Chapter 3

Alternatives Considered

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION

U.S. Department of Transportation
Federal Railroad Administration

MARYLAND DEPARTMENT OF TRANSPORTATION

Chapter 3: Alternatives Considered

This chapter describes the Superconducting Magnetic Levitation Project (SCMAGLEV Project) technology, summarizes the alternatives development and screening process, and defines the alternatives evaluated in this Draft Environmental Impact Statement (DEIS). The Appendix B Mapping Atlas provides a graphical illustration of the Build Alternatives discussed below.

The Federal Railroad Administration (FRA) considered the No Build Alternative and Build Alternatives that focus on implementation of a SMAGLEV system. FRA did not include the evaluation of other transportation modes for the Build Alternatives because modes other than SCMAGLEV technology would not achieve the SCMAGLEV Project Purpose and Need, as discussed in Chapter 2, nor be consistent with the FRA's Record of Decision (ROD) for the Programmatic Environmental Impact Statement (PEIS) for the Maglev Deployment Program (MDP) (see Section 1.2.1) and subsequent Federal legislation supporting development of an SCMAGLEV system between Washington, D.C. and Baltimore, MD.

As such, the Build Alternatives focus on the SCMAGLEV technology and related infrastructure, such as stations, trainset maintenance facility (TMF), and other ancillary facilities needed to support the operation of the SMAGLEV system. Additional details regarding the alternatives' evaluation process are provided in Appendix C, as well as in the *Preliminary Alternatives Screening Report* (January 2018) and the *Alternatives Report* (November 2018), which are available on the project website (www.bwmaglev.info).

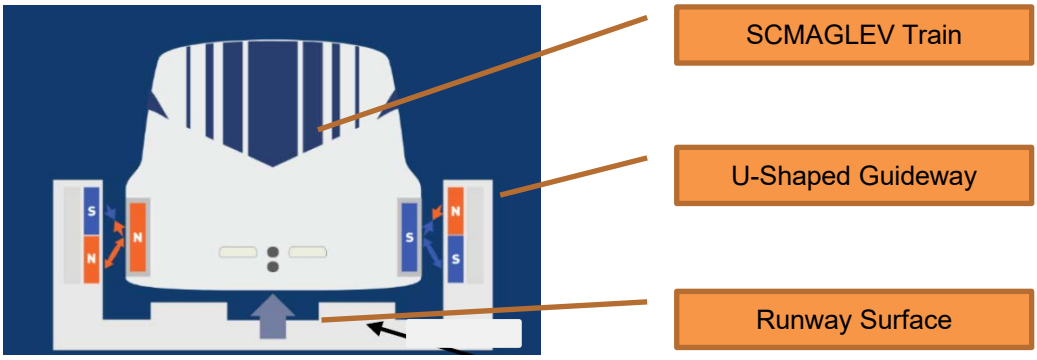
FRA is not presenting or evaluating a Preferred Alternative in this DEIS. Each alternative will be analyzed and evaluated throughout this DEIS. FRA will rely on the evaluations, agency and public input to inform a decision on the Preferred Alternative after the public comment period for this DEIS.

The Project Sponsor, Baltimore-Washington Rapid Rail (BWRR), has identified its Preferred Configuration which is discussed in Section 3.5.

3.1 SCMAGLEV Technology

SCMAGLEV is a transportation technology developed by the Central Japan Railway Company (JRC), but not currently in operation in the United States. The SCMAGLEV system relies on powerful magnetic forces to operate and results in travelling speeds of over 300 miles per hour. Unlike typical electric trains in service in the United States, a SCMAGLEV system does not operate on standard steel railroad tracks. As shown in **Figure 3.1-1** below, SCMAGLEV trains levitate between the walls of a unique U-shaped concrete structure, known as a guideway, which has walls surrounding the trains on both sides, which prevents the SCMAGLEV system from derailment.

Figure 3.1-1: SCMAGLEV Guideway



Source: BWRR 2020

Powerful superconducting magnets on the trains and propulsion coils in the guideway walls generate the acceleration forces that drive the SCMAGLEV system. Direct links to power substations transfers the electrical power needed to operate the SCMAGLEV system along the guideway.

The design of SCMAGLEV technology is guided by meticulous criteria developed and refined based upon real-world engineering practice and experience in designing, building, and operating SCMAGLEV technology in Japan. The technology and infrastructure design criteria draw upon a combination of civil, physical, mechanical, electrical, and chemical engineering factors that enable safe and efficient operation of a SCMAGLEV system. Decades of real-world experienced-based factors and practices contribute to the design, construction, and operation of SCMAGLEV technology, which has been optimized to deliver precision system performance on desired outcomes related to system speed, efficiency, maintenance, and safety.

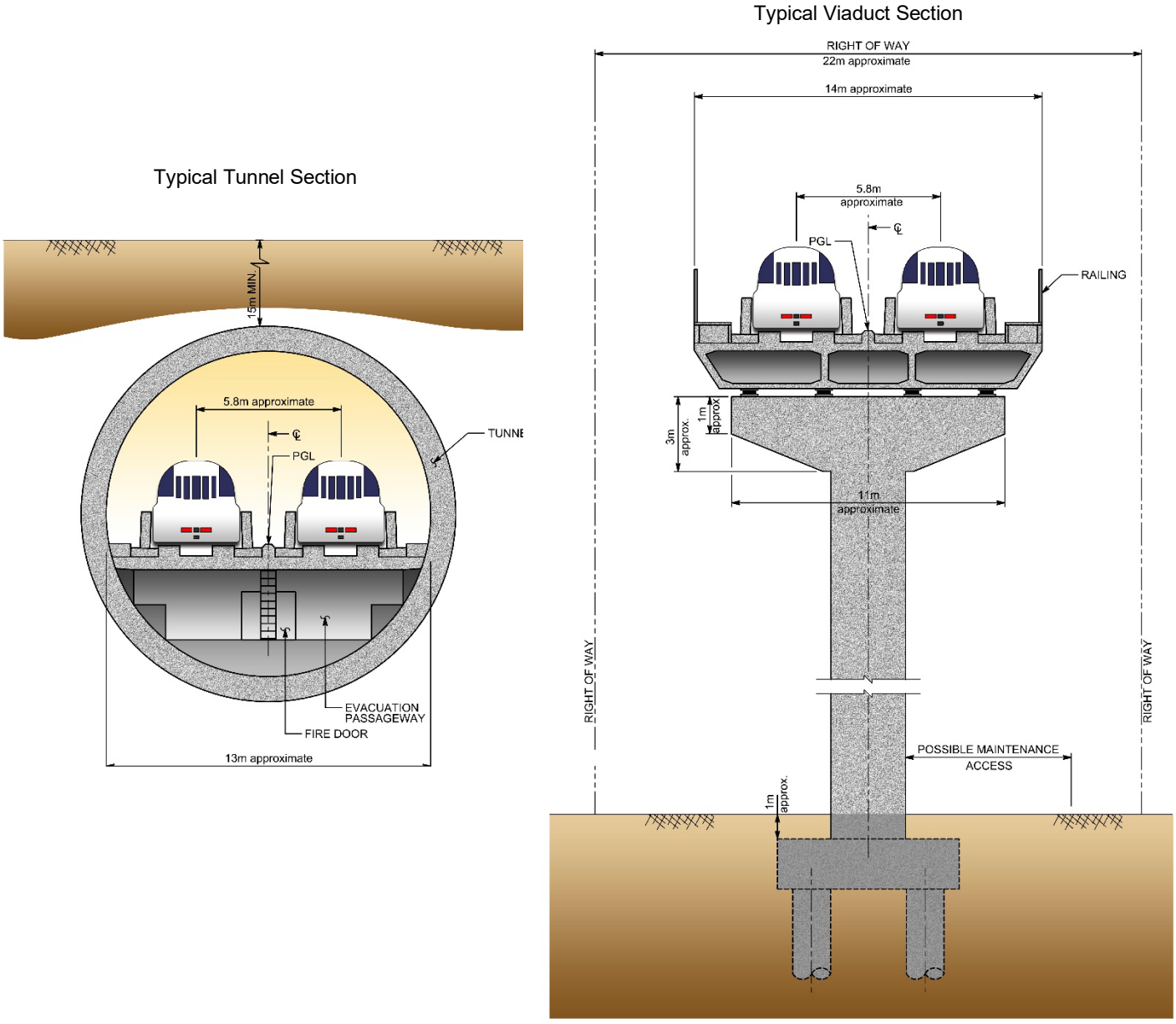
To achieve optimal performance, the Project Sponsor, in coordination with the SCMAGLEV technology owner JRC, has proposed a specific design, which constrains modifications to the overall system. For example, the SCMAGLEV alignment is designed with a certain curvature and geometry, which allows the SCMAGLEV train to achieve top speed. As a result, alterations to the guideway would have negative impacts on the system's performance, reliability, and financial viability. FRA considered these design constraints in its impact analysis, and recommendations for avoidance, minimization, and mitigation measures. FRA will continue to consult with the Project Sponsor to advance the engineering design and avoid and minimize impacts to the greatest extent feasible.

3.1.1 Dedicated Guideway

SCMAGLEV technology requires a grade-separated fixed guideway to operate. Grade-separated means that the guideway is not at ground level; it is either elevated above ground on a structure (viaduct) or below ground in a tunnel. The reason for grade-separation is to enable proposed operating speeds and eliminate ground level interference with existing roadways and railroads. The dedicated guideway is active

throughout a 24-hour period for either revenue service or maintenance. In general, guideway alignments that FRA evaluated in this DEIS follow existing transportation corridors and provide multimodal connections to existing Washington Metro Area Transit Authority (WMATA) and Maryland Department of Transportation/Maryland Transit Administration (MDOT MTA) transit services to the extent reasonably feasible. **Figure 3.2-1** illustrates the typical tunnel and viaduct sections.

Figure 3.2-1: Typical Tunnel and Viaduct Sections



Source: BWRR 2020

The tunnel segments would contain a single tunnel with an interior diameter of approximately 43 feet (13 meter) carrying two guideways. The tunnel sections would be constructed using a tunnel boring machine (TBM) at an average depth of approximately

80 to 170 feet. The viaduct would carry two guideways with a width of approximately 46 feet (14 meter) within a 72-foot (22 meter) right-of-way (ROW) and a height above the ground of at least 18 feet.

3.1.2 Ancillary Facilities

SCMAGLEV technology requires the following ancillary facilities to maintain operations and safety:

- Tunnel Portals – Tunnel portals are areas where the guideway transitions between viaduct and tunnel. For the SCMAGLEV Project, the portal length generally varies between 330 feet to 1,600 feet depending on SCMAGLEV design criteria and on-site conditions. During operation, a train would emerge from a tunnel in an area with walls on either side, transition to an area where the guideway would be supported on retaining walls and would then rise to a viaduct.
- Trainset Maintenance Facilities (TMF)[1] – A TMF is a facility for storing, maintaining, repairing, and cleaning the 16-car SCMAGLEV trains. The key elements at a TMF are a storage yard for trains; maintenance building for inspection, factory and repair shops; miscellaneous storage building; administrative offices; and employee/visitor parking. **Figure 3.4-5** shows a conceptual layout of a TMF.
- Maintenance of Way (MOW) Facilities – A MOW facility is an above ground location that consists of the offices, equipment, and materials for maintaining and repairing the SCMAGLEV guideway. The MOW has a crew that are dispatched to perform nightly inspection and maintenance operations along the guideway. Inspections would occur between 11:00PM and 5:00AM. A SCMAGLEV system may have one or more MOW facilities to accommodate the requirements to maintain and repair the guideway if needed.
- Stations – Stations are the points of passenger access to the SCMAGLEV system. Key elements of stations are access points; ticketing and waiting concourses; boarding platforms; operational spaces; passenger parking; pick-up and drop-off areas; and ground transportation connection areas. Stations would be in operation during service hours of 5:00AM until 11:00PM.
- Fresh Air and Emergency Egress (FA/EE) Sites[2] – Provide fresh air circulation during normal operations to underground facilities including tunnels and stations and in the event of an emergency provides evacuation facilities from the tunnel to the ground surface. FA/EE sites, located between 3.1 and 3.7 miles apart along tunnel guideway sections, are enclosed in above ground buildings with an access road connection to a public street. In addition to fan equipment, airshafts and emergency exits, the sites house control facilities and emergency response equipment.

[1] In the 2018 *Alternatives Report*, a TMF was referred to as a rolling stock depot or RSD facility. [2]

In the 2018 *Alternatives Report*, FA/EE Sites were referred to as vent plants.

- Power Facilities – SCMAGLEV technology requires power substations near or at each TMF, station, and approximately every 12 to 16 miles along the guideway route, including tunnel and viaduct sections. Substations provide power to the SCMAGLEV guideway and propulsion systems, and power all operations and maintenance facilities including FA/EE's and other ancillary signals and communications equipment. Substations can be built above or below ground, and possibly combined with other facilities.
- Operations Control Center - The Operations Control Center (Center) manages all operations related to the SCMAGLEV technology: train movements, safety and emergency activities, power usage, and operations according to the established schedule. Generally, the center is located at a station or at a TMF.
- Signals and Communications - Additional SCMAGLEV system facilities along the guideway route provide signals and communications required for safe and efficient operation of the overall SCMAGLEV system technology. Signal and communication equipment are typically housed in buildings adjacent to and at intervals along the guideway; the equipment is interconnected by means of underground wiring in conduit, which in turn, is connected to the Operations Control Center.

3.2 Alternatives Development Process

FRA published a Notice of Intent (NOI) in November 2016, announcing the intent to prepare an EIS for the SCMAGLEV Project. The NOI initiated formal scoping to obtain input from the public and agencies on process and alternatives to be considered. The geographic area of study during screening (referred to as the corridor) is approximately 40 miles between Washington, D.C. and Baltimore, MD.

During scoping, FRA and MDOT MTA conducted a multi-step screening process to evaluate design options and to identify potential routes for an SCMAGLEV system, as well as related facilities such as stations where passengers would access the system, facilities for the maintenance of the system, and substations to provide power to the SMAGLEV system. The alternatives comprise potential routes and related facilities proposed by BWRR. The screening process re-examined previously studied alternatives and considered new alternatives. In addition to considering SCMAGLEV system alternatives, FRA and MDOT MTA defined a No Build Alternative that was carried forward through the screening process.

Screening included public and agency outreach and input that informed the decision-making processes by evaluating the benefits and impacts of routes and facility elements. The screening process resulted in two reports: the *Preliminary Alternatives Screening Report*, January 2018 (PASR) and the *Alternatives Report*, November 2018 (summarized below). Both documents are available on the project website (www.bwmaglev.info). A summary of these screenings is provided below; Appendix C provides additional information on the alternatives' development process.

3.2.1 Preliminary Alternatives Screening Report

The PASR identified a reasonable range of alignments and possible station locations, proposed by BWRR, for the SCMAGLEV project. Fourteen initial alignments were screened for fatal flaws to identify alignments at meet the geometric requirements necessary to achieve and maintain optimum operating speed of the SCMAGLEV system. BWRR as the project sponsor developed engineering criteria and concepts for the alternatives. Seven alignments were advanced to a second screening and evaluated against criteria including construction feasibility (total length, percent of elevated guideway, length of tunnel, and conflicts with existing transportation facilities), environmental features (residential and business property impacts and displacements, cultural resources, parks and Federal lands, and natural resources), and public comments. This screening eliminated four alignments. One additional alignment was eliminated based on public input received at public meetings in October 2017. The results of the screenings recommended further study of two alternatives Build Alternatives J (Baltimore-Washington Parkway (BWP) Modified-East) and Build Alternatives J1 (BWP Modified-West). These alignments each achieve the geometrical requirements for SCMAGLEV Project operation and, compared to the other alternatives, would include the following:

- Relatively fewer residential property acquisitions and displacements;
- Fewer visual and noise impacts to surrounding neighborhoods and communities because of a shorter elevated section;
- No impacts to other existing and planned mass transit facilities, including the NEC, planned Odenton Town Center Transit-Oriented Development at the MARC Odenton Station, and the MARC Seabrook Station; and
- Fewer impacts on parks and trails.

The PASR also evaluated potential station zones proposed by BWRR – five zones at the northern terminus in Baltimore, an intermediate stop at Baltimore-Washington Thurgood Marshall International (BWI Marshall) Airport, and four zones in Washington, D.C. FRA and MDOT MTA qualitatively assessed the stations zones for engineering (geometric and constructive feasibility) and operational constraints (intermodal connectivity). After screening, three Baltimore station zones, the BWI Marshall Airport station, and two Washington, D.C. station zones were retained.

3.2.2 Alternatives Report

The *Alternatives Report* documented the advancement of the alternatives' development process, including refinements to Build Alternatives J and J1 such as ancillary facilities. Ancillary facilities include potential station and TMF sites, power substations, EE/FA Sites, and potential tunnel boring machine (TBM) launch sites. In addition, the *Alternatives Report* developed station concepts in the remaining station zones and evaluated the concepts with respect to residential and business displacements, compatibility with existing and planned land uses, multimodal connectivity and parking,

environmental impacts (parks, historic properties, environmental justice communities), cost, constructability, and operations. This evaluation identified stations at Mount Vernon Square East in Washington, D.C., BWI Marshall Airport, and in Baltimore at Cherry Hill and Camden Yards for additional evaluation.

3.2.3 Alternatives Refinements

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

Based on the updated design criteria, the Project Sponsor re-evaluated the requirements for TMF sites and undertook an alternatives analysis to consider fourteen potential sites[3]. They considered smaller, disaggregated sites (approximately 120 acres), as well as single, consolidated sites (up to approximately 180 acres). Sites were evaluated for sufficient size and shape; proximity to the Washington, D.C. terminus station, between D.C. and Baltimore; proximity to the mainline alignment and suitable geometry and orientation of TMF ramp connections; worker and material delivery access; and impacts (residential relocations, wetlands, parks, and other notable features). The study concluded that the disaggregated footprints could not meet operational and maintenance requirements and eliminated these sites from consideration. Underground TMF options were also eliminated due to engineering challenges and cost, limiting viable TMF locations to those along aboveground portions of the alignment. Three TMF sites were selected for further evaluation – two on Beltsville Agricultural Research Center (BARC) property and one near the BWP/MD 198 interchange. These sites are known as BARC Airstrip TMF, BARC West TMF, and MD 198 TMF.

During development of this DEIS, the design criteria for SCMAGLEV technology has evolved, resulting in design refinements to achieve newly adopted design criteria. This resulted in shifts and new locations for some elements. This DEIS represents and evaluates those refinements resulting from newly adopted design criteria. For more information on the Alternatives Development Process see Appendix C.

3.3 Description of Alternatives

3.3.1 No Build Alternative

The No Build Alternative, or no action alternative, is included in this analysis as the baseline for comparison with the SCMAGLEV Project. FRA's Procedures for Considering Environmental Impacts and the Council on Environmental Quality's (CEQ)

[3] BWRR, Baltimore-Washington SCMAGLEV Project Trainset Maintenance Facility (TMF) Alternatives Assessment Comparison, October 9, 2020 (see Appendix G.12).

regulations require consideration of a “no action” alternative. Under the no build scenario, the SCMAGLEV Project would not be constructed and would not provide a new transportation mode, and travel between Washington, D.C. and Baltimore, MD would continue along the existing transportation networks identified in this section. FRA defined the No Build Alternative to include the existing transportation network within the Project Study Area and additional planned and programmed network changes/improvements between current conditions and the 2045 horizon year. Network changes include modifications identified in the Constrained Long Range Plans (CLRP) of the Baltimore Metropolitan Council (BMC) and the Metropolitan Washington Council of Governments (MWCOG).

In addition, FRA acknowledges other major projects currently planned or under study (such as the Northeast Extension, The Loop, and other large-scale Public-Private-Partnership efforts) that are not yet programmed in the regional CLRPs but have been identified as important changes to the network by key stakeholders and elected officials.

To evaluate the No Build Alternative FRA considered the following planned and programmed transportation capacity improvements to existing modes between Washington, D.C. and Baltimore, MD:

- Major roadways between Washington, D.C. and Baltimore, MD
- Transit operations in Washington, D.C. BWI Airport, and Baltimore, MD
- Commuter rail operations between Washington, D.C. and Baltimore, MD
- Intercity rail operations between Washington, D.C. and Baltimore, MD

3.3.1.1 Major Roadway Improvements

Major north/south roadways in the Project Study Area include I-95, the Capital Beltway (I-495), I-97, US 1, US 29, and the BWP. Major east/west roadways in the Project Study Area include Maryland Routes 100, 175, 32, 197, 198, 450, 200 (also known as the Inter-County Connector (ICC)), and 193. Relevant roadway projects considered in the No Build Alternative focusing on capacity and operations include:

- US 1 in Prince George’s County – expand to four lanes
- MD 450 (Annapolis Road) – expand to four lanes
- MD 175 in Howard County – widen from two to three lanes in Howard County and widen from four to six lanes in Anne Arundel County
- MD 100 – widen from four lanes to six lanes in Anne Arundel County
- MD 198 – widen from two lanes to four lanes between BWP and MD 32
- US 29 – widen from four lanes to six lanes in Howard County between Patuxent River Bridge and Seneca Drive
- I-495 & I-270 – Public-Private Partnership Managed Lane Study currently evaluating alternatives that address the needs to accommodate existing and

long-term traffic growth, enhance trip reliability, expand travel options, accommodate homeland security, and improve the movement of goods and services. Build alternatives under consideration include evaluation of express toll lanes.

3.3.1.2 Passenger Rail Service

Commuter Rail Service – Maryland Area Regional Commuter (MARC)

MARC commuter rail service runs between downtown Baltimore and downtown Washington, D.C. on Amtrak's Northeast Corridor (NEC). The regional CLRPs show nearly $1.5 billion of funding committed to improvements on MARC service. Specific projects are not yet delineated in the CLRPs, but the MARC Growth and Investment Plan provides an understanding of the types of improvements that would ultimately be incorporated. These include:

- Station improvements or station re-builds; such as improvements to passenger amenities, platform construction/reconstruction/extensions, safety improvements such as Closed-Circuit Television (CCTV), additional bike racks, and Americans with Disabilities Act (ADA) modifications
- Maintenance and train storage improvements like capacity expansions and equipment improvements
- Parking expansion at multiple stations on both the Camden and Penn Lines
- Expanded rail capacity through track additions and reconfigurations, such as a third track on the Camden Line
- Expanded capacity at Washington Union Station
- Purchase of new coaches to maintain state of good repair and support expansion of service

Intercity Rail Service - Amtrak

Amtrak runs intercity rail service on the NEC between Boston, MA and Washington, D.C. In the Project Study Area, Amtrak Northeast Regional service stops at Baltimore Penn Station, Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport Station), and Washington Union Station for all trains, and at New Carrollton for select trains. Amtrak Acela Express service stops at Baltimore Penn Station and Washington Union Station.

FRA's 2017 Record of Decision for the NEC FUTURE program identifies service and performance objectives to improve rail service on the NEC. To meet these service and performance objectives, FRA recommended the following improvements within the Project Study Area that would allow for an increased number of daily trips and shorter travel times on both Amtrak and MARC commuter service:

- Chokepoint relief projects at three locations:

  - Reconstruct New Carrollton Station to have four platform tracks, thus permitting express and local trains serving the station to operate on separate tracks
  - Reconstruct Odenton Station, resulting in island platforms that allow Amtrak trains to stop at station on express tracks
  - Reconstruct BWI Marshall Airport Station with a new platform and improvements to existing platforms to accommodate upgrades to four tracks through the station (this is a related project to NEC FUTURE)
- New Track Capacity
  - Expand track capacity from New Carrollton to Halethorpe to a consistent four tracks, from the current two/three track configuration
- Signals
  - Provide systems upgrade to high density signaling to meet service and performance objectives

In addition to the NEC FUTURE program, there are related projects on the NEC that are moving forward separately, but would have an impact on intercity rail in the Project Study Area:

- Replacement/Rehabilitation of the Baltimore and Potomac (B&P) Tunnel – The B&P Tunnel runs under West Baltimore and provides access to Baltimore Penn Station from the west. Planning for the replacement or rehabilitation of the tunnel is moving forward as a project separate from the NEC FUTURE program but would have a significant impact on MARC and Amtrak service in the Project Study Area by allowing for higher speeds/shorter travel times.
- BWI Marshall Airport Rail Station Improvements and Fourth Track Project - The project includes providing a new platform, improvements to the current station, with possible multi-level transit-oriented development and addition of nine miles of the fourth track along the NEC generally between Odenton Station and Halethorpe Station.

Each of these improvements to the NEC would allow for capacity expansion, more frequent service on both MARC and Amtrak within the Project Study Area as well as shorter travel times between Washington, D.C. and Baltimore, MD.

Local Transit Service

A highly developed transit network consisting of local bus, express bus, light rail and heavy rail exists within the Project Study Area. Operators include the MDOT MTA, the Regional Transit Authority (RTA), WMATA, the District of Columbia Department of Transportation (DDOT), and contract operators. Section 4.2 presents a more detailed discussion of these operators and their services.

Transit improvements identified in the regional CLRPs include:

- MDOT MTA Bus Expansion Program
- Bus Rapid Transit to BWI Marshall Airport - from Dorsey MARC Station to BWI Light Rail Station
- US 29 Bus Rapid Transit service
- D.C. Streetcar Expansion

As noted above, under the No Build Alternative, other planned and funded transportation projects would be implemented in the region and would result in improved capacity of the regional transportation network for existing modes. However, these transportation projects would not likely fully achieve the capacity needed to keep pace with the region's population and employment growth. The No Build Alternative also does not support or provide a complementary alternative to future rail expansion opportunities on adjacent corridors. As such, the No Build Alternative does not meet the purpose and need of the SCMAGLEV Project.

3.3.2 Build Alternatives

The SCMAGLEV Project would provide a new transit service between Baltimore and Washington, D.C., that supplements other planned and programmed projects and helps alleviate transportation concerns in the region. This section defines the Build Alternatives and describes the various project elements that when combined create multiple Build Alternatives. Each Build Alternative consists of an alignment for the dedicated guideway, three stations, one TMF, and other ancillary facilities:

- Each Build Alternative follows the same common alignment in deep tunnel from the Washington, D.C. Station to just west of the Anacostia River. The alignments then split and follow along either the east or west side of the BWP in a combination of deep tunnel and elevated viaduct. The alignments re-converge just north of MD 175 near Fort George G. Meade. The alignments then continue in deep tunnel north through the BWI Marshall Airport tunnel and ultimately terminate at the Cherry Hill Station or Camden Yards Station.
- Each Build Alternative includes one of two alignments - Build Alternatives J or J1, each with six variations that incorporate station and TMF options, as noted below. Both Build Alternatives generally follow a common route (described above) and the BWP; Build Alternatives J are on the east side of the BWP and Build Alternatives J1 are on the west side of the BWP.
- Each Build Alternative includes stations at three locations: in Washington, D.C.; at the BWI Airport; and in the Baltimore area. There are two options for the Baltimore area station – Cherry Hill or Camden Yards – each of which has a corresponding MOW facility and a Systems Operations Center.
- Each Build Alternative includes one TMF, which could be one of three locations adjacent to the alignment. A MOW facility is associated with each TMF. The location of the MOW is determined by TMF selected.

- Each Build Alternative would have the same types of ancillary facilities; however, the locations of these facilities may vary among the Build Alternatives. Locations of these facilities were determined based on operational requirements of the SCMAGLEV system. Where possible, ancillary facilities have been collated with other SCMAGLEV facilities.

Table 3.4-1 provides a summary of the DEIS Build Alternatives. **Figures 3.4-1, 3.4-2, 3.4-3, and 3.4-4** show the locations of each Build Alternative. Detailed mapping of the alternatives is found in Appendix B.1. See Appendix G.2 for more detailed engineering, including plan and profiles. Property would be permanently acquired (or use easements) for aboveground elements of the SCMAGLEV system, including viaduct and tunnel portal sections of the alignment, stations, TMF, and other facilities, and additional temporary acquisitions or easements may be required to facilitate construction. Appropriate subsurface easements would be acquired for tunnel sections and underground facilities. These impacts are discussed in Chapter 4. As planning and design for the project progresses, details related to building code requirements for utility connections, vehicular access, fire and safety, parking, and appropriate buffers or facility separation distances would be determined for each municipality.

Table 3.4-1: 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, substations, and employee parking) plus maintenance of way facilities

Source: AECOM 2020.

Figure 3.4-1: Build Alternatives J-01 through J-03 – BWP East with Cherry Hill Station

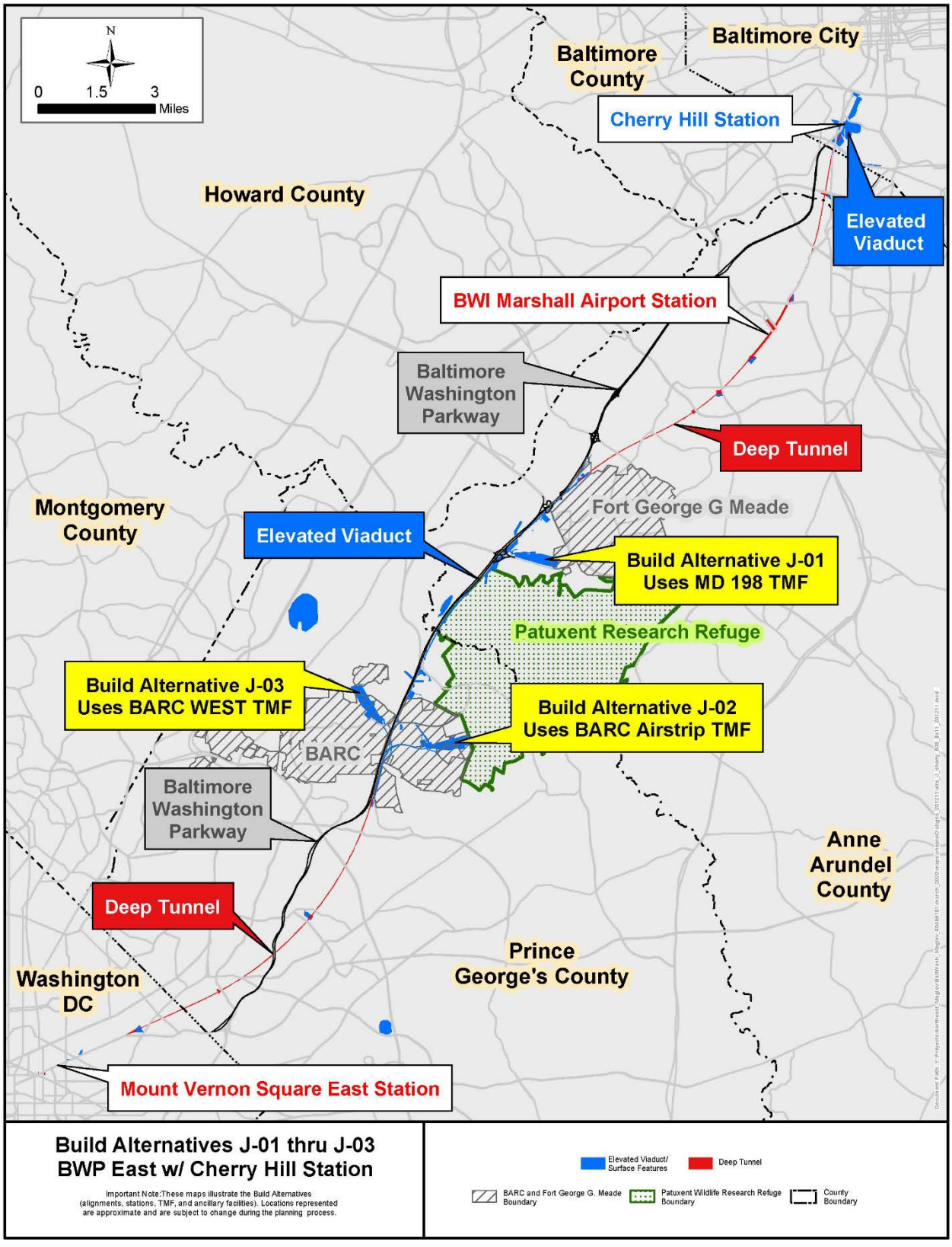


Figure 3.4-2: Build Alternatives J-04 through J-06 – BWP East with Camden Station

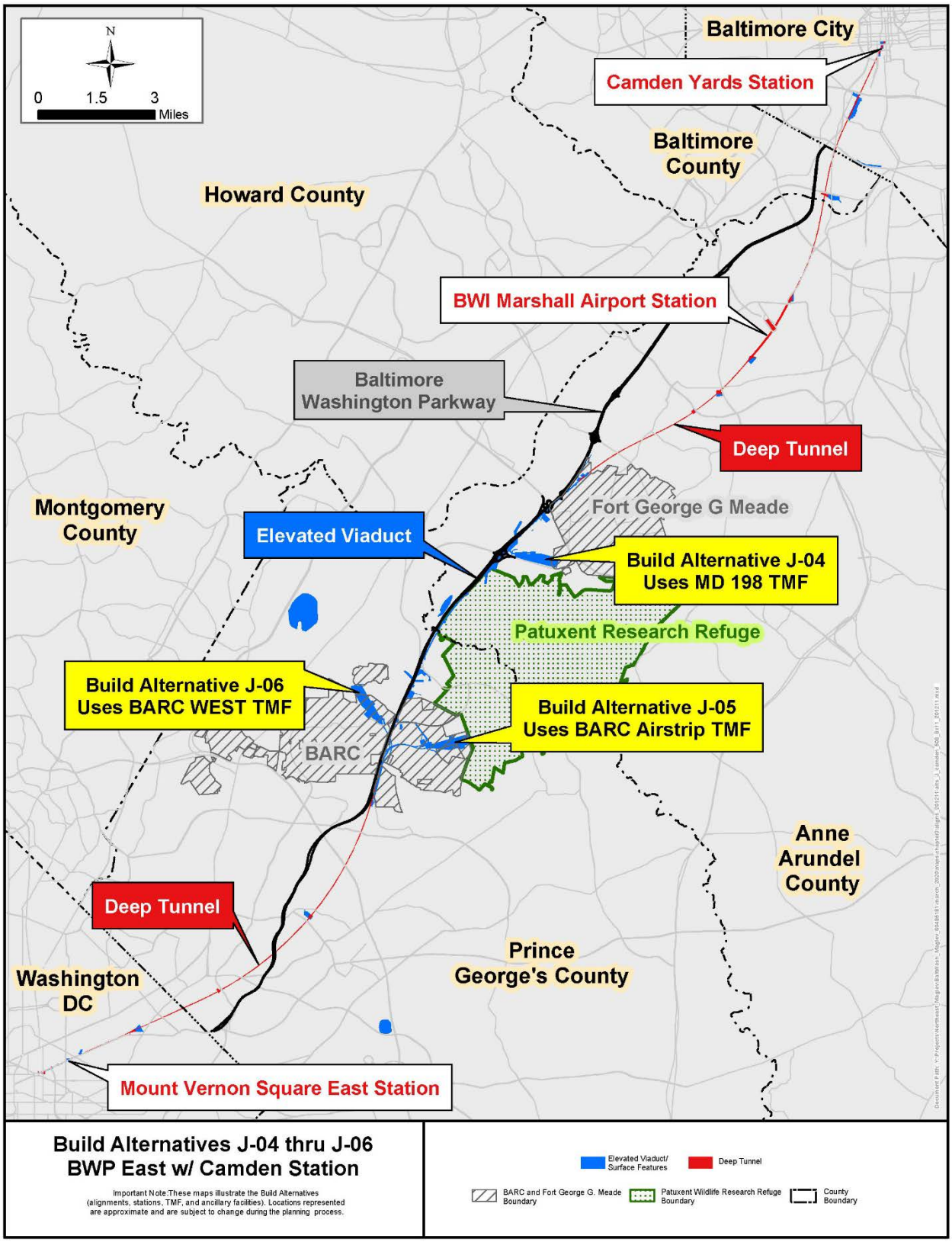


Figure 3.4-3: Build Alternatives J1-01 through J1-03 – BWP West with Cherry Hill Station

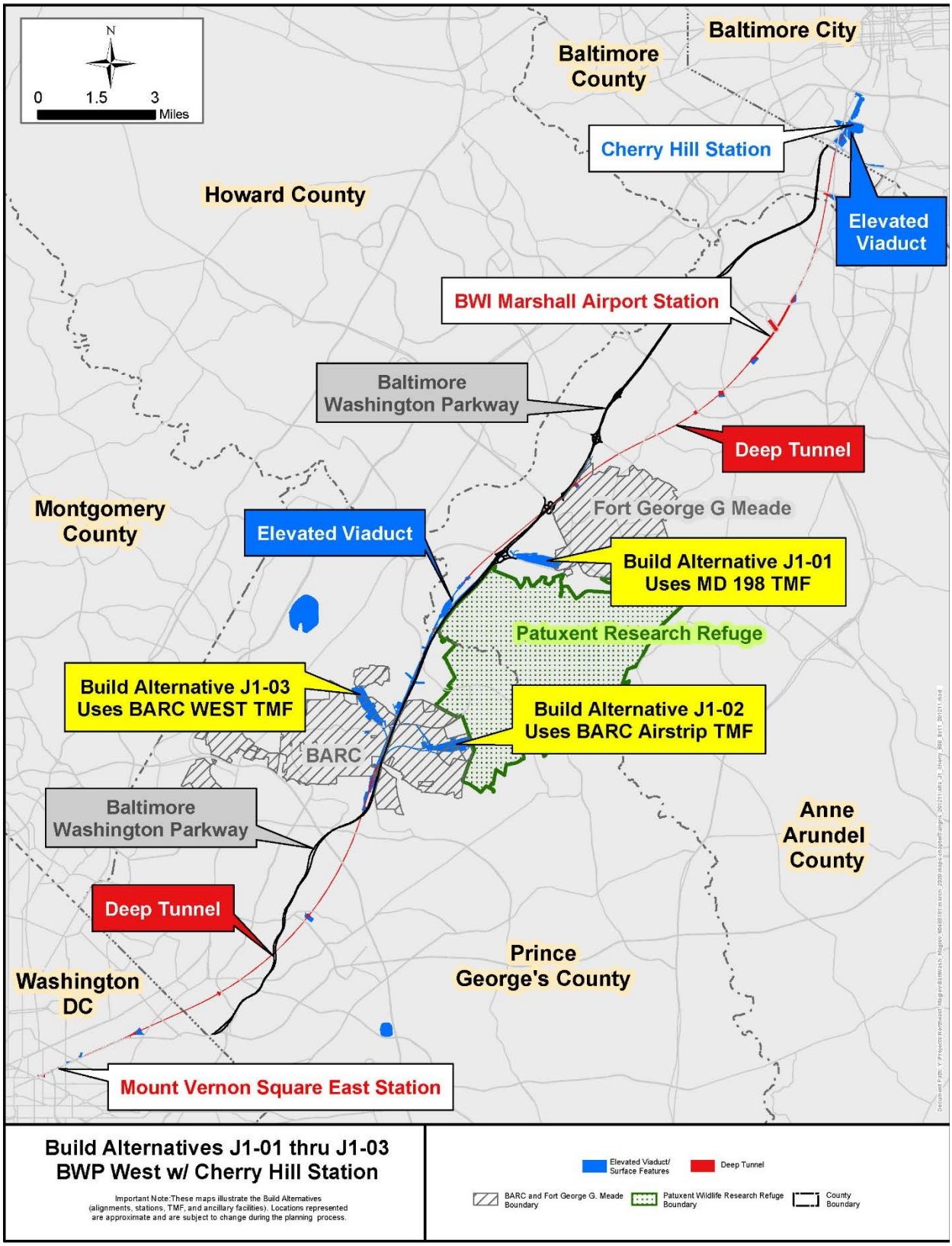
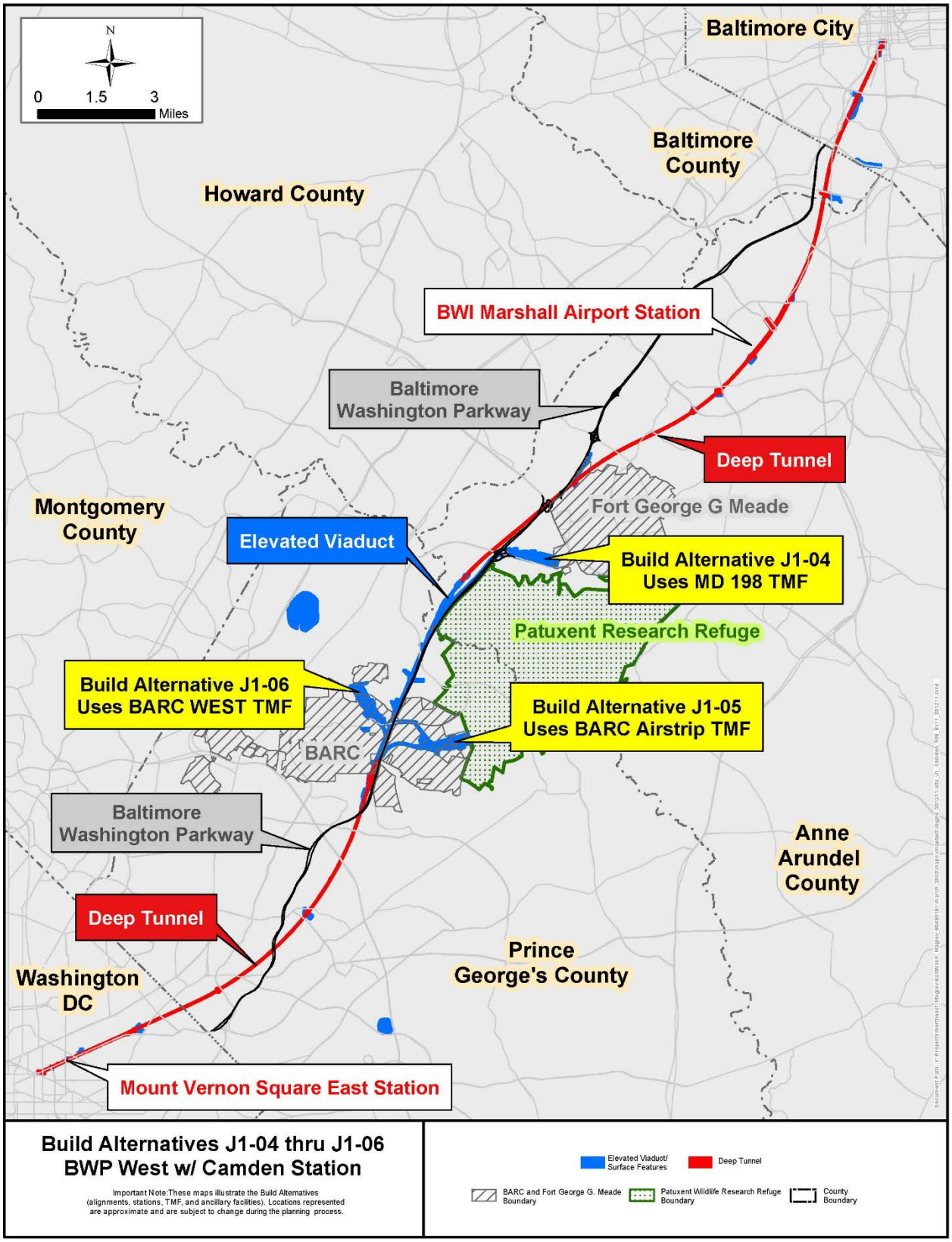


Figure 3.4-4: Build Alternatives J1-04 through J1-06 – BWP West with Camden Station



3.3.2.1 Alignment

FRA is considering two alignments: Build Alternatives J (BWP East) alignments and Build Alternatives J1 (BWP West) alignments. In each Build Alternative, a combination of underground tunnel and aboveground viaduct is proposed for the dedicated guideway. At the points where the guideway transitions between tunnel and viaduct, known as portals, the guideway would be in an open cut for a short distance. In an open cut, the guideway would be below ground level, but not covered with earth. Instead, the guideway would be covered by a hood structure as it rises out of the ground.

Generally, right of way width for aboveground viaduct sections would be approximately 72 feet. Fencing and other safety and security measures would be provided for ground facility features. Fencing would be installed in locations where the viaduct is less than 32.8 feet (10 meters) above the ground, as well as around SCMAGLEV facilities and equipment located adjacent to the viaduct and portal structures. Portions of the viaduct may be lit; however, the viaducts would not be continuously illuminated. **Table 3.4-2** provides a summary of the alignments.

Build Alternatives J (BWP East)

The Build Alternatives J alignments are a combination of tunnel sections and viaduct. Build Alternative J alignments extend 33 to 36 miles end-to-end, depending upon which Baltimore Station option is selected, and would average approximately 75 percent (or 25 to 27 miles) tunnel and 25 percent (or 8 to 9 miles) viaduct. Build Alternatives J (BWP East) includes a newly constructed independent station in Washington, D.C. (Mount Vernon Square East). The proposed alignment would be in a tunnel (see **Figure 3.4-1**) under Washington, D.C. from the southern terminus near Mount Vernon Square to east of the Capital Beltway (I-95/I-495). In this section, Build Alternatives J would be in a deep tunnel, typically 80 feet to 260 feet deep, with an optimum depth of approximately 320 feet and minimum depth equivalent to one tunnel diameter or approximately 50 feet.

After crossing under the Capital Beltway (I-95/I-495), the guideway would transition from tunnel to a viaduct, on the east side of the BWP between the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) overpass and Beaver Dam Road. A portal structure would transition the guideway between tunnel and viaduct. In Build Alternatives J alignments, the viaduct would be an optimum of 131 feet above ground level and 125 feet above the elevation of the northbound travel lanes of the BWP.

Build Alternatives J would generally follow the east side of the BWP travel lanes on viaduct through Federal lands including the BWP, the U.S. Department of Agriculture's Beltsville Agricultural Research Center (BARC), Patuxent Research Refuge (PRR), and Fort George G. Meade, and run adjacent to Federal facilities (U.S. Secret Service [USSS] and National Security Agency [NSA]) before returning to a tunnel on Fort George G. Meade. Build Alternatives J would continue north in tunnel toward a newly constructed underground BWI Marshall Airport Station. North of the airport, Build

Alternatives J would continue in a tunnel to Baltimore, MD. The northern terminus would be a newly constructed passenger station. **Table 3.4-2** summarizes the Build Alternatives J evaluated in the DEIS.

Build Alternatives J1 (BWP West)

The Build Alternatives J1 alignments a combination of tunnel sections and viaduct. Build Alternative J1 alignments would range in length approximately 33 to 36 miles, depending on the Baltimore Station option selected, and would average approximately 83 percent tunnel and 17 percent of a viaduct. Build Alternatives J1 (BWP West) would also include a newly constructed station in Washington, D.C. (Mount Vernon Station East). Similar to Build Alternatives J, Build Alternatives J1 would tunnel under Washington, D.C. from the southern terminus to north and east of the Capital Beltway. The guideway would be in a deep tunnel (typically 80 feet to 260 feet deep, with an optimum depth of approximately 320 feet) until crossing under I-95/I-495 (see **Figure 3.4-3**).

The guideway would transition to a viaduct, but unlike Build Alternatives J, Build Alternatives J1 would align on the west side of the BWP between the NASA GSFC overpass and Beaver Dam Road. Build Alternatives J1 would generally follow the west side of the BWP on a viaduct through BARC and BWP; then continue on a viaduct adjacent to residential developments in South Laurel. In Build Alternatives J1 alignments, the viaduct would be an optimum of 164 feet above ground level and 150 feet above the elevation of the northbound travel lanes of the BWP. The guideway would transition to a tunnel south of Maryland City and turn east towards a newly constructed independent underground BWI Marshall Airport Station. The guideway would continue in tunnel to Baltimore, MD. The northern terminus station would be a newly constructed independent station. **Table 3.4-2** summarizes the possible Build Alternatives J1 options.

Table 3.4-2: Summary of Build Alternatives J and J1 Alignments

Common Route	Unique Route – Build Alternatives J Alignments	Unique Route – Build Alternatives J1 Alignments
Build Alternatives J and J1 would be in tunnel in Washington, D.C., beginning at proposed Mount Vernon East Station near Mount Vernon Square; route is under New York Avenue NW Build Alternatives J and J1 would be in tunnel through BWI Marshall Airport area Build Alternatives J and J1 would be in tunnel from BWI Marshall Airport to Cherry Hill	Just north of Washington, D.C., the Build Alternatives J route (in tunnel) would shift to the east side of BWP Build Alternatives J would emerge from tunnel onto viaduct at Greenbelt near the USDA BARC and NASA Goddard properties Build Alternatives J would be on viaduct east of the BWP Build Alternatives J would return to tunnel from viaduct	Just north of Washington, D.C., the Build Alternatives J1 route (in tunnel) would shift to the west side of BWP Build Alternatives J1 would emerge from tunnel onto viaduct at Greenbelt near USDA BARC property Build Alternatives J1 would be on viaduct west of the BWP Build Alternatives J1 would return to tunnel from viaduct at Maryland City near Brock Bridge Elementary School

Common Route	Unique Route – Build Alternatives J Alignments	Unique Route – Build Alternatives J1 Alignments
and Camden Yards area of Baltimore Track extensions (Tail tracks, which allow for trains to park off of the mainline for storage) would rise from tunnel to viaduct north of Waterview Avenue in Baltimore as part of the Cherry Hill Station Option	north of MD 32 near Fort George G. Meade property	Build Alternatives J1 would remain in tunnel into Baltimore, ending at underground Camden Yards Station

Source: BWRR 2020.

3.3.2.2 Trainset Maintenance Facility

FRA considered three locations for the TMF, with only one location being required: the BARC Airstrip TMF, the BARC West TMF, and MD 198 TMF. The TMF location must be near the guideway; the preferred location is along the guideway rather than near an end point of the SCMAGLEV system. **Table 3.4-3** summarizes the location and elements of each TMF location.

Table 3.4-3: Summary of TMF Location Options

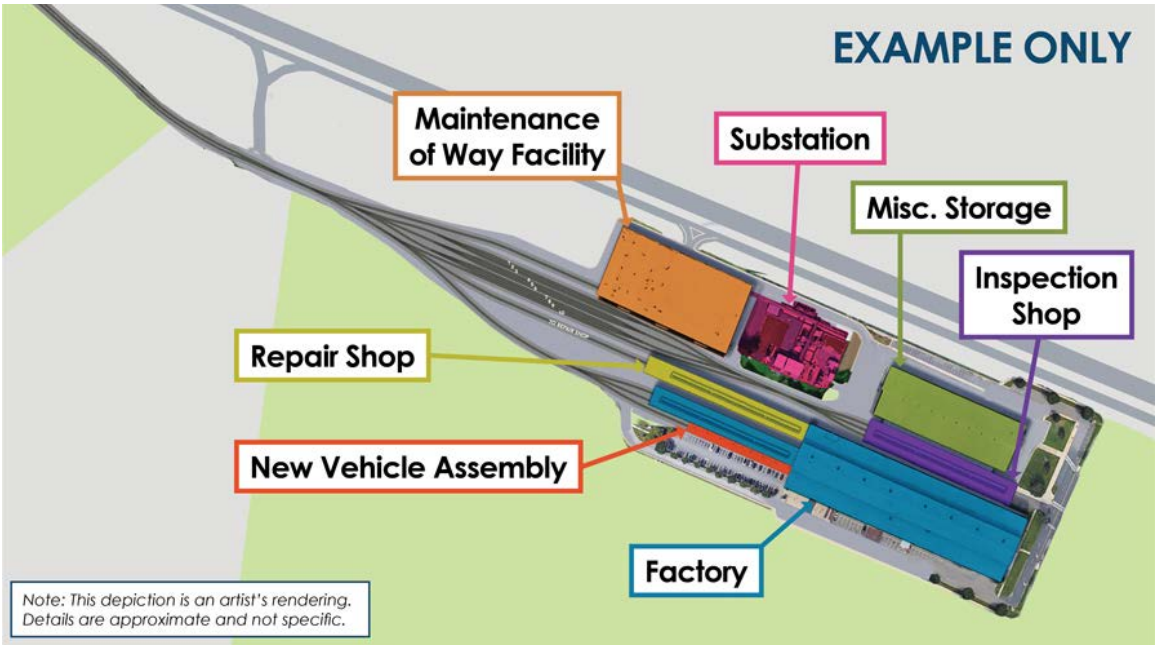
TMF Option	Location	Viaduct Ramps	Maintenance of Way Facility
BARC Airstrip	BARC airfield	Build Alternatives J connection: no new BWP crossing Build Alternatives J1 connection: one new BWP crossing	Adjacent to the TMF
BARC West	BARC forest at Entomology Road	Build Alternatives J connection: one new BWP crossing Alignments J1 connection: no new BWP crossing	Adjacent to the TMF
MD 198	Northeast quadrant of BWP/MD 198 interchange, Laurel, MD	Build Alternatives J connection: no new BWP crossing Build Alternatives J1 connection: one new BWP crossing	Build Alternatives J: near Beaver Creek Trail east of BWP Build Alternatives J1: near Springfield Road west of BWP

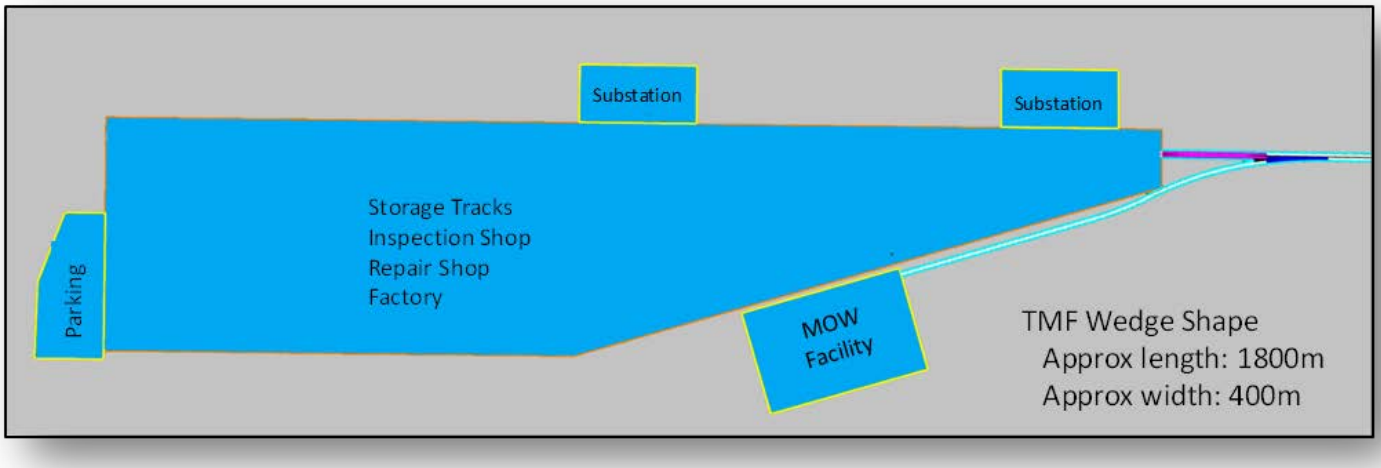
Source: BWRR 2020.

Operation of the SCMAGLEV system requires one TMF; as such only one location would be selected. To meet operational needs and activities, a TMF facility is up to 180 acres in size and generally rectangular wedge in shape. Each TMF would accommodate the full range of activities that typically occur at a SCMAGLEV TMF (for example, train storage, maintenance shops, factory and repair shops, cleaning facilities, train inspection facilities, offices, employee facilities, and on-site parking). Utilities to

these sites, including electric, communications, water and wastewater service will be determined during later phases of design. Utility requirements for these facilities would be similar to those for any commercial site, and it is assumed that local providers have capacity to provide these services. **Figure 3.4-5** shows a conceptual layout of a TMF. Appendices G.2-7 and G.12 include additional details regarding TMF elements and functions.

Figure 3.4-5: Conceptual TMF Layout





Source: BWRR 2020

The TMF consists primarily of a rectangular-wedge shape area with supporting power substations, MOW facility, and a 600- space employee parking facility. In addition, the recently adopted design criteria require an optimum grade of four percent on the two

ramp viaducts leading from the main alignment to each TMF to achieve required operational and safety criteria. A dedicated electrical power transmission corridor would connect the TMF substations to the SCMAGLEV Project power system along the alignment.

The MD 198 TMF is located near the BWP/MD 198 interchange. Because the site slopes downward toward the Little Patuxent River to the north and east, the Project Sponsor would provide up to 154 feet of fill to raise the site to a level grade. The fill would be supported by perimeter retaining walls. Ramp viaducts would connect the TMF to the guideway, with the length of the ramp based on optimum grade requirements set forth in design standards. For Build Alternatives J, the ramp viaduct would turn off the guideway viaduct just south of BWP/MD 198 interchange and turn east toward the MD 198 TMF; the length of each ramp viaduct would be approximately 0.7 to 1.1 miles. For Build Alternatives J1, the ramp viaduct would turn off the guideway 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; the length of each ramp viaduct would be 3.3 miles.

Two other TMF locations considered in this DEIS are known as BARC Airstrip TMF and BARC West TMF. Each of these options would be located on a portion of the USDA's BARC property. The BARC Airstrip TMF would be on the portion of the BARC property that is on the east side of the BWP, south of Powder Mill Road. The facility would be on an existing airfield. The surface of the BARC Airstrip TMF would be at approximately the same elevation as the existing ground surface at the airstrip.

The BARC West TMF would be on the portion of BARC property that is on the west side of the BWP. The facility would be on forested land between Powder Mill Road and Odell Road. Because the site slopes downward toward the northwest and Odell Road, the Project Sponsor would provide up to 56 feet of fill to raise the northwestern portion of the site to a level grade with the rest of the TMF site. The fill would be supported by perimeter retaining walls.

Two ramps on the viaduct would serve each TMF (BARC Airstrip TMF and BARC West TMF). The two ramps would branch off from the mainline alignment (both Build Alternatives J and J1) and parallel the alignment on BWP property before turning toward the TMF. The distances of the ramps along the mainline alignment and BWP property would be 1.6 miles for BWP Airstrip TMF and 1.4 miles for BWP West TMF. Build Alternatives J-02, J-05, J1-01, J1-02, J1-04, and J1-05 require configurations where access ramps to TMF sites would cross over the BWP property.

3.3.2.3 MOW Facilities

A MOW facility is an above ground location that consists of the offices, equipment, and materials for maintaining and repairing the system. A MOW facility is similar to a municipal public works yard, with one or two buildings, a parking area for vehicles, plus a ramp for maintenance vehicles to access the viaduct. **Figure 3.4-6** illustrates an

example of a standalone MOW facility with a maintenance vehicle access ramp. MOW facilities are depicted in the alternatives mapping in Appendix B.1.

The SCMAGLEV Project would include up to two MOW facilities depending on the Build Alternative. The location of each MOW facility is specific to the alignment and ancillary facility:

- Build Alternatives J and J1: A MOW facility associated with a TMF.
  - The MOW facilities associated with the BARC Airstrip TMF or the BARC West TMF would be located adjacent to each TMF. The MOW facilities adjacent to the BARC Airstrip TMF or the BARC West TMF would have dedicated access ramps to the guideway that are separate from the TMF ramps. The separate TMF ramps are required because maintenance operations are distinct activities that must be separated from operations activities.
  - The MOW facility associated with the MD 198 TMF would be located adjacent to Alignments J and J1. The location of the MD 198 TMF is different for each Build Alternative. The MOW facility along Build Alternatives J would be on the east side of the alignment and the BWP. Ramp access to the MD 198 MOW facility for Build Alternatives J would parallel Build Alternatives J and extend approximately 2 miles from the southern tunnel portal to the TMF, crossing beneath Build Alternatives J three times. The MOW facility along Build Alternatives J1 would be on the west side of the Build Alternative and the BWP. The ramp to the MD 198 MOW facility for Build Alternatives J1 would parallel Build Alternatives J1 and extend approximately two miles from the southern tunnel portal to the TMF. The optimum elevation of the ramps above the existing ground surface would be approximately 62 feet near Springfield Road (Build Alternatives J1).
- Cherry Hill Station Option: A MOW facility would be required at the Annapolis Road/Patapsco Avenue intersection if the Cherry Hill Station Option is selected for the Baltimore station.
  - If the Cherry Hill Station Option is selected, a second MOW facility would be provided near the Annapolis Road/Patapsco Avenue intersection in the Cherry Hill section of Baltimore. The ramp viaduct for the MOW facility would extend approximately 0.3 mile along the west side of the tunnel alignment to Cherry Hill Station.
- Camden Yards Option: A MOW facility would be required on the east side of Kloman Avenue, north of Waterview Avenue, if the Camden Yards Station Option is selected for the Baltimore station.
  - If the Camden Yards Station Option is selected, the MOW facility would be on the east side of Kloman Avenue, north of Waterview Avenue in the Cherry Hill/Westport section of Baltimore. The ramp viaduct for the MOW facility would extend northward approximately 2.3 miles underground in a tunnel alongside the mainline tunnel to access the alignment.

Figure 3.4-6: MOW Facility Illustration

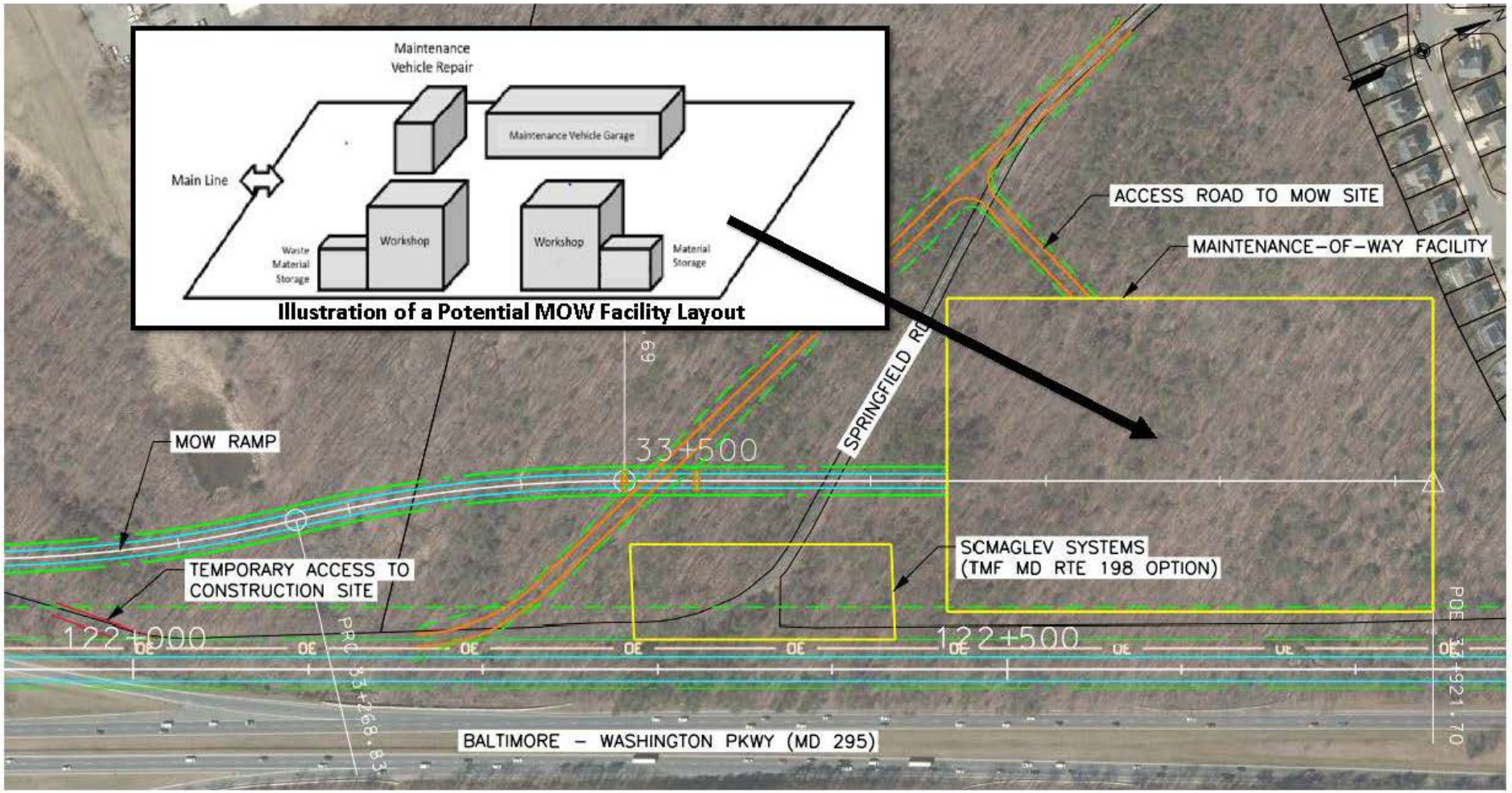


Illustration of a Proposed MOW Facility for the Build Alternatives J1-01 and J1-04 (MD 198 TMF)

Source: BWRR 2020

3.3.2.4 Stations

As described in Section 3.3.2, the SCMAGLEV Project would have three stations: a southern terminal station in Washington, D.C., known as Mount Vernon Square East; an intermediate station at BWI Marshall Airport; and a northern terminal station in Baltimore, MD. Two station options are under consideration in Baltimore, a Cherry Hill Station in the Cherry Hill section of the city and a Camden Yards Station in the downtown area.

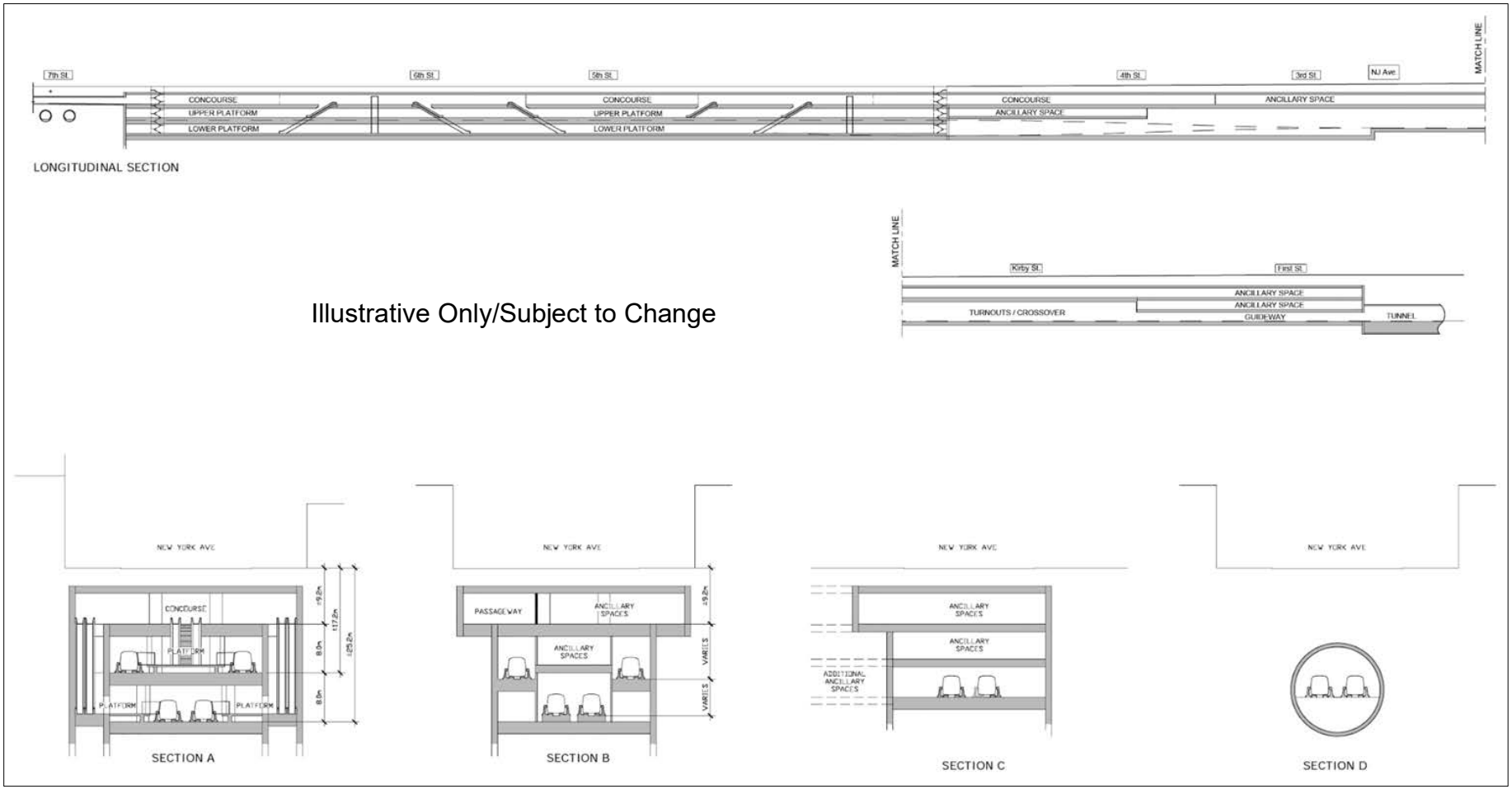
Table 3.4-4 provides a summary of the stations evaluated in the DEIS. Each station would consist of the following elements: access points, ticketing area, waiting area, boarding platforms, and operations spaces (offices, mechanical room, and employee areas). Utilities to these sites, including electric, communications, water and wastewater service will be determined during later phases of design. Utility requirements for these facilities would be similar to those for any commercial site, and it is assumed that local providers have capacity to provide these services. **Figures 3.4-7 thru 3.4-11** are preliminary concepts of stations to illustrate how the stations may appear. The boarding platforms would be located in between the tracks, enabling multiple trains to be boarded simultaneously from each side of the platforms. **Figure 3.4-12** is a generic top-down plan view of the station platform and track layout at each station. More detail regarding station elements and functions is provided in Appendix G.2.

Table 3.4-4: Summary of Station Locations and Features

Station	Location	Access	Connectivity	Parking
Mount Vernon Square East (Washington, D.C.)	Underground along New York Avenue between 7th Street NW and 4th Street NW	Via Carnegie Library building; Massachusetts Avenue at Chinatown Park; or New York Avenue	Existing Metro Convention Center and Gallery Place stations; city bus services; roadway network; bicycle/ pedestrian networks	5-level, 1,000 space underground facility
BWI Marshall Airport	Underground beneath the existing hourly parking garage and airport terminals on either side	Parking garage/airport terminal via new multimodal facility above the station	BWI Airport; Amtrak/MARC rail; Raillink light rail; bus services; roadway network	Parking would be available at a new hourly garage (coordinated with BWI)
Cherry Hill Option (Baltimore)	Elevated above the MTA Cherry Hill Light Rail along and east of MD 295, south of Waterview Avenue,	Via Cherry Hill Station and via new pedestrian connection to adjacent proposed parking facility	Raillink light rail; city bus network; roadway network; bicycle/ pedestrian networks	4-level, 5,000 space facility
Camden Yards Option (Baltimore)	Underground beneath the Convention Center generally between Martin Luther King Jr Blvd to Pratt Street	Via Howard/Camden Streets; Camden MARC Station; or adjacent to Convention Center along Conway Street	Raillink light rail; city bus network; roadway network; bicycle/ pedestrian networks	7-level, 5,000 space facility constructed north of Pratt Street between Sharp and Charles Streets

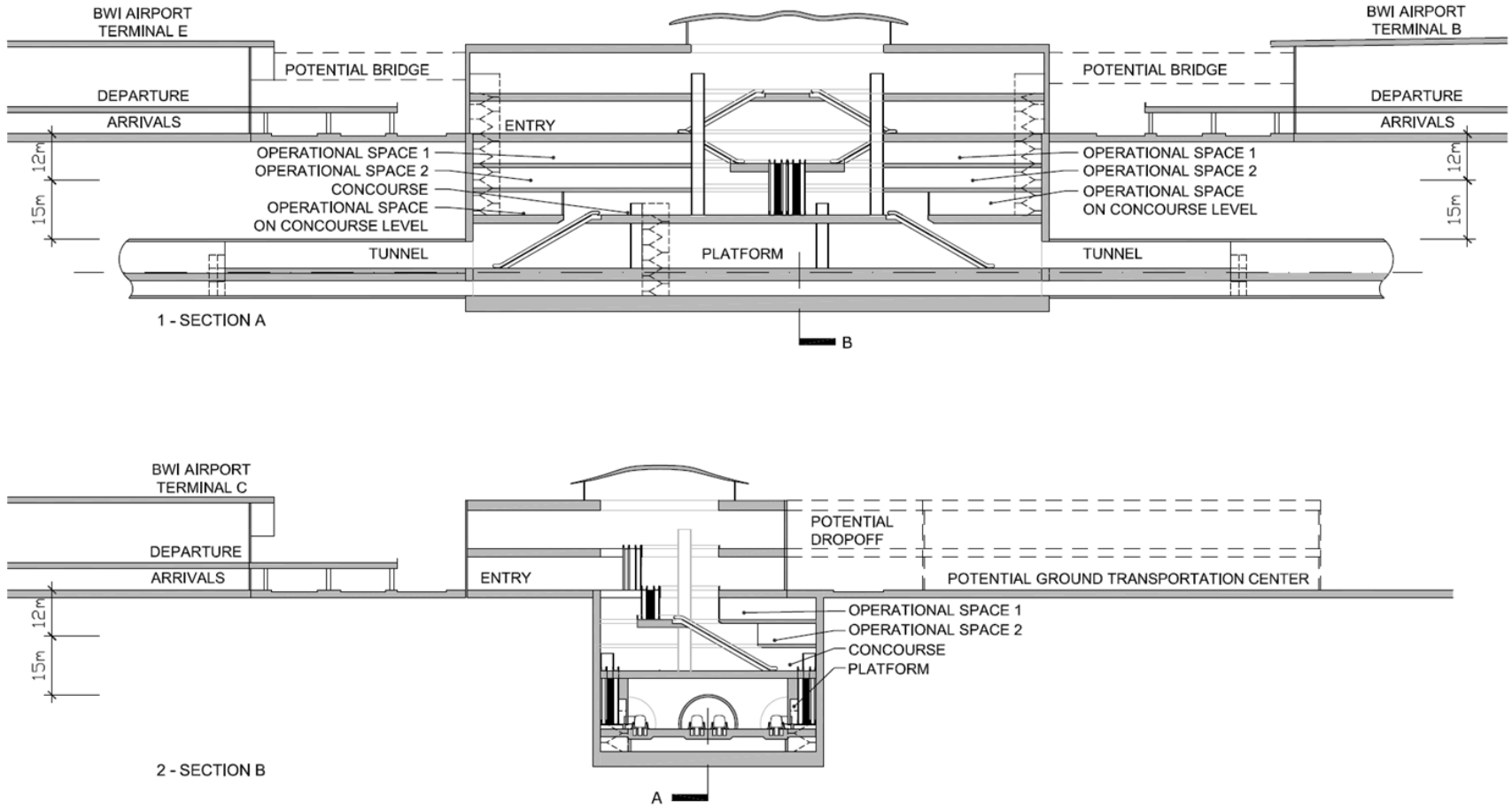
Sources: Alternatives Report, November 2018; Baltimore-Washington SCMAGLEV Project, Washington, D.C. Station Comparison, 2018-12-19

Figure 3.4-7: Station Layout Concept (BWI Marshall Airport and Mount Vernon Square East Stations)



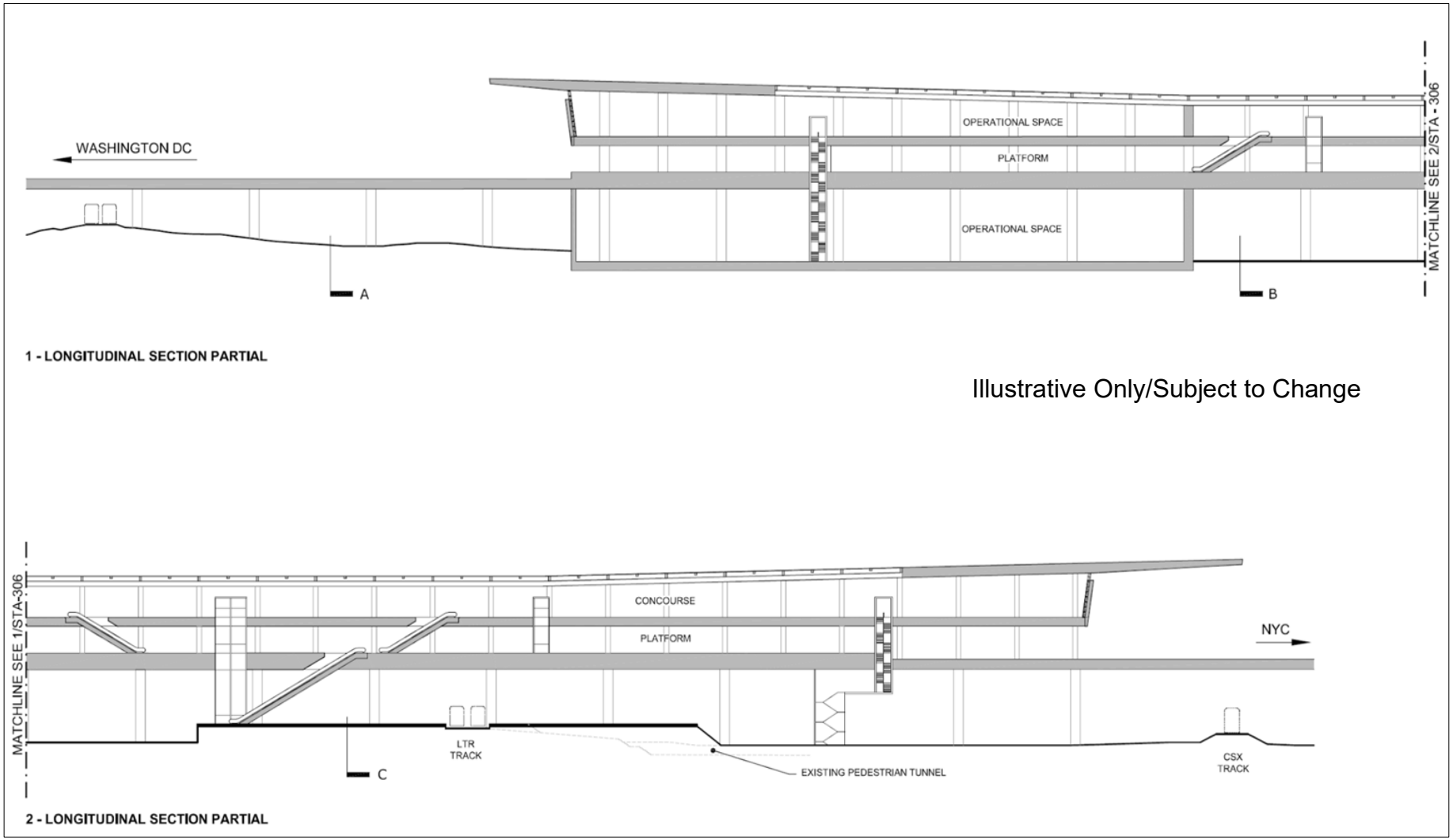
Source: BWRR 2020

Figure 3.4-8: Concept Plans for Mount Vernon Square East Station and BWI Marshall Airport Station



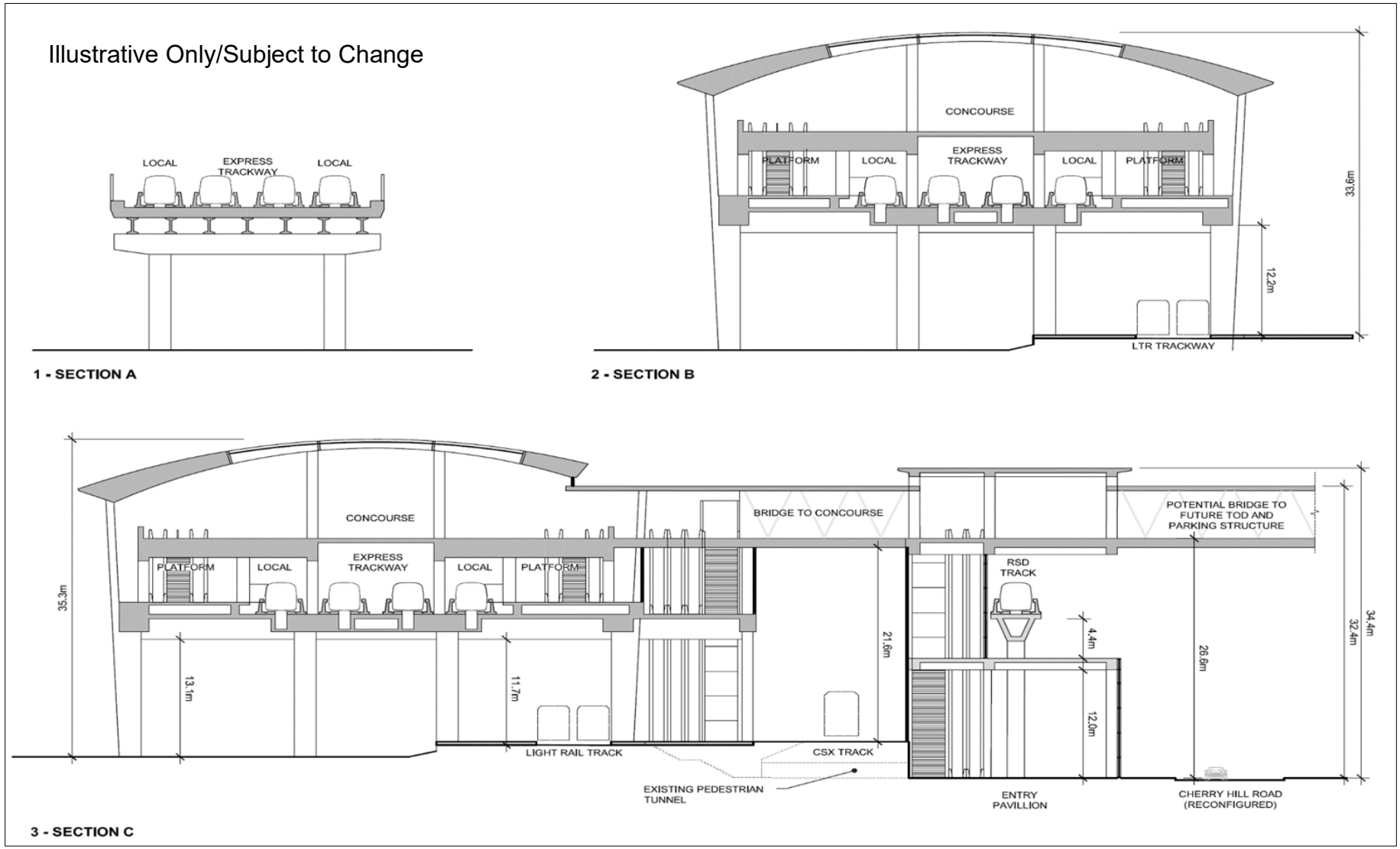
Source: BWRR 2020

Figure 3.4-9: Concept Plans for Cherry Hill Station



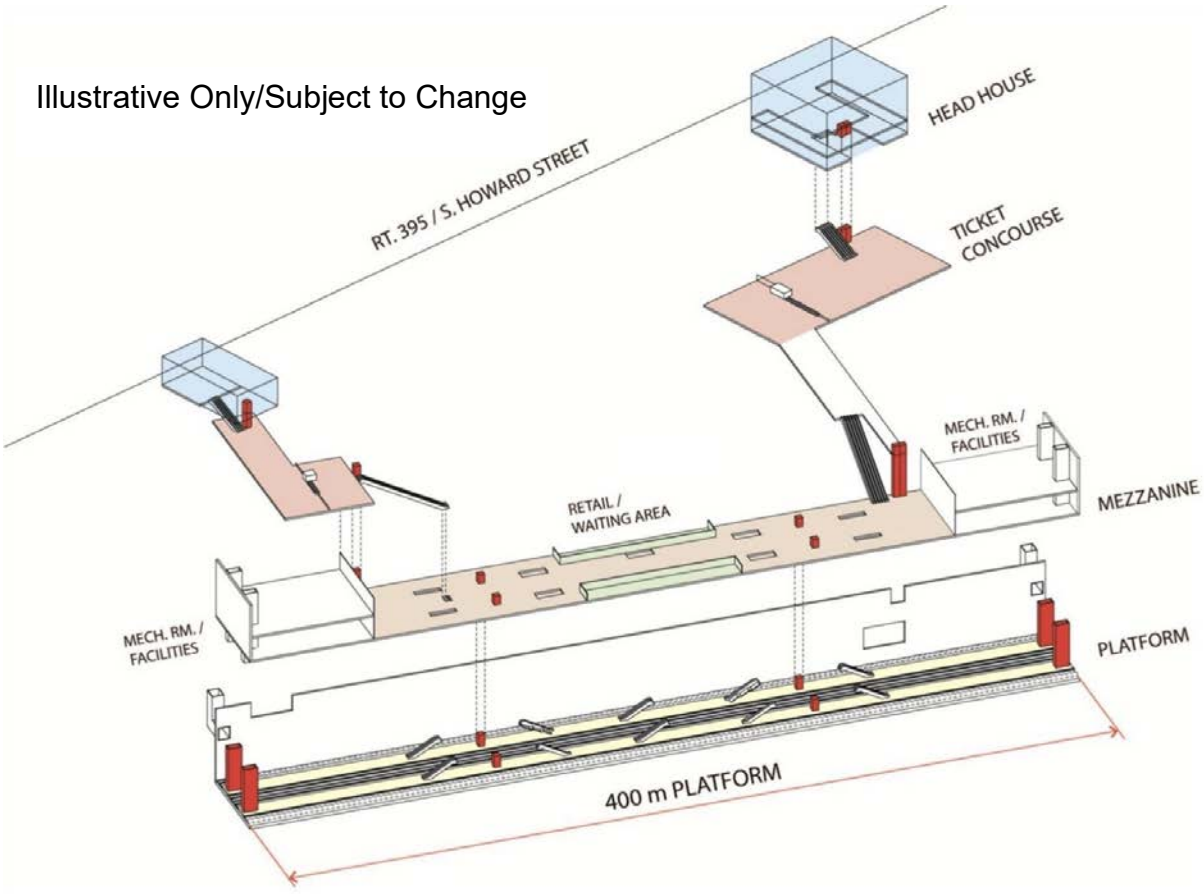
Source: BWRR 2020

Figure 3.4-10: Concept Plans for Cherry Hill Station



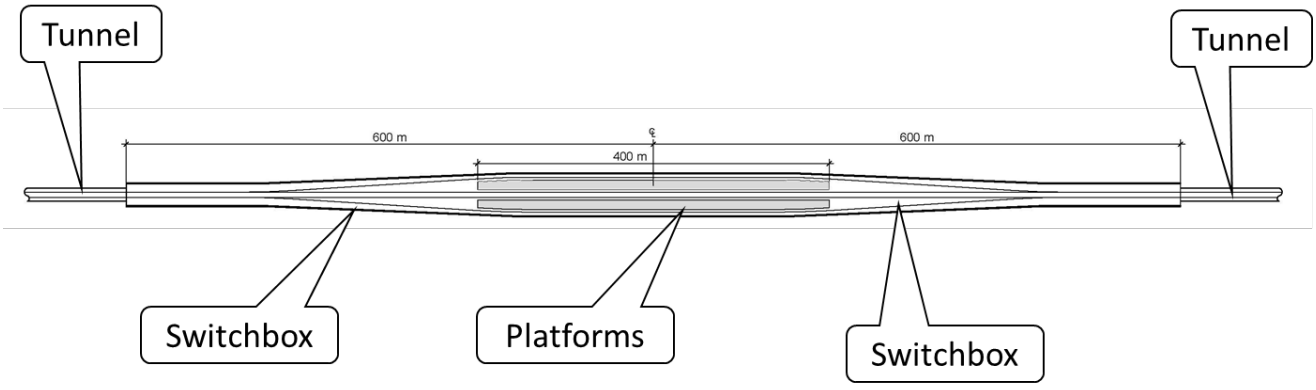
Source: BWRR 2020

Figure 3.4-11: Concept Plans for Camden Yards Station



Source: BWRR 2020

Figure 3.4-12: Plan View (top-down) of Generic Station Layout



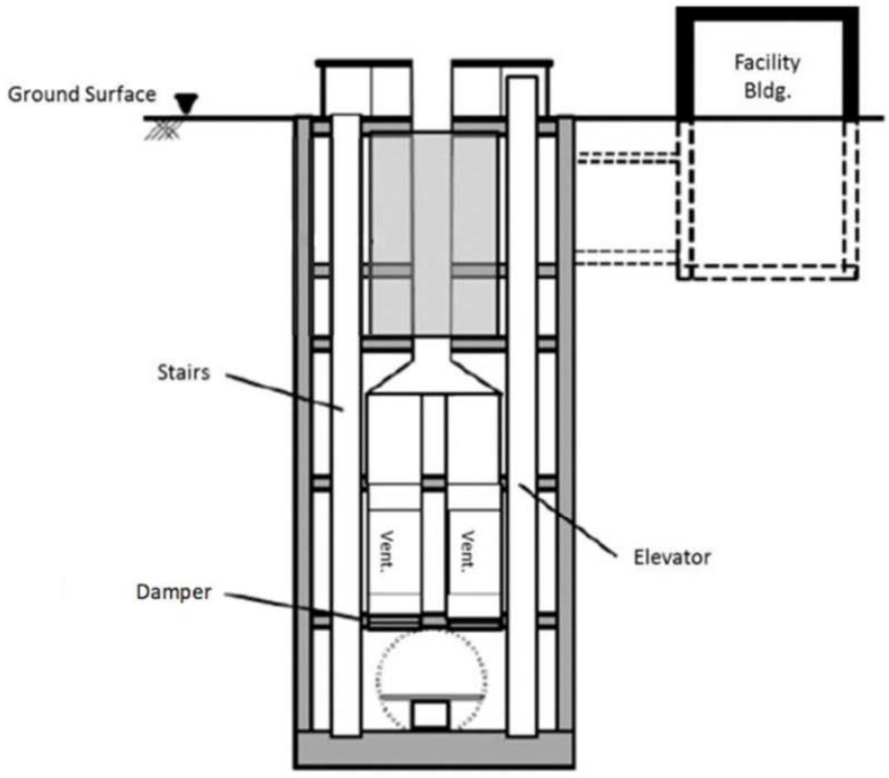
Source: AECOM 2020

3.3.2.5 Fresh Air and Emergency Egress Sites

Fresh air and emergency egress sites (FA/EE) would be provided by the Project Sponsor at eight locations along each Build Alternatives J and Build Alternatives J1, each spaced approximately 3.1 to 3.7 miles apart. Because the Build Alternatives have the same tunnel routes in most of Washington, D.C., at BWI Marshall Airport, and north of the airport to the Cherry Hill area of Baltimore, FA/EE sites in those areas apply to both Build Alternatives. FA/EE sites are shown in Appendix B.1.

FA/EE sites must be adjacent to the guideway or incorporated into the underground facility they are intended to serve. The Project Sponsor would house the facilities in a single building at each location. The typical height of each fresh air and emergency egress site would be approximately 40 to 50 feet above the ground. **Figure 3.4-13** illustrates a typical FA/EE site layout. The fresh air ventilation system consists of a vertical structure that would be primarily underground. Air exchange would be provided by vertical piping that connects the tunnel to the air above ground similar to a chimney structure. Alongside the vertical piping, a stairway and an elevator shaft would be provided to connect the tunnel to the ground surface. These points of access would serve as maintenance access as well as emergency egress ways from the tunnel.

Figure 3.4-13: Typical Fresh Air and Emergency Egress Site Layout



Source: BWRR 2020

The FA/EE sites are:

- 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

3.3.2.6 Power Facilities

The SCMAGLEV system would be powered by electricity, sourced from power purchased from an existing electricity provider. The SCMAGLEV Project would connect to electrical power at existing facilities. Build Alternatives J and J1 would connect to the existing Potomac Electric Power Company (PEPCO) power transmission line near the BWP/MD 197 interchange in Laurel, MD and to the existing Baltimore Gas and Electric (BGE) Pumphrey Substation near the I-895/MD 648 crossing in Halethorpe, MD.

Purchased natural gas would be used to heat offices and occupied indoor spaces (for example, ventilation buildings, maintenance buildings, and stations). The SCMAGLEV Project would connect to the natural gas grid near the locations near the facilities that would use the energy.

Within the SCMAGLEV system, the superconducting magnets in the guideway must be cooled to a temperature that eliminates electrical resistance and produces efficient magnetic forces that propel the trains. The design criteria call for a sealed, refrigerated coolant system that uses liquid helium or a suitable alternative. According to the Project Sponsor, liquid helium would be supplied in sealed, temperature-controlled containers that would be transported to the SCMAGLEV Project and stored at the TMF.

Electric Power Substations

Electric power substations would transform voltage from a high voltage source to the relatively low voltage needs of the SCMAGLEV Project. Power substations energize stations and facilities, support linear infrastructure such as lighting and drainage pumps, and provide current to the coils in the guideway sidewalls to propel and levitate the trains.

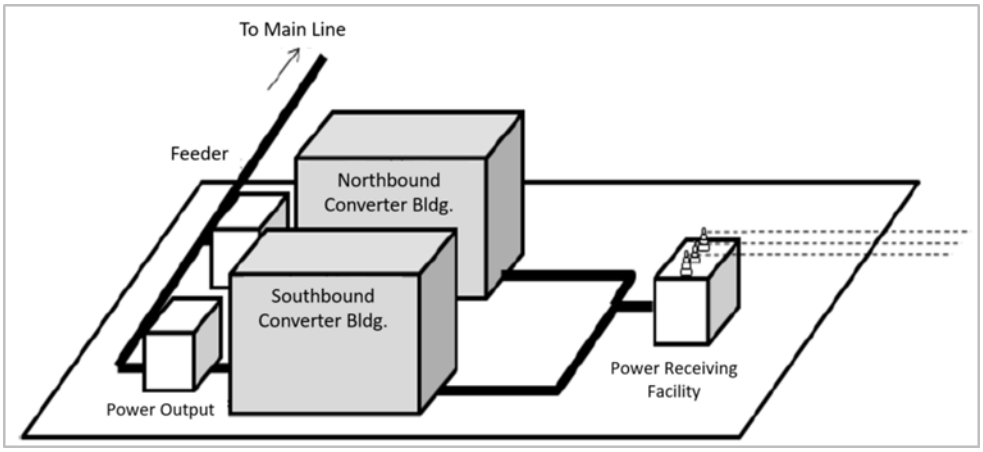
Each substation would require approximately 7 acres, give or take depending upon the location constraints and system requirements. The actual size will be confirmed as the design is finalized. Substations would be collocated with other SCMAGLEV facilities,

such as FA/EE sites or the TMF. At this time, the Project Sponsor has identified there would be two substations required at the TMF and five required for the mainline alignments, Build Alternatives J and J1:

- Build Alternatives J and J1 power substation locations:
  - Adjacent to an existing PEPCO substation along Harry Thomas Way NE, Washington, D.C.: 2 acres
  - New York Avenue NW at Adams Place NE, Washington, D.C.: 14 acres
  - Annapolis Road at Hoffman Avenue, Halethorpe, MD: 20 acres
  - Annapolis Road at Clare Street, Westport, MD: 7 acres
  - BWP/MD 197 interchange, Laurel, MD (enlarged): 12 acres (Build Alternatives J)
  - Airfield, Brock Bridge Road, Laurel, MD: 20 acres (Build Alternatives J1)
- BARC Airstrip TMF:
  - Springfield Road, Glenn Dale, MD: 5 acres
  - BARC airfield, Glenn Dale, MD: 5 acres
- BARC West TMF:
  - Entomology Way, Beltsville, MD: 5 acres
  - Powder Mill Road, Beltsville, MD: 5 acres
- MD 198 TMF:
  - Old Portland Road near MD 198, Laurel, MD: 5 acres
  - Center Avenue near MD 198, Laurel, MD: 5 acres

Each substation would be primarily an aboveground facility containing overhead electric lines on towers or poles, transformer units that would convert the power voltage, a circuit breaker, and a control facility. Substation elements would be inside a building in high visibility areas, such as in Washington, D.C. Substation elements in low visibility areas would not be enclosed by a building. Substations would be fenced and provided with an access driveway and parking for SCMAGLEV Project personnel. **Figure 3.4-14** illustrates a electric power substation layout with equipment housed in a building.

Figure 3.4-14: Electric Power Substation Layout



Source: BWRR 2020

Natural Gas Lines

Connections would be made to existing natural gas supplies operated by BGE and Washington Gas near the SCMAGLEV facilities requiring natural gas. Existing natural gas supply lines are typically located underground; with underground connections to existing natural gas lines. During subsequent design, the Project Sponsor would coordinate with the utility providers regarding the need for natural gas service and to obtain connections.

3.3.2.7 Operations, Signals, and Communications Facilities

The SCMAGLEV Project includes operations, signals, and communications facilities along the alignments that would be used to operate the trains on the SCMAGLEV system. The purposes of these facilities are as follows:

- Operations Control Center: A facility where SCMAGLEV Project personnel operate and monitor the SCMAGLEV system, including trains, ancillary facilities, signals, and communications.
- Signals: Visual display devices that provide instructions or advance warning of instructions to train operators during operations.
- Communications: A system of transmitting information and instructions between the operations center and a train, the guideway, and ancillary facilities.

The Project Sponsor identified the location of the SCMAGLEV Project Operations Control Center on 20 acres of land west of MD 295 and south of Waterview Avenue. The Operations Control Center would consist of one or more buildings with on-site parking for employees. Prior to operation of the SCMAGLEV Project, the Project Sponsor will develop and implement protocols and procedures for all activities at the Operations Control Center and throughout the SCMAGLEV system, such as: operational authority, job descriptions, hours of personnel service, equipment operations and maintenance, and security and safety. The protocols will include

requirements such as selecting and training of personnel, fitness for duty requirements, work environment, and employee resources. Auxiliary control facilities adjacent to and along the guideway route would be smaller in size (approximately one acre in size) and would be similarly organized and regulated. These facilities are shown in Appendix B.1 as “SCMAGLEV Systems”.

Signals and communications equipment would typically be housed in the auxiliary control facilities adjacent to and at intervals along the alignment or are installed on the guideway structure. Signals and communications equipment would be interconnected and tied to the Operations Control Center by a system of underground and overhead cabling.

3.3.2.8 Service and Operations

SCMAGLEV Project trains would operate between Baltimore, MD and Washington, D.C. 24 hours a day, seven days a week. Bidirectional revenue service would operate from 5:00 AM to 11:00 PM. Movements between 11:00 PM and 5:00 AM would be to/from the TMF site. Service headways (time between trains) would vary by time of day, ranging from 8 to 15 minutes to accommodate peak hour travel. The optimum train operating speed would be 311 mph, with the exception of station approaches/ departures and ramps to TMF facilities. The service and operations of the SCMAGLEV system would be the same for all Build Alternatives.

The Baltimore-Washington operation would use a 16-car train with an approximate length of 1,312 feet. A 16-car train would have a capacity of approximately 543 passengers. The number of train cars (consist) will not vary throughout the day or change during peak/off peak service times. **Table 3.4-5** summarizes the service characteristics of the SCMAGLEV Project.

3.3.2.9 Relocation of Major Utilities

The SCMAGLEV Project would intersect several major utility corridors, requiring relocation of the utilities within these corridors to accommodate the SCMAGLEV Project. Major utility corridors are existing, regional rights of way through which underground or aboveground power or other services, such as water, are conveyed. Major utility relocation would be required to address physical conflicts and to enable safe operations for the utilities as well as the SCMAGLEV Project.

The Project Sponsor identified the locations where major utilities would intersect the SCMAGLEV Project and conceptually identified the land area that would be required to either raise or relocate the intersecting utilities (see mapping in Appendix B.1). **Table 3.4-6** summarizes the major utility relocations along each Build Alternative. During subsequent design, the Project Sponsor will coordinate with the utility operators to develop and obtain approvals for major utility relocations.

Table 3.4-5: Service Characteristics

Characteristic	Description
Train consist (number of cars) and size (train length) for both peak and off-peak periods	For both peak and off-peak service periods: • 16-car trains (inclusive of two head cars) • Train length is 1,312 feet (400 meters)
Headway times by period of the day	Headways vary by hour throughout the day depending on ridership requirements. • 5:00AM-7:00AM – 15 minutes • 7:00AM-9:00AM – 8 minutes • 9:00AM-3:00PM – 15 minutes • 3:00PM-7:00PM – 8 minutes • 7:00PM-11:00PM – 15 minutes
Speed profiles (i.e., train speeds as a function of location or station) for all sections of the corridor	Optimum speed except as noted below: 311 mph Restricted travel speed: 45 mph at approaches to stations and on TMF ramps
Anticipated train dwell (idle) time at stations	Washington, D.C. and Baltimore, MD Stations: 10-minute minimum BWI Marshall Airport Station: 4-minute maximum

Source: BWRR 2020.

Table 3.4-6: Summary of Major Utility Relocations

Unique Route – Build Alternatives J	Unique Route – Build Alternatives J1	TMF Options
High Voltage Corridor, south of BWP/ MD 197 intersection, Laurel, MD (raise existing lines) High Voltage Corridor, south and north of BWP/ MD 198 intersection, Laurel, MD (existing lines to be relocated and raised) Major utility, BWP/ MD 32 intersection, Laurel, MD (existing lines to be relocated)	High Voltage Corridor, south of BWP/ MD 197 intersection, Laurel, MD (raise existing lines)	BARC Airstrip TMF: None BARC West TMF: None MD 198 TMF: High Voltage Corridor, south and north of BWP/ MD 198 intersection, Laurel, MD (existing lines to be relocated and raised)

Source: BWRR 2020

3.3.2.10 Permanent Relocation of Public Roadways

The Project Sponsor identified several locations where existing public roadways would be permanently relocated or changed to accommodate the SCMAGLEV Project. Refer to Appendix B.1 and Appendix G.2 for mapping illustrating the roadway relocations.

Table 3.4-7 summarizes the portions of existing roadways that would be permanently relocated as part of the SCMAGLEV Project.

Table 3.4-7 Summary of Permanent Existing Public Roadway Relocations

Common Route	Unique Route – Build Alternatives J	Unique Route – Build Alternatives J1
Adams Place, Washington, D.C. to be closed to public traffic Closure of Spellman Overpass over BWP, Greenbelt, MD Relocate portion of Odell Road, Beltsville, MD: 0.35 mile (BARC West TMF only) Relocate portion of Springfield Road, Beltsville, MD: 0.60 mile (for BARC Airstrip TMF only) Relocate portion of Old Portland Road, Laurel, MD: 0.5 mile (for MD 198 TMF only) Raise elevation of Annapolis Road/ Patapsco Avenue intersection approximately 20 feet on retained fill, Cherry Hill, Baltimore, MD: 0.25 mile along each approach	Explorer Road ramps to and from BWP Northbound, Greenbelt, MD: raise the elevation of 2 existing ramps approximately seven feet; ramps would be on retained fill, 0.15 mile each Lower the elevation of the existing BWP northbound ramp to Powder Mill Road[1] by approximately 3 feet to increase vertical clearance to the viaduct, 0.13 mile	Realignment of portion of Springfield Road near BWP, Laurel, MD: 0.33 miles

Source: AECOM 2020

[1] Powder Mill Road is owned by USDA.

3.3.2.11 Stormwater Management

The SCMAGLEV Project would require facilities to manage drainage (also known as stormwater) from rain and storm events on new imperious surfaces such as the guideway, buildings, roadways, driveways, and parking areas.

At the current level of design, the following types of stormwater management strategies were considered: vegetated swales, ditches, and channels; piped drainage; and drainage basins. Regulatory design criteria prescribe the conditions under which stormwater management facilities would be required and dimensions.

Table 3.4-8 summarizes the stormwater management basin locations along each Build Alternative, which are shown in Appendix B.1. Because the Build Alternatives have the same route in most of Washington, D.C., at BWI Marshall Airport, and north of the airport to the Cherry Hill area of Baltimore, stormwater management basins in those areas are listed in the “Common Route” column. Stormwater management basins along other portions of the alignment options are listed in the “Unique Route” columns for

each alignment option. During subsequent design, the Project Sponsor will identify, design, and obtain required approvals for stormwater management facilities.

Table 3.4-8: Summary of Stormwater Management Facility Locations by Build Alternative

Common Route	Unique Route – Build Alternatives J	Unique Route – Build Alternatives J1
Common	BWP/Explorer Road interchange, Greenbelt, MD: 3 locations, 17 acres North of I-295/MD 32 Interchange, Fort Meade, MD: portal area 8 acres	BWP/Explorer Road interchange, Greenbelt, MD: 3 locations, 35 acres BWP/MD 198 interchange, Laurel, MD: portal area, 2 locations, 7 acres

Source: AECOM 2020.

3.3.2.12 Construction Phase Facilities

Staging and/or laydown areas are used to store construction-related vehicles, equipment, and materials. Where reasonably-feasible, the Project Sponsor identified construction sites within the limits of disturbance (LOD) such as proposed tunnel portal, fresh air and emergency egress, and substation locations as construction staging areas. The Project Sponsor located staging areas by identifying areas that were previously developed for non-residential use and are currently underutilized. These areas are shown in the Build Alternatives mapping in Appendix B.

In addition to smaller construction sites along the respective alignments, which range in size from two to ten acres, the Project Sponsor identified three larger potential staging areas to store precast superstructure segments before crews transport them to specific elevated guideway (viaduct) construction segments:

- Site of former Suburban Airport – 50 acres
- Undeveloped commercial land near the I-95 & MD 200 (ICC) interchange – 160 acres
- Site of former Landover Mall – 40 acres

The Project Sponsor will designate material haul routes for vehicles carrying construction materials and debris to use. The Project Sponsor will review the preliminary plans and develop the final construction coordination plans and details (such as the need to upgrade haul routes, the traffic control of haul routes, and the frequency of clearing the hauls route roads of dirt/debris) during final design in consultation with contractors. No commercial or construction vehicles are allowed on the BWP south of MD 175 since this section of the road is maintained by the NPS.

3.4 Project Sponsor Preferred Configuration

The Project Sponsor's proposal and recommended preferred end-to-end configuration is the Build Alternatives J alignment, BARC West TMF, and Cherry Hill as the north terminus station (Build Alternative J-03). BWRR favors this alternative for its shorter construction, ability to avoid and mitigate impacts, and lower construction and operating costs. BWRR believes Build Alternative J-03 will be the least impact and lowest cost to construct, operate, and maintain while also providing the earliest start to revenue service. As noted earlier in this chapter, FRA is not making a recommendation on a Preferred Alternative as part of this DEIS. Each of the Alternatives Considered are presented and evaluated in this DEIS.