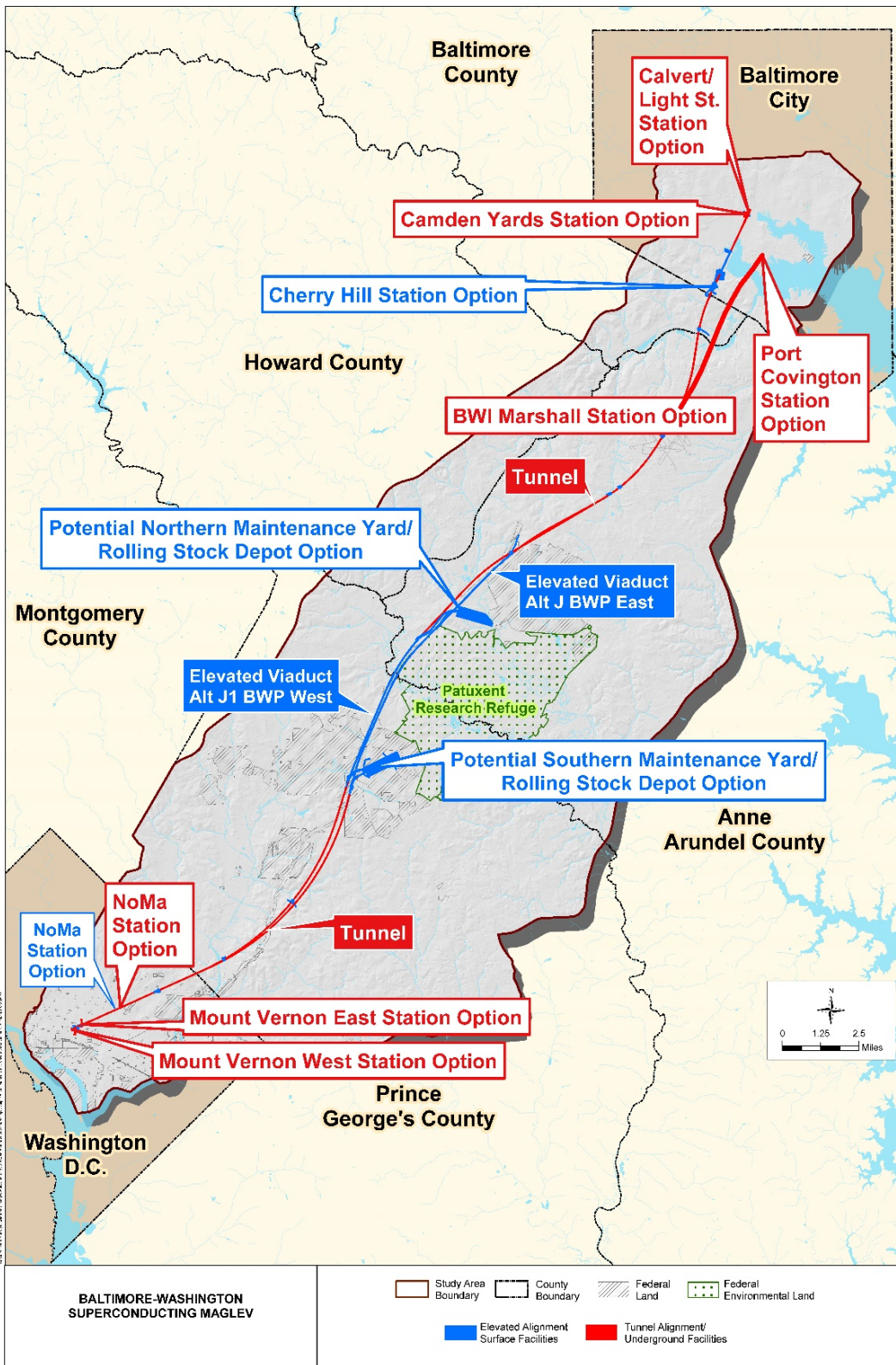
The flowchart below (**Figure C-7**) provides an overview of the options considered by FRA in the 2018 *Alternatives Report*, and the Patapsco Avenue TMF, which the Project Team subsequently added. **Figure C-8** shows a map of the locations of the alternatives, stations, and TMF facilities FRA considered. The following subsections describe the results of the evaluation, including the alternative alignments, station locations, and TMF facilities FRA retained for or eliminated from further consideration.

Figure C-7: Project Elements Considered in the Alternatives Report



*Patapsco Avenue TMF developed after the 2018 Alternatives Report

Figure C-8: Project Elements Considered in the Alternatives Report



Source: Alternatives Report, 2018; Revised January 2021 for Section 508 Compliance

C.2.2.1 Alternative Guideway Alignments and Tunnel Portals

As a result of the screening documented in the 2018 *Alternatives Report*, FRA and MDOT MTA retained Alignment J (BWP Modified-East), Alignment J1 (BWP Modified-West) and the No Build to further compare the benefits and impacts of each alternative.

C.2.2.2 Alternative Station Locations

FRA and MDOT MTA further evaluated the station locations using the following factors:

- Property acquisition,
- Land use (station-oriented land use, development or redevelopment potential),
- Transportation (connectivity and accessibility, parking),
- Human environment impacts (parks, historic properties, environmental justice populations),
- Cost (magnitude),
- Constructability (interface with other structures and infrastructure), and
- Operations (trip time) and forecasted ridership.

The evaluation resulted in the elimination of the following station locations from further consideration:

- Calvert/Light Street – underground (Inner Harbor Station Zone): no direct connection to an intermodal facility, demolition of multiple buildings, congested roadways, historic property impact (Otterbein Church), adds \$1.4 Billion to SCMAGLEV Project cost due to construction complexity. This location would not provide a direct connection to an intermodal facility and would require passengers to walk approximately 2,100 feet to the Camden Yards Light Rail Transit (LRT) and MARC Station. This station would require easements and underpinning (for approximately seven downtown buildings and to support roadway infrastructure) and/or the demolition of existing buildings (over the span of approximately three blocks) since the station cavern is on a diagonal and does not align with the existing street grid. An underground station located near Calvert/Light Street in the Baltimore Inner Harbor Station Zone is also in an area with heavy traffic. There is a potential adverse effect on one historic property, the Otterbein Church. The Calvert/Light Street Station is in close proximity to the Inner Harbor waterway, which would require a waterway permit for any proposed impacts to aquatic resources to the Inner Harbor. The location would potentially require the use of McKeldin Fountain for station access and is a longer walk for pedestrians to access other fixed guideway transit options. The estimated cost differential relative to the Cherry Hill SCMAGLEV Station is also an additional \$1.4 Billion to construct the underground Calvert / Light Street SCMAGLEV Station.

- Port Covington – underground (Port Covington Station Zone): no connectivity to other rail/transit, constructability issues due to deep foundations, conflict with property development plan and timeline, adds \$1.1 Billion to SCMAGLEV Project cost due to complex station construction.
- NoMa – elevated and underground (NoMa-Gallaudet Station Zone): connection only to the overburdened Metro Red line, low ridership and operating revenue compared to other station locations:
 - NoMa (elevated): guideway would cross NEC (PASR criteria for elimination) with complex guideway crossing of 10 active rail tracks (Amtrak, MARC, Virginia Rail Express (VRE), CSX and Washington Metro Area Transit Authority (WMATA) Metrorail); potential realignment of rail tracks near existing US Route 50 (New York Avenue); reconstruction of the 9th Street Bridge; and poor interconnectivity with the nearest fixed-guideway transit station (underground SCMAGLEV to an elevated Metro NoMa-Gallaudet Station).
 - NoMa (underground): constructability issues due to deep foundations, adds \$950 Million to SCMAGLEV Project cost due to complex construction.

Following the 2018 *Alternatives Report*, FRA and MDOT MTA reevaluated and eliminated the Mount Vernon Square West station based on the following factors:

- Constructability issues related to required station depth (200 feet) to pass under existing Metrorail tunnels, substantial non-blasting rock excavation requirements, and limited sites for construction staging.
- Substandard station functioning because of the reduced width available for platforms and tracks.

FRA determined that the construction complexity related to existing buildings, utilities and infrastructure, and space constraints on station operations due to station depth and New York Avenue right-of-way (ROW) width rendered the Mount Vernon West Station location unreasonable.

FRA retained the following station locations for further study:

- Mount Vernon Square East - underground (Mount Vernon Square Station Zone)
- BWI Marshall Airport – underground (BWI Station Zone)
- Camden Yards - underground (Inner Harbor Station Zone)
- Cherry Hill - elevated (Westport Zone)

C.2.2.3 Alternative TMF Locations

FRA and MDOT MTA identified potential TMF locations by considering operational requirements. A TMF requires a large land area that can be configured to facilitate efficient storage and movement of SCMAGLEV trains. Due to the developed condition

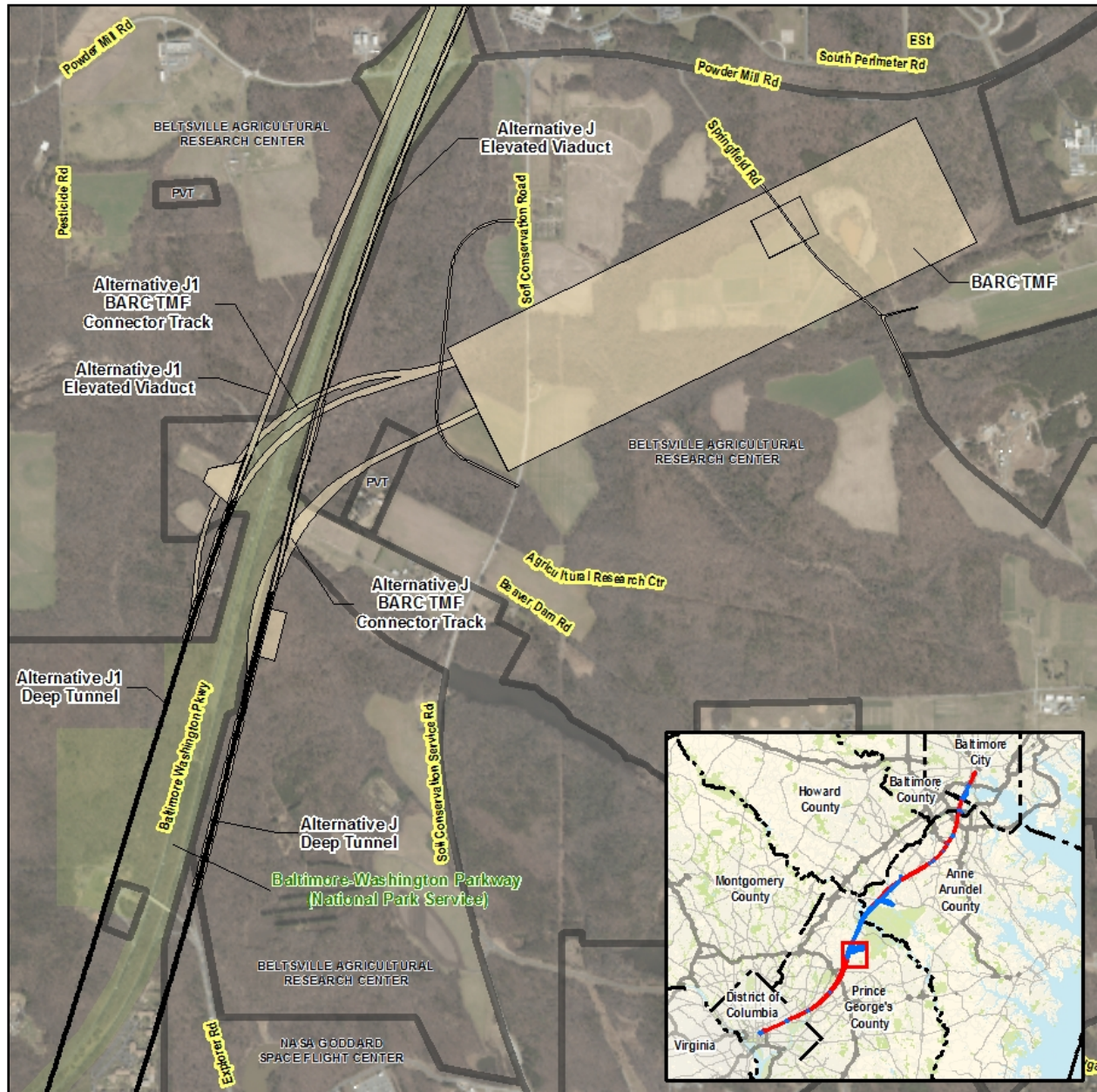
of the Project Study Area, there were a limited number of potential properties of the necessary size and configuration to potentially serve as a TMF location. In addition, the TMF location must be accessible by SCMAGLEV vehicles from the guideway alignment by means of a spur guideway that achieves specific geometrical requirements. The presence of existing development, transportation, and other infrastructure can constrain access to an otherwise suitably sized property.

During the evaluations that culminated in the 2018 *Alternatives Report*, the foregoing factors limited the potential number of TMF location options to two: a portion of the Beltsville Agricultural Research Center (BARC) property (**Figure C-9**), and a location near MD 198 and the BWP (**Figure C-10**). Shortly after FRA and MDOT completed the 2018 *Alternatives Report* the Team developed the Patapsco Avenue TMF as a new potential location near Cherry Hill in Baltimore, MD (**Figure C-11**).

FRA evaluated each TMF by:

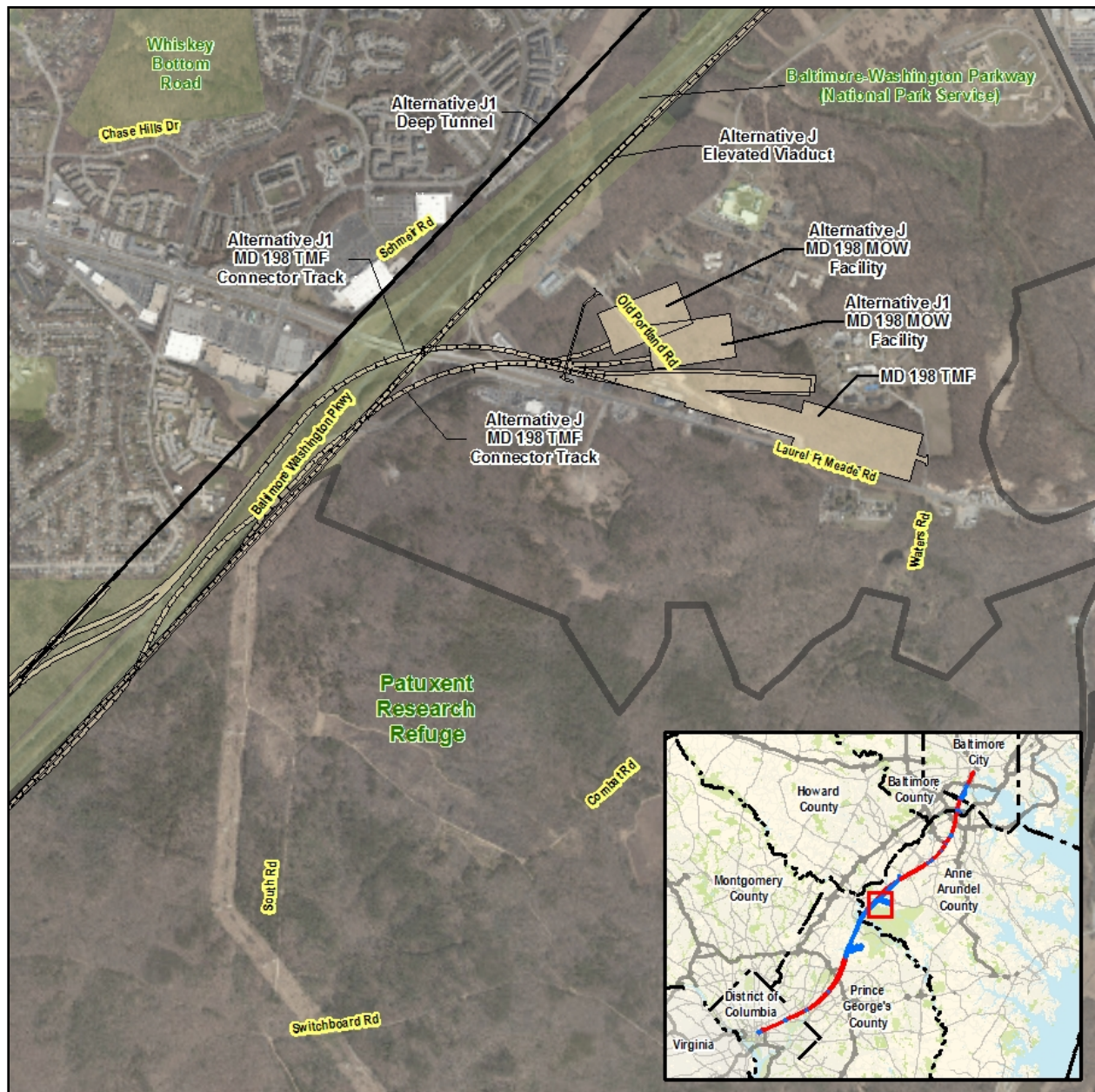
- Developing a conceptual layout of the facility and spur guideways,
- Comparing how each location would perform in terms of SCMAGLEV Project operating requirements,
- Considering the benefits and impacts of each concept on the natural and human environment, and
- Obtaining comments on each concept from the entities that own or manage the properties.

Figure C-9: BARC TMF, 2018 Alternatives Report



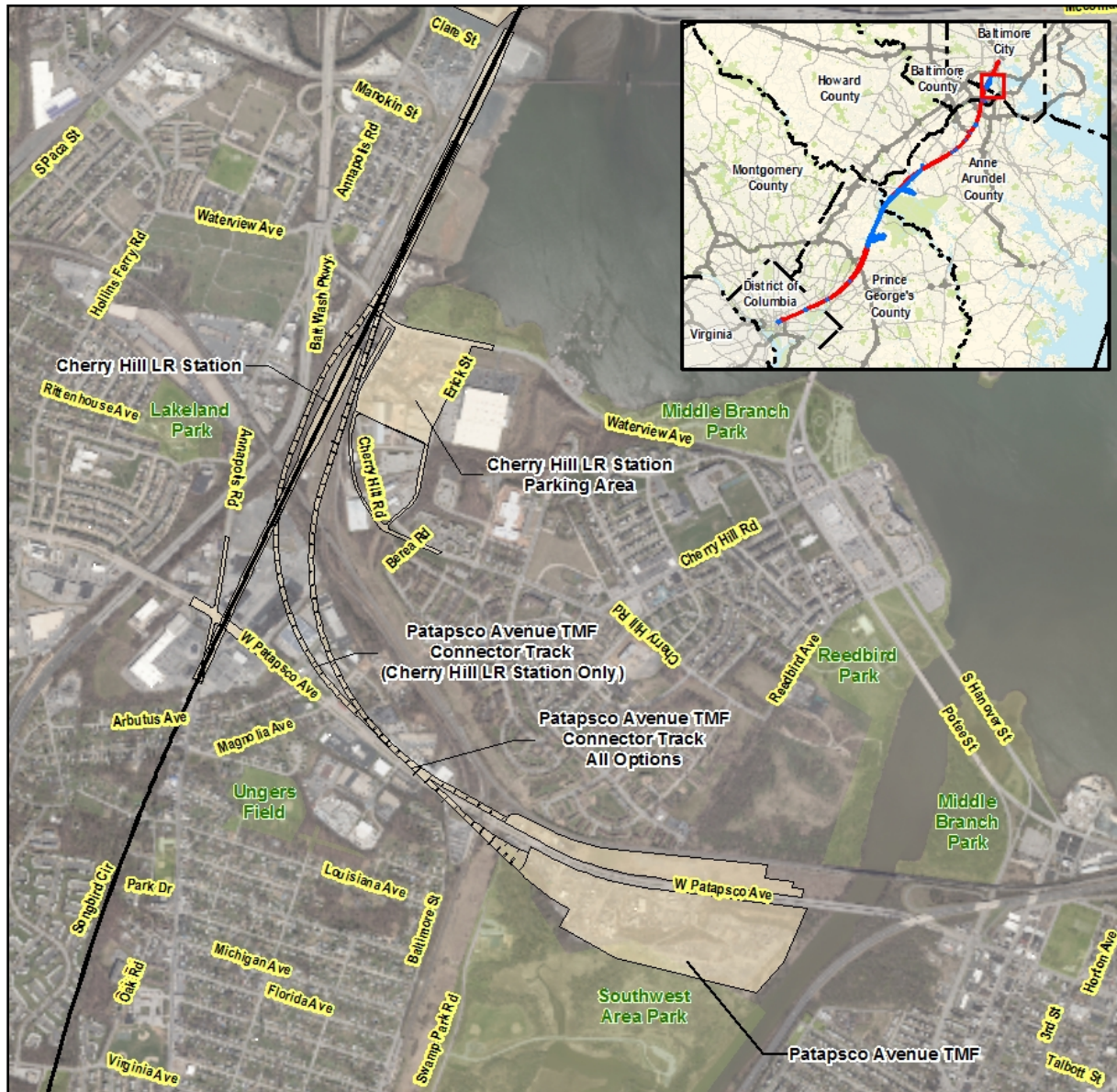
Source: Alternatives Report, 2018

Figure C-10: MD 198 TMF, 2018 Alternatives Report



Source: Alternatives Report, 2018

Figure C-11: Patapsco Avenue TMF (with Cherry Hill Station), Post 2018 Alternatives Report



Source: Alternatives Report, 2018

The evaluation of the TMF locations resulted in the findings presented in **Tables C-1 and C-2** below.

Table C-1: TMF Locations, 2018 Alternatives Report

TMF	Location	Acreage
BARC (combined TMF & MOW facility)	At-grade facility on BARC property south of Powder Mill Road and east of the BWP	257 acres
MD 198 (combined TMF & MOW facility)	At-grade facility on undeveloped, southern portion of D.C. Children’s Center property east of the BWP	91 acres
Patapsco Avenue (TMF with standalone MOW facility along guideway)	At-grade facility on both sides of Patapsco Avenue to the Patapsco River, east of MD 648	109 acres

Source: Baltimore-Washington SCMAGLEV Project, Rolling Stock Depot (RSD) Alternatives Assessment Comparison, 2018

FRA compared the benefits and adverse impacts of each TMF location and determined that the adverse impacts from using the BARC property outweighed its benefits. These impacts included: incompatibility with the BARC mission, the vulnerability of the nearby NASA facility to light and vibration from the TMF, and the negative impacts to regulated natural resources on the BARC property. As a result of that comparison, FRA eliminated the BARC TMF location from further consideration, and retained the MD 198 TMF for further study. For more detail on the evaluation process, metrics used and specific findings, refer to the 2018 *Alternatives Report*.

Table C-2: Initial Findings of TMF Locations, 2018 Alternatives Report

	BARC	MD 198
Federal Property	<ul style="list-style-type: none"> Use of BARC property would negatively impact the BARC mission. Area of BARC property impacted is undeveloped natural land. Alternative J spur guideway would require additional property on federally owned PRR; Alternative J1 would not impact the PRR. Alternative J spur guideway would require crossing the federally owned BWP; Alternative J1 spur guideway would not cross over the BWP. 	<ul style="list-style-type: none"> Property is Federally owned with D.C. stewardship; developed with a variety of correctional, educational, former hospital, historic cemetery, public works, and environmental conservation uses. Alternative J1 spur guideway would require crossing the federally owned BWP; Alternative J spur guideway would not cross over the BWP. TMF would negatively impact D.C. Children’s Center use, including multiple buildings. The Center is an historic and a Section 4(f) property (During DEIS evaluations, the footprint of the TMF was shifted to reduce impacts to the historic core of the Center).
Wetlands & Waterways	<ul style="list-style-type: none"> Beaverdam Creek and associated tributaries and wetlands would require surface crossings, including Non-Tidal Wetlands of Special State Concern (NTWSSC). 	<ul style="list-style-type: none"> Greater than 8-acre existing wetland present, associated with either Build Alternative.

	BARC	MD 198
Floodplain	<ul style="list-style-type: none"> Associated with Beaverdam Creek. 	<ul style="list-style-type: none"> None present.
Forest	<ul style="list-style-type: none"> Forested wetland, wetland buffer, and riparian stream buffers associated with Beaverdam Creek and tributaries. 	<ul style="list-style-type: none"> Large contiguous forest and forested wetlands.
RTE and/or SSPRA	<ul style="list-style-type: none"> RTE and SSPRA likely associated with NTWSSC on BARC property. 	<ul style="list-style-type: none"> Eastern end of TMF within an SSPRA likely associated with NTWSSC along the Little Patuxent River.
Additional Findings	<ul style="list-style-type: none"> The proximity of the TMF to artificial light- and vibration-sensitive activities at National Aeronautical Space Administration (NASA)-Goddard Space Flight Center would be a potential negative impact. 	<ul style="list-style-type: none"> The proximity of the TMF to Tipton Airport may result in some light emissions impacts. Additional coordination with the Federal Aviation Administration (FAA) and Tipton Airport would be required.

Source: Alternatives Report, 2018

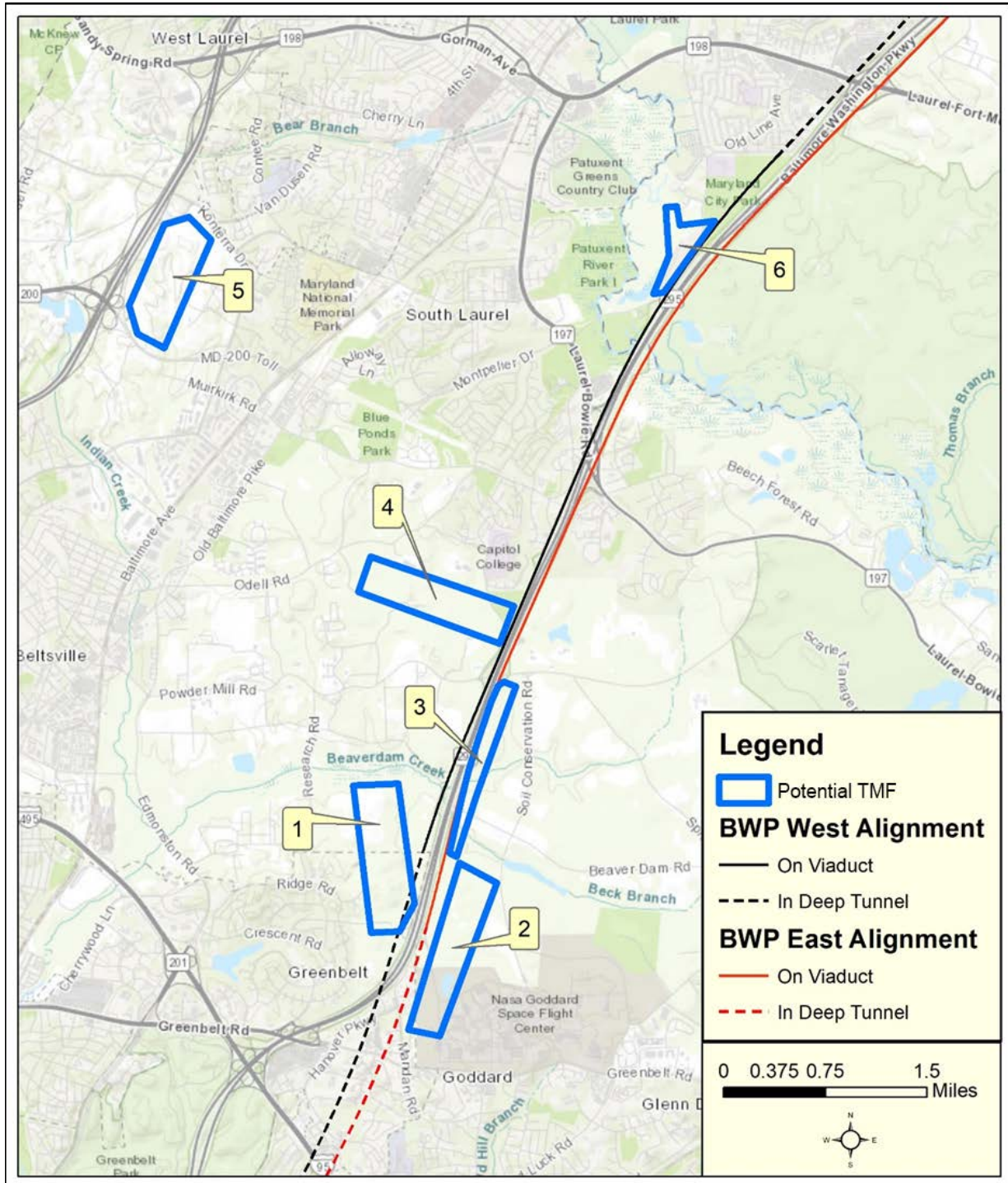
Notes: RTE = Rare, Threatened, or Endangered Species. SSPRA = Sensitive Species Project Review Areas

Following completion of the 2018 *Alternatives Report*, the owner of the SCMAGLEV technology, Central Japan Railroad Company (JRC), informed FRA and MDOT MTA that a more flexible TMF configuration, requiring less than 235 acres, would be possible in order to reduce impacts; however, a smaller TMF would be less operationally efficient. The reduction in overall TMF footprint size was the result of relocating the mainline substation and a MOW support facility to separate sites. Based on this new information, FRA and MDOT MTA identified and evaluated additional locations. FRA studied nine additional locations, plus the previously studied BARC and MD 198 locations (three different BARC locations and sites in Beltsville, Maryland City, Russet, Laurel, Fort Meade, BWI Marshall Airport and Patapsco Avenue), listed in **Table C-3** and shown in **Figures C-12 and C-13**. FRA evaluated each location in terms of property acquisition requirements, land use compatibility, access and transportation needs, natural and built environment conditions, constructability, operational characteristics, and cost.

Table C-3: Additional TMF Locations Considered, 2018 Alternatives Report

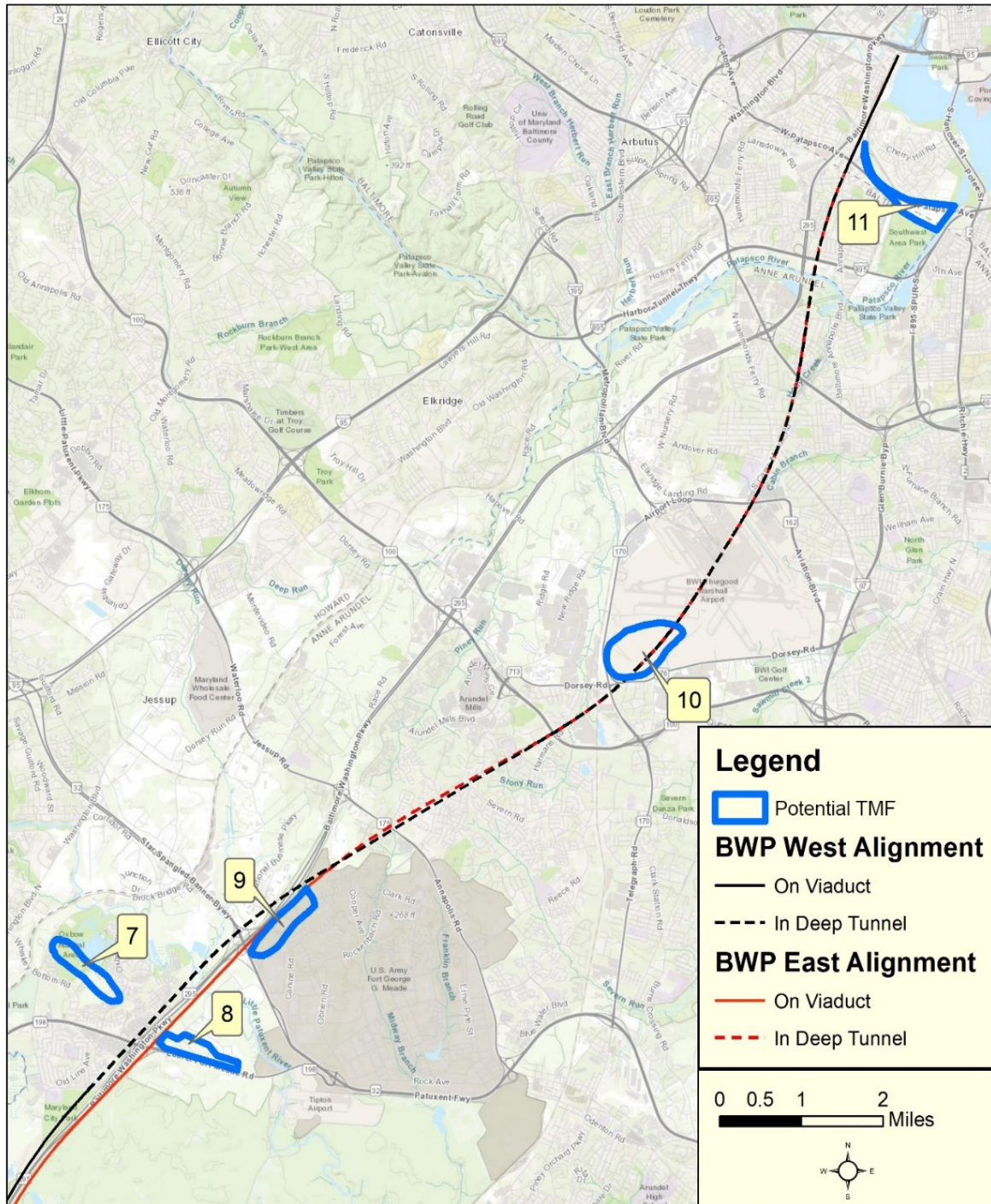
ID	City/Area	Property Owner	Area (Acres)
1	Greenbelt	BARC, Greenbelt	217
2	Greenbelt	BARC, NASA, Prince George's County	228
3	BARC Facility	BARC	92
4	BARC North	BARC, GSA	202
5	Beltsville	PEPCO, Konterra Associates LLC	200
6	Maryland City	Commercial, Anne Arundel County	65
7	Russett	Anne Arundel County, Private Owners	125
8	Laurel (MD 198)	Federal Gov't (D.C. use), Commercial	97
9	Fort George G. Meade	Fort Meade (NSA Exclusive Use)	131
10	Baltimore Washington Airport	State of Maryland	253
11	Patapsco/Cherry Hill	Commercial, Industrial, CSX, Maryland	109

Figure C-12: Potential Additional TMF Locations Considered (South of MD 198)



Source: Alternatives Report, 2018

Figure C-13: Potential Additional TMF Locations Considered (North of MD 198)



Source: Alternatives Report, 2018

The findings of the study of additional TMF locations included:

- Seven of the new locations and BARC are incompatible due to existing or planned land use or environmental concerns
- Three of the new locations and the BARC location would require U.S. Congress approval to re-designate U.S. Department of Agriculture (USDA) property to a transportation use
- Four of the new locations would require substantially more cost to construct either because of the distance between the location and the guideway or because the connection of the spur guideway to the main guideway would be in a deep tunnel
- Two of the new locations could result in impacts to National Security Agency (NSA), NASA, or sensitive research activities
- Five of the new locations and MD 198 would require trains to travel a comparatively long distance away from the main guideway to the TMF
- One new location would require ROW or an easement for the spur guideway approximately three miles long in a Potomac Electric Power Company (PEPCO) utility corridor; this corridor passes through a residential area

FRA determined that the locations with the fewest construction, operational and environmental concerns were the MD 198 TMF, the BARC East TMF, and the Patapsco Avenue TMF (discussed below). However, FRA found the operational and location benefits of the Patapsco Avenue TMF outweighed the adverse impacts of using federally owned BARC property and eliminated the BARC East TMF from further study. Thus, FRA selected the MD 198 and Patapsco Avenue TMF locations for additional evaluation in this DEIS.

C.2.2.4 Refined MD 198 TMF Location

FRA reconfigured and reduced the size of the MD 198 TMF to avoid impacts to buildings at the D.C. Children's Center and the Maryland Environmental Trust Conservation Easement. Although changing the size and configuration of the MD 198 TMF reduced some of the impacts identified at the site, it did not completely eliminate impacts to the property or change the benefits identified as part the 2018 *Alternatives Report*. The impacts associated with the refined MD 198 TMF locations are described below:

- No residential property acquisitions or displacements
- Four commercial property acquisitions and displacements
- Some potentially impacted light-sensitive land uses nearby (Tipton Airport)
- No potentially impacted vibration-sensitive land uses nearby

- One impact on an historic and Section 4(f) property (D.C. Children's Center)
- Approximately eight acres of wetlands impact
- Approximately 57 to 64 acres of forest impact, dependent upon the alignment and corresponding ramp and facility configuration differences in LOD

C.2.2.5 Patapsco Avenue TMF Location

The Patapsco Avenue TMF is in the Cherry Hill area near Baltimore, MD. The ability to reduce the size of a TMF facility allowed the Patapsco Avenue location to meet the requirements of size and proximity to the guideway. The characteristics and general impacts of the Patapsco Avenue TMF location are listed below.

C.2.2.6 Patapsco Avenue TMF location (Figure C-11):

- Property would not require crossing of the BWP for either alternative
- Operations between the mainline guideway, the spur guideway, and the TMF itself would be more efficient than the MD 198 TMF because of their proximity to one another, fewer conflicts with existing infrastructure, and proximity with the Cherry Hill Station location
- Because the TMF location is near the Baltimore terminus of the SCMAGLEV Project, a more centrally located, standalone MOW facility would be required along the guideway alignment rather than within the TMF footprint
- One residential property acquisition and displacement
- Twenty-one commercial property acquisitions and displacements
- No potentially impacted light- or vibration-sensitive land uses nearby
- Community impacts would also include potential changes to surrounding aesthetics, modifications to access, potential increases in noise, and commercial/retail displacements requiring nearby residents to find alternative shopping locations.
- No known impacts on historic or Section 4(f) properties (minor impact to Southwest Area Park later revealed)
- Less than ¼ acre of wetlands impact
- Approximately 14 to 16 acres of forest impacts

C.2.3 Results of the Alternatives Report Evaluation, November 2018

The 2018 *Alternatives Report* recommends further study of Build Alternative J (BWP Modified-East) and Build Alternative J1 (BWP Modified-West) and four alternative station locations: Mount Vernon Square East, BWI Marshall Airport, Camden Yards, and Cherry Hill (elevated). The TMF options recommended for further study is the MD 198 location. As noted above, after the Alternatives Report was released, the Project

Sponsor introduced the Patapsco Avenue TMF which was subsequently evaluated and also determined that it should be carried forward for further study along with the MD 198 TMF. **Figure C-14** shows the alternatives retained for further study.

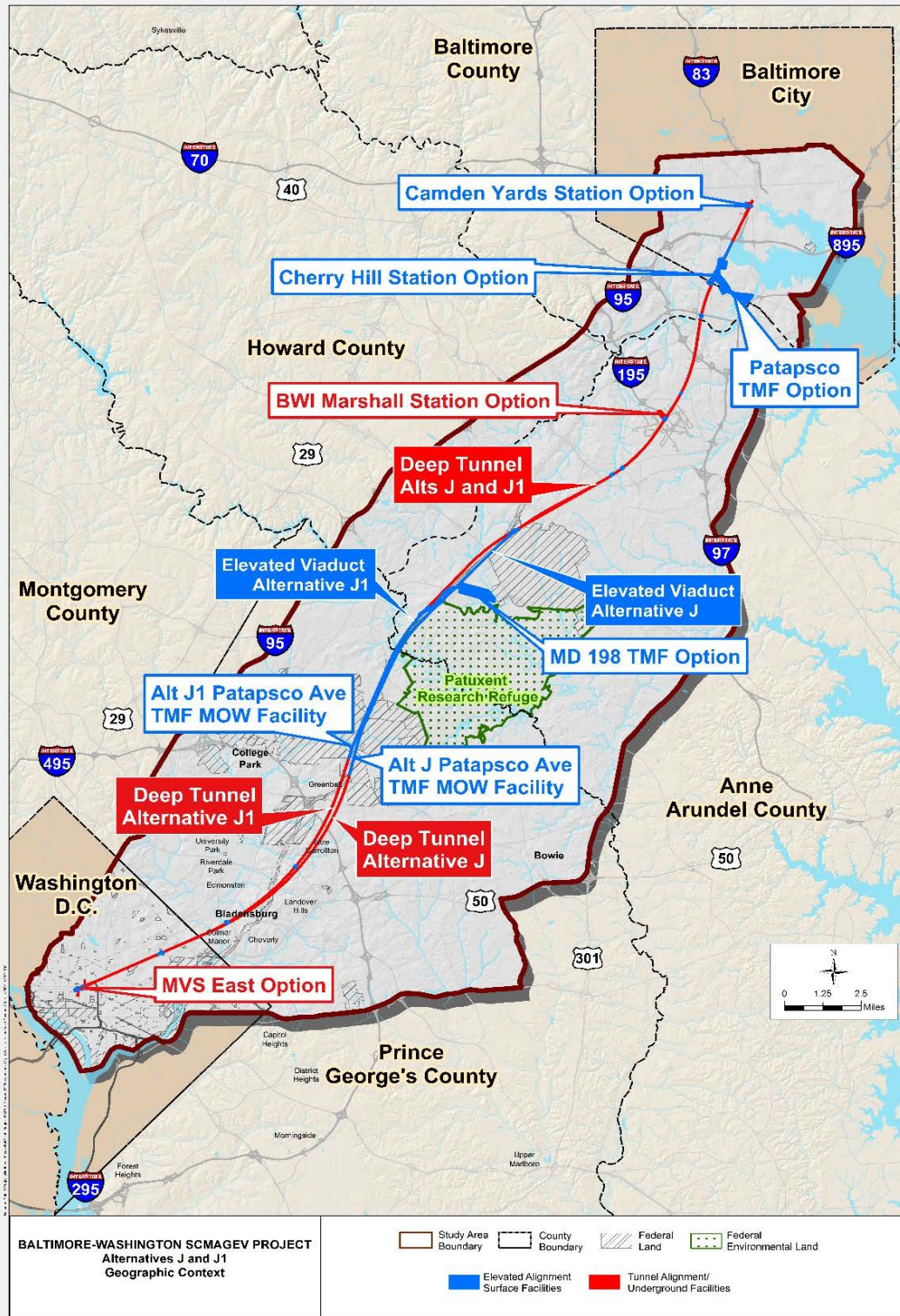
C.3 Refinements to Alternatives, May 2020

Subsequent to the 2018 *Alternatives Report*, the Project Sponsor further examined Alignment J (BWP Modified-East), Alignment J1 (BWP Modified-West), making refinements to the guideway alignment and ancillary SCMAGLEV facilities to improve operational efficiency, safety, constructability, and overall Project cost-effectiveness. In this activity, the Project Sponsor applied newly adopted design criteria provided by Japanese designers and operators of existing SCMAGLEV systems. The newly adopted design criteria resulted in the following refinements to the alignments and ancillary facilities:

- Operations
 - Increased train size from 12-car to 16-car trains to accommodate U.S. standards for larger seats, restrooms, luggage storage, and Americans with Disabilities Act requirements, and the same passenger capacity;
- Alignments
 - Widened guideway viaduct by 20 feet to accommodate continuous maintenance access route;
 - Increased (straightened) alignment curves to maximize operational speeds and efficiency;
 - Shifted tunnel portals to accommodate proposed TMF Options;
- TMF Options

Eliminated the Patapsco TMF because the recently adopted, standardized TMF size and configuration are different than the previous concept design for the TMF considered in the 2018 Alternatives Report. The TMF size was increased and the TMF configuration was made a uniform shape to accommodate 16-car trains and to align facilities within the TMF to minimize the movement of trains within the TMF. These changes enable maximum operational efficiency in the TMF and help to optimize revenue service operations. The site of the Patapsco Avenue TMF does not have sufficient size or shape to accommodate the standardized TMF size and configuration;

Figure C-14: Alternatives Retained for Further Study, 2018 Alternatives Report



Source: Alternatives Report, 2018; Revised January 2021 for Section 508 Compliance

- Resumed consideration of a TMF on the BARC property east of the BWP; despite the impacts of a BARC East TMF that were cited by FRA as reasons for eliminating the BARC property from consideration during alternatives screening. The BARC East TMF and the MD 198 TMF would each have the potential for adverse impacts to federal properties and regulated natural resources. Resumed consideration of a TMF on the BARC property east of the BWP enables further comparative study of the TMF Options in the DEIS. The Project Sponsor is reconsidering the TMF on BARC property east of the BWP because the large land area of BARC enables the standardized TMF size and configuration to be accommodated on a single parcel of land without the constraints of existing development, public, roadways, waterways, and other existing infrastructure. The refined TMF on the BARC property east of the BWP (known as the BARC Airstrip TMF Option) is in a different location (in the existing airfield area) of the BARC property compared to the BARC East TMF considered in the 2018 *Alternatives Report*.
- Added a BARC West TMF; the large land area of BARC enables the standardized TMF size and configuration to be accommodated on a single parcel of land without the constraints of existing development, public, roadways, waterways, and other existing infrastructure.
- Refined the MD 198 TMF to provide the standardized TMF size and configuration; shifted the site of the MD 198 TMF to the east to accommodate recently adopted curve design standards for the access ramps to the MD 198 TMF;
- Maintenance of Way Facilities
 - Enlarged the size of maintenance of way facilities to achieve recently adopted design standards;
 - Moved maintenance of way facilities associated with the TMF Options to be standalone facilities instead of incorporated into the TMF configuration;
 - Added a dedicated maintenance of way facility in Cherry Hill/Westport for the Camden Yards Station Option;
 - Added a dedicated maintenance of way facility in Cherry Hill for the Cherry Hill Station Option;
- Stations
 - Added an underground pedestrian connection between the Mount Vernon East Station and the adjacent Walter E. Washington Convention Center at Mount Vernon Square;
 - Added more underground parking area for Mount Vernon East Station;
 - Added more underground space for SCMAGLEV operations control systems at Mount Vernon East Station;

- Modified existing roadway ramp geometry at I-395 and New York Avenue NE interchange to improve roadway operations, particularly during construction;
- Resumed consideration of tail track at the Cherry Hill Station to improve operating efficiency;
- Fresh Air and Emergency Egress Sites (FA/EE)
 - Increased the number of sites to provide more frequent emergency egress points;
 - Increased the size of two sites to accommodate a larger ventilating capacity facility;

In addition to the foregoing refinements, the Project Sponsor developed concept designs for ancillary facilities, which are described in DEIS Section 3.3, including:

- Power facilities (substations, connections to the existing electric utility grid, and relocation of electric power transmission lines that cross the alignments);
- Operations, signals, and communications facilities;
- Permanent relocation of existing roadways;
- Stormwater management facilities; and,
- Construction phase facilities, including laydown areas along the alignments and in remote areas.

C.3.1 Refinements to Dedicated Guideway

Key aspects of refinements to the dedicated guideway relate to system operations and safety, maintenance access, track alignment on approach to stations, and tunnel portal areas. **Table C-4** summarizes the refinements to the dedicated guideway for Build Alternative Alignments J and J1 to achieve the recently adopted design standards.

Table C-4: Summary of Dedicated Guideway Refinements

New Design Standard	Refinements
Provide continuous maintenance access route along viaduct	The guideway design in Alignments J and J1 has been widened by approx. 20 feet (6 meters) to accommodate a continuous maintenance accessway alongside the track on the viaduct structure.
Provide a straight alignment, where reasonably feasible, to provide the highest operational efficiency; provide straight alignment on approaches to stations	<p>Alignment J: No change to the alignment south of MD 175; north of MD 175, the tunnel alignment to BWI Marshall Airport Station is straighter, resulting in a slight route shift; north of the Airport, a western shift of the tunnel alignment is provided near I-695 and I-895 to make a straighter approach to Cherry Hill Station.</p> <p>Alignment J1: No change to the alignment south of MD 197; north of MD 197, the tunnel alignment to BWI Marshall Airport is further west, allowing space for a ramp to the MD 198 TMF to hug the west side of the BWP; north of the MD 198 TMF, the alignment comes closer to</p>

New Design Standard	Refinements
	the BWP at MD 32 before curving north and west on approach to the BWI Marshall Airport Station; north of BWI Marshall Airport, the tunnel alignment shifts to the east on its approach to Cherry Hill Station.
Shift and enlarge the southern tunnel portal area (near BWP/Explorer Road interchange) to accommodate the BARC TMF ramps	<p>Alignment J: Tunnel portal area shifted south approximately one-half mile to accommodate the BARC TMF ramps</p> <p>Alignment J1: Tunnel portal area shifted south approximately one mile to accommodate BARC TMF ramps</p>

Source: AECOM 2020.

C.3.2 Refinements to TMF options

The Project Sponsor examined the Patapsco Avenue TMF against the recently adopted design criteria and determined that the new standardized TMF size and configuration cannot be accommodated in that location because of required acreage and dimensions of the existing land area. In addition, the ramp viaduct design criteria cannot be achieved without substantial residential property acquisition in the area surrounding Patapsco Avenue and Cherry Hill Station in Baltimore. For these reasons, the Project Sponsor eliminated the Patapsco Avenue TMF option from further consideration. Refer to **Table C-5** for a summary of TMF refinements.

Table C-5: Summary of TMF Refinements

New Design Standard	TMF Design Refinement
Newly standardized size (up to 180 acres) and configuration of TMF with adjacent areas for parking and power substations	<p>MD 198 TMF: The footprint is in the same general location, but larger. Location was chosen in part because it was previously investigated.</p> <p>Patapsco Avenue TMF: The new standardized TMF size and configuration cannot be accommodated because of required acreage and dimensions of the existing land area. The Patapsco TMF option was eliminated from further consideration.</p> <p>BARC Airstrip TMF: The new standardized TMF size can be accommodated in this new option. Location was chosen in part because it was previously investigated.</p> <p>BARC West TMF: The new standardized TMF size can be accommodated in this new option.</p>

New Design Standard	TMF Design Refinement
<p>Maximum grade requirements of 4% slope for the ramp viaducts to a TMF</p>	<p>MD 198 TMF: The ramp viaducts are longer in length to achieve the maximum grade requirement; the ramp viaducts would turn off the main viaduct just north of the BWP/MD 197 interchange and parallel the BWP before crossing over the BWP at the BWP/MD 198 interchange and turning east toward the MD 198 TMF. In Alignment J, the maximum ramp viaduct elevation above existing ground would be approximately 121 feet near the mainline crossing (Southbound Ramp to Alignment J). In Alignment J1, the maximum ramp viaduct elevation above existing ground would be approximately 144 feet near the point where the TMF ramp turns off the Alignment J1 (Northbound Ramp to Alignment J1).</p> <p>Patapsco Avenue TMF: The ramp viaduct design criteria cannot be achieved without substantial residential property acquisition in the area surrounding Patapsco Avenue and Cherry Hill Station in Baltimore. The Patapsco Avenue TMF option was eliminated from further consideration.</p> <p>BARC Airstrip TMF: The ramp viaduct grade requirements can be accommodated in this new option. In Alignment J, the maximum ramp viaduct elevation above existing ground would be approximately 92 feet at Beaver Dam Creek (Southbound Ramp to Alignment J). In Alignment J1, the maximum ramp viaduct elevation above existing ground would be approximately 69 feet near the Baltimore Washington Parkway (Northbound Ramp to Alignment J1).</p> <p>BARC West TMF: The ramp viaduct grade requirements can be accommodated in this new option. In Alignment J, the maximum ramp viaduct elevation above existing ground would be approximately 101 feet at Beaver Dam Creek (Southbound Ramp to Alignment J). In Alignment J1, the maximum ramp viaduct elevation above existing ground would be approximately 79 feet at Beaver Dam Creek (Southbound Ramp to Alignment J1).</p>

Source: AECOM 2020.

C.3.3 Refinements to Maintenance of Way Facilities

Table C-6 summarizes the refinements the Project Sponsor has made to the maintenance of way facilities since the 2018 *Alternatives Report*.

Table C-6: Summary of MOW Options Refinements

New Design Standard	Maintenance of Way Design Refinement
One midway MOW facility	BARC Airstrip TMF: adjacent to TMF BARC West TMF: adjacent to TMF MD 198 Option: adjacent to BWP and Alignments J and J1, South Laurel, MD
One additional MOW facility in Baltimore	Camden Yards Station Option: Waterview Ave, Baltimore, MD Cherry Hill Station Option: Annapolis Road/Patapsco Avenue intersection, Baltimore, MD
Larger size of the MOW facilities to accommodate activities, vehicles, and materials	Camden Station MOW facility area: 16 acres TMF MOW facility areas: 12 acres each

Source: AECOM 2020.

C.3.4 Station Refinements

The Project Sponsor made no substantive changes to the BWI Marshall Airport or Camden Yards Station aside from the addition of a proposed MOW facility in the Cherry Hill area if the Camden Yards Station option is selected. However, refinements were made to the Mount Vernon East Station and the Cherry Hill Stations. **Table C-7** summarizes the station refinements and the applicable design criteria.

Table C-7: Summary of Station Design Refinements

New Design Standard	Station Design Refinement
Mount Vernon Square East Station: <ul style="list-style-type: none"> • Provide underground pedestrian connection to adjacent convention center • Provide additional area for above ground station building and underground parking beneath the station • Provide additional underground space for SCMAGLEV operations control systems at station • Provide emergency egress and operational entrance to station • Address ramp connection at I-395 and New York Avenue NW to address roadway operations 	Mount Vernon Square East Station: <ul style="list-style-type: none"> • Added underground pedestrian connection from station to Walter E. Washington Convention Center at Mount Vernon Square • Provided additional area for the station building and underground station parking south of New York Avenue NW along the west side of 6th Street NW • Provided additional underground areas for SCMAGLEV operations control systems at New York Avenue NW and 4th Street NW and at New York Avenue NW and 1st Street NW • Provided emergency egress and operational entrance to the station in the block bounded by New York Avenue NW, First Street NW, N Street NW, and Second Street NW • Modified ramp geometry at I-395 and New York Avenue NW to improve roadway operations at that location

New Design Standard	Station Design Refinement
<p>Cherry Hill Station:</p> <ul style="list-style-type: none"> • Provide tail track to maximize operations efficiency 	<p>Cherry Hill Station:</p> <ul style="list-style-type: none"> • Approximately one-half mile of tail track on viaduct would be provided north of Cherry Hill Station on the east side of Kloman Street in the Westport area of Baltimore. The purpose of the tail track is to enable trains to change direction north of the station rather than use the operating tracks south of the station for that movement. By eliminating the use of the operating tracks south of the station as proposed in the 2018 <i>Alternatives Report</i>, the SCMAGLEV system operations schedule does not have to accommodate the time required at Cherry Hill Station to turn each train around and move to the tracks that operate in the opposing direction.

Source: AECOM 2020.

C.3.5 FA/EE Site Refinements

Refinements were made to the locations and configurations of the FA/EE sites to coincide with the revised Alignments J and J1 and to achieve recently adopted design criteria. The recently adopted design criteria take into consideration U.S. safety regulations and codes that affect facility design and operations, such as the Americans with Disabilities Act of 1990 (ADA). DEIS Section 4.24 Safety provides more detail on applicable regulations that have been accommodated in the recently adopted design criteria. The design criteria require FA/EE sites to be more closely spaced along the underground portions of Alignments J and J1 than the up-to four-mile spacing considered in the 2018 *Alternatives Report*. The FA/EE sites are now spaced at 3.1 to 3.7 miles apart. The purpose of closer spacing is to provide more frequent emergency egress points along the tunnel sections. In response to the recent design criteria, the Project Sponsor added two new FA/EE sites to achieve the design criteria. The recently adopted design criteria also requires an increase in the size of two FA/EE sites from the previously studied 3 acres to 6 to 7 acres. The increase in size is required to accommodate a larger capacity facility.

The Project Sponsor has designed the sites to also serve as launch sites for tunnel boring machines (TBMs) during construction.

Table C-8 summarizes the refinements made regarding FA/EE sites.

Table C-8: Summary of FA/EE Site Design Refinements

New Design Standard	Fresh Air and Emergency Egress Site Design Refinement
<p>Increase number of sites to provide more frequent emergency egress points; increase size of two sites to accommodate a larger capacity facility</p>	<p>Alignment J and Alignment J1 Site Locations:</p> <ul style="list-style-type: none"> • New York Avenue NW at Montana Avenue NW, Washington, D.C.: 3 acres • Kenilworth Avenue near Lloyd Street, Hyattsville, MD: 3 acres • Riverdale Road near Auburn Avenue, Riverdale, MD: 3 acres • North of Connector Road, Fort Meade, MD: 3 acres • Railroad Avenue at MD 176, Harmans, MD: 7 acres • Harman’s Road at MD 100, Hanover, MD (new site): 3 acres • Mathison Way, BWI Marshall Airport, MD (new site): 3 acres • MD 170 at South Camp Meade Driver, BWI Marshall Airport, MD: 3 acres • I-895 near Annapolis Road, Halethorpe, MD: 6 acres

Source: AECOM 2020

C.3.6 Power Facilities Refinements

The locations of power substations were also revised to be consistent with other refinements of the Project and to coincide with Alignments J and J1. Conceptual areas for connection to the existing electric power system (BGE and PEPCO) were also developed.

Electric Power Connections. The Project Sponsor identified the points of connection to the existing electric power grid by identifying major utility facilities that potentially have the capacity to supply the power needs of the SCMAGLEV Project because the utility facilities convey a relatively large amount of power today. For example, BGE’s Pumphrey Substation is a very large utility facility that covers approximately 30 acres and, together with BGE’s network of substations, conveys electric power to more than 1.25 million customers in central Maryland, according to their website www.bge.com.

Electric Power Substations. The recently adopted design criteria specify location, spacing, and dimensions for power substations. Power substations must be adjacent to or incorporated within the facility to which the power station would supply power. For example, power substations along the alignment routes must be adjacent or very close to the guideway. Each substation would be sized to accommodate the equipment required for each station. The Project Sponsor anticipates housing most electrical equipment in multiple buildings at each power substation. The typical height of power substation facilities would be approximately 40 feet. Power substations would be located as needed along Alignments J and J1 to supply power to the SCMAGLEV system. Since the 2018 *Alternatives Report*, the Project Sponsor added two substation locations and increased the size of two previously considered substation locations to achieve the design criteria and accommodate electric power needs. **Table C-9** summarizes the refinements made regarding power substations.

Table C-9: Summary of Power Substation Design Refinements

New Design Standard	Power Substation Design Refinement
Increase number and area of power substations to accommodate electric power needs	<p>Alignment J and J1 Power Substation Locations:</p> <ul style="list-style-type: none"> • Adjacent to an existing PEPCO substation along Harry Thomas Way NE, Washington, D.C. (potential, new): 2 acres • New York Avenue NW at Adams Place NE, Washington, D.C. (enlarged): 14 acres • Annapolis Road at Hoffman Avenue, Halethorpe, MD (new): 20 acres • Annapolis Road at Clare Street, Westport, MD: 7 acres <p>Alignment J: Additional Substation Location:</p> <ul style="list-style-type: none"> • BWP/MD 197 interchange, Laurel, MD (enlarged): 12 acres <p>Alignment J1: Additional Power Substation Location:</p> <ul style="list-style-type: none"> • Airfield, Brock Bridge Road, Laurel, MD: 20 acres <p>BARC Airstrip TMF:</p> <ul style="list-style-type: none"> • Springfield Road, Glenn Dale, MD: 5 acres • BARC airfield, Glenn Dale, MD: 5 acres <p>BARC West TMF:</p> <ul style="list-style-type: none"> • Entomology Way, Beltsville, MD: 5 acres • Powder Mill Road, Beltsville, MD: 5 acres <p>MD 198 TMF:</p> <ul style="list-style-type: none"> • Old Portland Road near MD 198, Laurel, MD: 5 acres • Center Avenue near MD 198, Laurel, MD: 5 acres

Source: AECOM 2020.

Electric Power Lines. The Project Sponsor developed a conceptual design of electric power service lines for the SCMAGLEV project. The conceptual design was guided by codes and regulations for electric power service, including but not limited to: the Federal Energy Regulatory Commission, the Code of Maryland (COMAR 20.50.12.11), and Pennsylvania-New Jersey-Maryland (PJM) Interconnection (a regional transmission organization that is a coordinator of wholesale electric supply movement in MD). Electric power lines would supply power from the source to the guideway and ancillary facilities. Overhead electric power lines are proposed in the following areas: from the existing electric supply sources to SCMAGLEV systems substations; and from SCMAGLEV substations to each SCAMAGLEV facility. Overhead power lines from the electric source to SCMAGLEV substations would be supported on towers or monopole structures similar to regional overhead power systems. Overhead power lines from SCMAGLEV substations to each SCMAGLEV facility would be supported on utility poles similar to those in public transportation rights of way or may be attached to or incorporated within SCMAGLEV structures, such as the viaduct. During subsequent

design and in coordination with electric utility providers, the Project Sponsor will refine the design of electric power lines for the SCMAGLEV Project.

C.3.7 Operations, Signals, and Communications Facilities Refinements

The Project Sponsor refined the locations of operations, signals, and communications facilities and developed conceptual areas for these SCMAGLEV Project facilities. The design criteria for SCMAGLEV operations, signals, and communications require that such facilities are adjacent to or incorporated within the facility that is controlled. For example, operations, signals, and communications facilities along the alignment must be adjacent or very close to the guideway. A primary Operations Control Center is required, and it must be supported by auxiliary control facilities along the alignment. Signal and communication facilities must be provided throughout the SCMAGLEV system to maintain train control; operate the trains, guideway, and ancillary facilities; communicate among SCMAGLEV personnel at all system locations; and communicate in the event of an emergency situation.

C.3.8 Major Utility Relocation Refinements

The Project Sponsor refined the locations of SCMAGLEV Project impacts to major utility facilities, and developed conceptual areas for relocating the impacted portions of those facilities either by raising the utilities, such as overhead power lines, or by burying the utilities below ground at the point of SCMAGLEV Project intersection.

The design criteria for operation of a SCMAGLEV system requires physical separation of the guideway and ancillary facilities from intersecting major utilities. To accommodate these requirements, a SCMAGLEV system should be located greater than those required distances from major utilities; or, if achieving the required distance of separation is not reasonably feasible, the major utilities must be relocated to achieve the required distance of separation. The Project Sponsor determined that because the major utilities that intersect the SCMAGLEV Project are long-distance, linear corridors that are oriented perpendicularly to the SCMAGLEV Project, it is not reasonably feasible to avoid a conflict with the utilities. For this reason, the Project Sponsor proposes to raise or bury the portions of the major utilities at the points of intersection with the SCMAGLEV Project to achieve the required distance of separation.

C.3.9 Relocation of Public Roadways Refinements

The Project Sponsor identified and developed conceptual designs to relocate portions of several existing roadways. During subsequent design, the Project Sponsor will coordinate with existing roadway operators to further develop the relocation designs and obtain approvals for roadway relocations. The Project Sponsor will relocate existing roadways prior to the start of SCMAGLEV Project construction.

C.3.10 Stormwater Management Refinements

The Project Sponsor further developed and refined the conceptual design of stormwater management facilities for the SCMAGLEV Project. Stormwater would be managed by a combination of manmade structures that would be designed to collect and convey water from impervious surfaces to existing waterways without causing flooding or other water-related problems such as ponding. Stormwater management facilities must be adjacent to or incorporated within the facility from which the drainage water would be collected. For example, stormwater management facilities along the alignment routes must be adjacent or very close to the guideway.

C.4 Definition of Alternatives

Based on the previous studies and refinements noted between 2018 and 2020, the Project Sponsor defined a set of Build Alternatives for consideration in this DEIS.

Table C-10, DEIS Build Alternatives, provides an overview of the major Project elements – alignment, station, and TMF locations for a total of twelve Build Alternatives. Each Build Alternative has the same operational characteristics and requires the same ancillary facilities, although the specific locations of the ancillary facilities may vary to coincide with other Project elements.

Table C-10: DEIS Build Alternatives

Build Alternative	Alignment	Stations				TMF		
	BWP	Mount Vernon Square East	BWI Marshall Airport	Cherry Hill	Camden Yards	BARC Airstrip	BARC West	MD 198
J-01	EAST	✓	✓	✓	-	-	-	✓
J-02	EAST	✓	✓	✓	-	✓	-	-
J-03	EAST	✓	✓	✓	-	-	✓	-
J-04	EAST	✓	✓	-	✓	-	-	✓
J-05	EAST	✓	✓	-	✓	✓	-	-
J-06	EAST	✓	✓	-	✓	-	✓	-
J1-01	WEST	✓	✓	✓	-	-	-	✓
J1-02	WEST	✓	✓	✓	-	✓	-	-
J1-03	WEST	✓	✓	✓	-	-	✓	-
J1-04	WEST	✓	✓	-	✓	-	-	✓
J1-05	WEST	✓	✓	-	✓	✓	-	-
J1-06	WEST	✓	✓	-	✓	-	✓	-

Notes:

1. **Alignment** = alignment between station limits and ancillary facilities (fresh air and emergency egress sites; stormwater management; substations; and portal areas)
2. **Stations** = station footprint and parking (if parking is included at the station), plus surface access points, underground access tunnels to the stations or parking, and maintenance of way facility in the case of the Camden Yards Station Option
3. **TMF** = TMF footprint (includes the connecting tracks, portals and cut/cover areas) plus maintenance of way facilities

Source: AECOM 2020.